POORNIMA
COLLEGE OF ENGINEERING

Approved by AICTE
Affiliated to Rajasthan Technical University, Kota
Recognized by UGC under Section 2(f) of the UGC Act, 1956

Scheme and Syllabus
Rajasthan Technical University, Kota
(Session 2019-20)

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Scheme and Syllabus

Rajasthan Technical University, Kota

B. Tech. in 1st Year

(Session 2019-20)

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Teaching and Examination Scheme

I Semester: B.Tech
Common to all branches of UG Engineering & Technology

SN	Category	Course Code	Course Title	Hours			Marks			Cr
				L	T	P	IA	ETE	Total	
1	BSC	1FY2-01	Engineering Mathematics-I	3	1	-	40	160	**200**	**4**
2	BSC	1FY2-02/ 1FY2-03	Engineering Physics/ Engineering Chemistry	3	1	-	40	160	**200**	**4**
3	HSMC	1FY1-04/ 1FY1-05	Communication Skills/ Human Values	2	-	-	20	80	**100**	**2**
4	ESC	1FY3-06/ 1FY3-07	Programming for Problem Solving/ Basic Mechanical Engineering	2	-	-	20	80	**100**	**2**
5	ESC	1FY3-08/ 1FY3-09	Basic Electrical Engineering/ Basic Civil Engineering	2	-	-	20	80	**100**	**2**
6	BSC	1FY2-20/ 1FY2-21	Engineering Physics Lab/ Engineering Chemistry Lab	-	-	2	30	20	**50**	**1**
7	HSMC	1FY1-22/ 1FY1-23	Language Lab/ Human Values Activities and Sports	-	-	2	30	20	**50**	**1**
8	ESC	1FY3-24/ 1FY3-25	Computer Programming Lab/ Manufacturing Practices Workshop	-	-	3	45	30	**75**	**1.5**
9	ESC	1FY3-26/ 1FY3-27	Basic Electrical Engineering Lab/ Basic Civil Engineering Lab	-	-	2	30	20	**50**	**1**
10	ESC	1FY3-28/ 1FY3-29	Computer Aided Engineering Graphics/ Computer Aided Machine Drawing	-	-	3	45	30	**75**	**1.5**
11	SODECA	1FY8-00							**25**	**0.5**
								Total	**1025**	**20.5**

L = Lecture, **T** = Tutorial,
P = Practical, **IA**=Internal Assessment**,**
ETE=End Term Exam, **Cr**=Credits

Teaching and Examination Scheme

II Semester: B.Tech.
Common to all branches of UG Engineering & Technology

SN	Category	Course Code	Course Title	Hours			Marks			Cr
				L	T	P	IA	ETE	Total	
1	BSC	2FY2-01	Engineering Mathematics-II	3	1	-	40	160	**200**	**4**
2	BSC	2FY2-03/ 2FY2-02	Engineering Chemistry/ Engineering Physics	3	1	-	40	160	**200**	**4**
3	HSMC	2FY1-05/ 2FY1-04	Human Values/ Communication Skills	2	-	-	20	80	**100**	**2**
4	ESC	2FY3-07/ 2FY3-06	Basic Mechanical Engineering/ Programming for Problem Solving	2	-	-	20	80	**100**	**2**
5	ESC	2FY3-09/ 2FY3-08	Basic Civil Engineering/ Basic Electrical Engineering	2	-	-	20	80	**100**	**2**
6	BSC	2FY2-21/ 2FY2-20	Engineering Chemistry Lab/Engineering Physics Lab	-	-	2	30	20	**50**	**1**
7	HSMC	2FY1-23/ 2FY1-22	Human Values Activities and Sports/ Language Lab	-	-	2	30	20	**50**	**1**
8	ESC	2FY3-25/ 2FY3-24	Manufacturing Practices Workshop/ Computer Programming Lab	-	-	3	45	30	**75**	**1.5**
9	ESC	2FY3-27/ 2FY3-26	Basic Civil Engineering Lab/Basic Electrical Engineering Lab	-	-	2	30	20	**50**	**1**
10	ESC	2FY3-29/ 2FY3-28	Computer Aided Machine Drawing/ Computer Aided Engineering Graphics	-	-	3	45	30	**75**	**1.5**
11	SODECA	1FY8-00							**25**	**0.5**
								Total	**1025**	**20.5**

L = Lecture, **T** = Tutorial,
P = Practical, **IA**=Internal Assessment**,**
ETE=End Term Exam, **Cr**=Credits

SYLLABUS
I Semester
Common to all branches of UG Engineering & Technology

1FY2-01: Engineering Mathematics-I

Credit: 4 **Max. Marks: 200 (IA:40, ETE:160)**
3L+1T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	Hours
1	**Calculus:** Improper integrals (Beta and Gamma functions) and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.	8
2	**Sequences and Series:** Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions.	6
3	**Fourier Series:** Periodic functions, Fourier series, Euler's formula, Change of intervals, Half range sine and cosine series, Parseval's theorem.	6
4	**Multivariable Calculus (Differentiation):** Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence.	10
5	**Multivariable Calculus (Integration):** Multiple Integration: Double integrals (Cartesian), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes, Centre of mass and Gravity (constant and variable densities); Triple integrals (Cartesian), Simple applications involving cubes, sphere and rectangular parallelepipeds; Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes.	10
	TOTAL	**40**

I & II Semester
Common to all branches of UG Engineering & Technology

1FY2-02/ 2FY2-02: Engineering Physics

Credit: 4 **Max. Marks: 200 (IA:40, ETE:160)**
3L+1T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	Hours
1	**Wave Optics:** Newton's Rings, Michelson's Interferometer, Fraunhofer Diffraction from a Single Slit. Diffraction grating: Construction, theory and spectrum, Resolving power and Rayleigh criterion for limit of resolution, Resolving power of diffraction grating, X-Ray diffraction and Bragg's Law.	9
2	**Quantum Mechanics:** Introduction to quantum Mechanics, Wave-particle duality, Matter waves, Wave function and basic postulates, Time dependent and time independent Schrodinger's Wave Equation, Physical interpretation of wave function and its properties, Applications of the Schrodinger's Equation: Particle in one dimensional and three dimensional boxes.	6
3	**Coherence and Optical Fibers:** Spatial and temporal coherence: Coherence length; Coherence time and 'Q' factor for light, Visibility as a measure of Coherence and spectral purity, Optical fiber as optical wave guide, Numerical aperture; Maximum angle of acceptance and applications of optical fiber.	4
4	**Laser:** Einstein's Theory of laser action; Einstein's coefficients; Properties of Laser beam, Amplification of light by population inversion, Components of laser, Construction and working of He-Ne and semiconductor lasers, Applications of Lasers in Science, engineering and medicine.	6
5	**Material Science & Semiconductor Physics:** Bonding in solids: covalent and metallic bonding, Energy bands in solids: Classification of solids as Insulators, Semiconductors and Conductors, Intrinsic and extrinsic semiconductors, Fermi dirac distribution function and Fermi energy, Conductivity in semiconductors, Hall Effect: Theory, Hall Coefficient and applications.	7
6	**Introduction to Electromagnetism:** Divergence and curl of electrostatic field, Laplace's and Poisson's equations for electrostatic potential, Bio-Savart law, Divergence and curl of static magnetic field, Faraday's law, Displacement current and magnetic field arising from time dependent electric field, Maxwell's equations, Flow of energy and Poynting vector.	8
	TOTAL	**40**

I & II Semester

Common to all branches of UG Engineering & Technology

1FY2-03/ 2FY2-03: Engineering Chemistry

Credit: 4 **Max. Marks: 200 (IA:40, ETE:160)**

3L+1T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	Hours
1	**Water:** Common impurities, hardness, determination of hardness by complexometric (EDTA method), Degree of hardness, Units of hardness Municipal water supply: Requisite of drinking water, Purification of water; sedimentation, filtration, disinfection, breakpoint chlorination. Boiler troubles: Scale and Sludge formation, Internal treatment methods, Priming and Foaming, Boiler corrosion and Caustic embrittlement Water softening; Lime-Soda process, Zeolite (Permutit) process, Demineralization process. Numerical problems based on Hardness, EDTA, Lime-Soda and Zeolite process.	**10**
2	**Organic Fuels:** Solid fuels: Coal, Classification of Coal, Proximate and Ultimate analyses of coal and its significance, Gross and Net Calorific value, Determination of Calorific value of coal by Bomb Calorimeter. Metallurgical coke, Carbonization processes; Otto-Hoffmann by-product oven method. Liquid fuels : Advantages of liquid fuels, Mining, Refining and Composition of petroleum, Cracking, Synthetic petrol, Reforming, Knocking, Octane number, Anti-knocking agents, Cetane number Gaseous fuels; Advantages, manufacturing, composition and Calorific value of coal gas and oil gas, Determination of calorific value of gaseous fuels by Junker's calorimeter Numerical problems based on determination of calorific value (bomb calorimeter/Junkers calorimeter/Dulongs formula, proximate analysis & ultimate and combustion of fuel.	**10**
3	**Corrosion and its control:** Definition and significance of corrosion, Mechanism of chemical (dry) and electrochemical (wet) corrosion, galvanic corrosion, concentration corrosion and pitting corrosion. Protection from corrosion; protective coatings-galvanization and tinning, cathodic protection, sacrificial anode and modifications in design.	**3**
4	**Engineering Materials:** Portland Cement; Definition, Manufacturing by Rotary kiln. Chemistry of setting and hardening of cement. Role of Gypsum. Glass: Definition, Manufacturing by tank furnace, significance of	**10**

	annealing, Types and properties of soft glass, hard glass, borosilicate glass, glass wool, safety glass Lubricants: Classification, Mechanism, Properties; Viscosity and viscosity index, flash and fire point, cloud and pour point. Emulsification and steam emulsion number.	
5	**Organic reaction mechanism and introduction of drugs:** Organic reaction mechanism: Substitution; SN1, SN2, Elecrophilic aromatic substitution in benzene, free radical halogenations of alkanes, Elimination; elimination in alkyl halides, dehydration of alcohols, Addition: electrophilic and free radical addition in alkenes, nucleophilic addition in aldehyde and ketones, Rearrangement; Carbocation and free radical rearrangements Drugs : Introduction, Synthesis, properties and uses of Aspirin, Paracetamol	**7**
	TOTAL	**40**

I & II Semester
Common to all branches of UG Engineering & Technology

1FY1-04/ 2FY1-04: Communication Skills

Credit: 2 **Max. Marks: 100 (IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hours
1	**Communication:** Meaning, Importance and Cycle of Communication. Media and Types of Communication. Verbal and Non-Verbal Communication. Barriers to communication. Formal and Informal Channels of Communication (Corporate Communication). Divisions of Human Communication and Methods to improve Interpersonal Communication. Qualities of good communication.	5
2	**Grammar:** Passive Voice. Reported Speech. Conditional Sentences. Modal Verbs. Linking Words (Conjunctions)	5
3	**Composition:** Job Application and Curriculum-Vitae Writing. Business Letter Writing. Paragraph Writing. Report Writing.	5
4	**Short Stories:** "Luncheon" by Somerset Maugham."How Much Land Does a Man Need?" by Count Leo Tolstoy. "The Night Train at Deoli" by Ruskin Bond.	5
5	**Poems:** "No Men are Foreign" by James Kirkup. "If" by Rudyard Kipling. "Where the Mind is without Fear" by Rabindranath Tagore.	5
	TOTAL	**25**

I & II Semester
Common to all branches of UG Engineering & Technology

1FY1-05/ 2FY1-05: Human Values

Credit: 2 **Max. Marks: 100 (IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hours
1	**Course Introduction - Need, Basic Guidelines, Content and Process for Value Education** Understanding the need, basic guidelines, Self Exploration - its content and process; 'Natural Acceptance' and Experiential Validation, Continuous Happiness and Prosperity- Human Aspirations, Right understanding, Relationship and Physical Facilities,Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario. Method to fulfill the above human aspirations: understanding and living in harmony at various levels	5
2	**Understanding Harmony in the Human Being - Harmony in Myself** Understanding human being as a co-existence of the sentient 'I' and the material 'Body' Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha Understanding the Body as an instrument of 'I',Understanding the characteristics and activities of 'I' and harmony in 'I' Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya.	5
3	**Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship** Understanding harmony in the Family, Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) , meaning of Vishwas; Difference between intention and competence, meaning of Samman, Difference between respect and differentiation; the other salient values in relationship, harmony in the society , Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals ,Visualizing a universal harmonious order in society- Undivided Society (AkhandSamaj), Universal Order (SarvabhaumVyawastha)- from family to world family.	5

4	**Understanding Harmony in the Nature and Existence - Whole existence as Coexistence** Understanding the harmony in the Nature. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature. Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all pervasive Space. Holistic perception of harmony at all levels of existence	**5**
5	**Implications of the above Holistic Understanding of Harmony on Professional Ethics. Natural acceptance of human values** Definitiveness of Ethical Human Conduct. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in Professional Ethics: a) Ability to utilize the professional competence for augmenting universal human order, (b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models. Strategy for transition from the present state to Universal Human Order: (a). At the level of individual: as socially and ecologically responsible engineers, technologists and managers. (b). At the level of society: as mutually enriching institutions and organization. Case studies related to values in professional life and individual life.	**5**
	TOTAL	**25**

I & II Semester

Common to all branches of UG Engineering & Technology

1FY3-06/ 2FY3-06: Programming for Problem Solving

Credit: 2 **Max. Marks: 100 (IA:20, ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hours
1	**Fundamentals of Computer:** Stored program architecture of computers, Storage device- Primary memory, and Secondary storage, Random, Direct, Sequential access methods, Concepts of High-level, Assembly and Low-level languages, Representing algorithms through flowchart and pseudo code.	8
2	**Number system:** Data representations, Concepts of radix and representation of numbers in radix r with special cases of r=2, 8, 10 and 16 with conversion from radix r1 to r2, r's and (r-1)'s complement, Binary addition, Binary subtraction, Representation of alphabets.	8
3	**C Programming:** Problem specification, flow chart, data types, assignment statements, input output statements, developing simple C programs, If statement, for loops, while loops, do-while loops, switch statement, break statement, continue statement, development of C programs using above statements, Arrays, functions, parameter passing, recursion, Programming in C using these statements, Structures, files, pointers and multi file handling.	12
	TOTAL	**28**

I & II Semester
Common to all branches of UG Engineering & Technology

1FY3-07/ 2FY3-07: Basic Mechanical Engineering

Credit: 2 **Max. Marks: 100 (IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hours
1	**Fundamentals:** Introduction to mechanical engineering, concepts of thermal engineering, mechanical machine design, industrial engineering and manufacturing technology. Steam Boilers classification and types of steam boilers and steam turbines. Introduction and Classification of power plants.	
2	**Pumps and IC Engines:** Applications and working of Reciprocating and Centrifugal pumps. Introduction, Classification of IC Engines, Main Components of IC Engines, Working of IC Engines and its components.	
3	**Refrigeration and Air Conditioning:** Introduction, classification and types of refrigeration systems and air-conditioning. Applications of refrigeration and Air-conditioning.	
4	**Transmission of Power:** Introduction and types of Belt and Rope Drives, Gears.	
5	**Primary Manufacturing Processes:** Metal Casting Process: Introduction to Casting Process, Patterns, Molding, Furnaces. Metal Forming Processes: Introduction to Forging, Rolling, Extrusion, Drawing. Metal Joining Processes: Introduction to various types of Welding, Gas Cutting, Brazing, and Soldering.	
6	**Engineering Materials and Heat Treatment of Steel:** Introduction to various engineering materials and their properties.	

I & II Semester
Common to all branches of UG Engineering & Technology

1FY3-08/ 2FY3-08: Basic Electrical Engineering

Credit: 2 **Max. Marks: 100 (IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hours
1	**DC Circuits:** Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff current and voltage laws, Series-Parallel circuits, Node voltage method, Mesh current method, Superposition, Thevenin's, Norton's and Maximum power transfer theorems.	5
2	**AC Circuits:** Representation of sinusoidal waveforms, peak and r.m.s values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase AC circuits consisting of R, L, C, RL, RC and RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections.	4
3	**Transformers:** Ideal and practical transformer, EMF equation, equivalent circuit, losses in transformers, regulation and efficiency.	4
4	**Electrical Machines:** Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Starting and speed control of induction motor, single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited DC motor. Construction and working of synchronous generators.	7
5	**Power Converters:** Semiconductor PN junction diode and transistor (BJT). Characteristics of SCR, power transistor and IGBT. Basic circuits of single phase rectifier with R load, Single phase Inverter, DC-DC converter.	4
6	**Electrical Installations:** Layout of LT switchgear: Switch fuse unit (SFU), MCB, ELCB, MCCB, Type of earthing. Power measurement, elementary calculations for energy consumption.	4
	TOTAL	**28**

I & II Semester
Common to all branches of UG Engineering & Technology

1FY3-09/ 2FY3-09: Basic Civil Engineering

Credit: 2 **Max. Marks: 100 (IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hours
1	**Introduction to objective, scope and outcome the subject**	1
2	**Introduction:** Scope and Specialization of Civil Engineering, Role of civil Engineer in Society, Impact of infrastructural development on economy of country.	2
3	**Surveying:** Object, Principles & Types of Surveying; Site Plans, Plans& Maps; Scales & Unit of different Measurements. Linear Measurements: Instruments used. Linear Measurement by Tape, Ranging out Survey Lines and overcoming Obstructions; Measurements on sloping ground; Tape corrections, conventional symbols. Angular Measurements: Instruments used; Introduction to Compass Surveying, Bearings and Longitude & Latitude of a Line, Introduction to total station. Levelling: Instrument used, Object of levelling, Methods of levelling in brief, Contour maps.	8
4	**Buildings:** Selection of site for Buildings, Layout of Building Plan, Types of buildings, Plinth area, carpet area, floor space index, Introduction to building byelaws, concept of sun light and ventilation. Components of Buildings & their functions, Basic concept of R.C.C., Introduction to types of foundation.	3
5	**Transportation:** Introduction to Transportation Engineering; Traffic and Road Safety: Types and Characteristics of Various Modes of Transportation; Various Road Traffic Signs, Causes of Accidents and Road Safety Measures.	2

6	**Environmental Engineering:** Environmental Pollution, Environmental Acts and Regulations, Functional Concepts of Ecology, Basics of Species, Biodiversity, Ecosystem, Hydrological Cycle;Chemical Cycles: Carbon, Nitrogen& Phosphorus; Energy Flow in Eco-systems. Water Pollution: Water Quality standards, Introduction to Treatment & Disposal of Waste Water. Reuse and Saving of Water, Rain Water Harvesting. Solid Waste Management: Classification of Solid Waste, Collection, Transportation and Disposal of Solid. Recycling of Solid Waste: Energy Recovery,Sanitary Land fill, On-Site Sanitation. Air& Noise Pollution: Primary and Secondary air pollutants, Harmful effects of Air Pollution, Control of Air Pollution. . Noise Pollution, Harmful Effects of noise pollution, control of noise pollution, Global warming& Climate Change, Ozone depletion, Green House effect	**4** **3** **2** **3**
	TOTAL	**28**

I & II Semester

Common to all branches of UG Engineering & Technology

1FY2-20/ 2FY2-20: Engineering Physics Lab

Credit: 1 **Max. Marks: 50 (IA:30, ETE:20)**

0L+0T+2P

1. To determine the wave length of monochromatic light with the help of Michelson's interferometer.
2. To determine the wave length of sodium light by Newton's Ring.
3. To determine the wave length of prominent lines of mercury by plane diffraction grating with the help of spectrometer.
4. Determination of band gap using a P-N junction diode.
5. To determine the height of given object with the help of sextant.
6. To determine the dispersive power of material of a prism with the help of spectrometer.
7. To study the charge and discharge of a condenser and hence determine the same constant (both current and voltage graphs are to be plotted.
8. To determine the coherence length and coherence time of laser using He – Ne laser.
9. To measure the numerical aperture of an optical fibre.
10. To study the Hall Effect and determine the Hall Voltage and Hall coefficients.

I & II Semester
Common to all branches of UG Engineering & Technology

1FY2-21/ 2FY2-21: Engineering Chemistry Lab

Credit: 1 **Max. Marks: 50 (IA:30, ETE:20)**

0L+0T+2P

1.	Determination the hardness of water by EDTA method
2.	Determination of residual chlorine in water
3.	Determination of dissolved oxygen in water
4.	Determination of the strength of Ferrous Ammonium sulphate solution with the help of K2Cr2O7 solution by using diphenyl amine indicator
5.	Determination of the strength of CuSO4 solution iodometrically by using hypo solution
6.	Determination of the strength of NaOH and Na2CO3 in a given alkali mixture
7.	Proximate analysis of Coal
8.	Determination of the flash & fire point and cloud & pour point of lubricating oil
9.	Determination of the kinematic viscosity of lubricating oil by Redwood viscometer no. 1 at different temperature
10.	Synthesis of Aspirin/ Paracetamol

I & II Semester
Common to all branches of UG Engineering & Technology

1FY2-22/ 2FY2-22: Language Lab

Credit: 1 **Max. Marks: 50 (IA:30, ETE:20)**
0L+0T+2P

1. Phonetic Symbols and Transcriptions.
2. Extempore.
3. Group Discussion.
4. Dialogue Writing.
5. Listening comprehension.

I & II Semester
Common to all branches of UG Engineering & Technology

1FY1-23/ 2FY1-23: Human Values Activities and Sports

Credit: 1 **Max. Marks: 50 (IA:30, ETE:20)**
0L+0T+2P

PS 1:
Introduce yourself in detail. What are the goals in your life? How do you set your goals in your life? How do you differentiate between right and wrong? What have been your salient achievements and shortcomings in your life? Observe and analyze them.

PS 2:
Now-a-days, there is a lot of talk about many techno-genic maladies such as energy and material resource depletion, environmental pollution, global warming, ozone depletion, deforestation, soil degradation, etc. - all these seem to be manmade problems, threatening the survival of life Earth - What is the root cause of these maladies & what is the way out in opinion?
On the other hand, there is rapidly growing danger because of nuclear proliferation, arms race, terrorism, breakdown of relationships, generation gap, depression & suicidal attempts etc. - what do you think, is the root cause of these threats to human happiness and peace - what could be the way out in your opinion?

PS 3:
1. Observe that each of us has the faculty of 'Natural Acceptance', based on which one can verify what is right or not right for him. (As such we are not properly trained to listen to our 'Natural Acceptance' and may a time it is also clouded by our strong per-conditioning and sensory attractions).

Explore the following:
(i) What is Naturally Acceptable' to you in relationship the feeling of respect or disrespect for yourself and for others?
(ii) What is 'naturally Acceptable' to you - to nurture or to exploit others?

Is your living in accordance with your natural acceptance or different from it?
2. Out of the three basic requirements for fulfillment of your aspirations - right understanding, relationship and physical facilities - observe how the problems in your family are related to each. Also observe how much time & effort you devote for each in your daily routine.

PS 4:
1. a. Observe that any physical facility you use, follows the given sequence with time:

Necessary and tasteful - unnecessary but still tasteful - unnecessary and tasteless - intolerable

b. In contrast, observe that any feeling in you is either naturally acceptable or not acceptable at all. If not acceptable, you want it continuously and if not acceptable, you do not want it any moment!

2. List down all your important activities. Observe whether the activity is of 'I' or of Body or with the participation of both or with the participation of both 'I' and Body.
3. Observe the activities within 'i'. Identify the object of your attention for different

moments (over a period of say 5 to 10 minutes) and draw a line diagram connecting these points. Try to observe the link between any two nodes.

PS 5:

1. Write a narration in the form of a story, poem, skit or essay to clarify a salient Human Value to the children.
2. Recollect and narrate an incident in your life where you were able to exhibit willful adherence to values in a difficult situation.

PS 6:

List down some common units (things) of Nature which you come across in your daily life and classify them in the four orders of Nature. Analysis and explain the aspect of mutual fulfillment of each unit with other orders.

PS 7:

Identify any two important problems being faced by the society today and analyze the root cause of these problems. Can these be solved on the basic of natural acceptance of human values? If so, how should one proceed in this direction from the present situation?

PS 8:

1. Suggest ways in which you can use your knowledge of Science/Technology/Management etc. for moving towards a universal human order.
2. Propose a broad outline for humanistic Constitution at the level of Nation.

Project:

Every student required to take-up a social project e.g. educating children in needy/weaker section; services in hospitals, NGO's and other such work i.e. social work at villages adopted by respective institute/ college.

Sports:

a) Planning in Sports,
b) Sports & Nutrition
c) Yoga and Life style
d) Measures Physical Education & Sports for CWSN (Children with Special needs - Divyang)
e) Children & Sports
f) Women & Sports
g) Test & Measurement in Sports
h) Physiology & Sports
i) Sports Medicine
j) Kinesiology, Biomechanics & Sports
k) Psychology & Sports
l) Training in Sports

I & II Semester
Common to all branches of UG Engineering & Technology

1FY3-24/ 2FY3-24: Computer Programming Lab

Credit: 1.5 **Max. Marks: 75 (IA:45, ETE:30)**
0L+0T+3P

1.	To learn about the C Library, Preprocessor directive, Input-output statement.
2.	Programs to learn data type, variables, If-else statement
3.	Programs to understand nested if-else statement and switch statement
4.	Programs to learn iterative statements like while and do-while loops
5.	Programs to understand for loops for iterative statements
6.	Programs to learn about array and string operations
7.	Programs to understand sorting and searching using array
8.	Programs to learn functions and recursive functions
9.	Programs to understand Structure and Union operation
10.	Programs to learn Pointer operations
11.	Programs to understand File handling operations
12.	Programs to input data through Command line argument

I & II Semester

Common to all branches of UG Engineering & Technology

1FY3-25/ 2FY3-25: Manufacturing Practices Workshop

Credit: 1.5 **Max. Marks: 75 (IA:45, ETE:30)**
0L+0T+3P

Carpentry Shop

1. T – Lap joint
2. Bridle joint

Foundry Shop

3. Mould of any pattern
4. Casting of any simple pattern

Welding Shop

5. Lap joint by gas welding
6. Butt joint by arc welding
7. Lap joint by arc welding
8. Demonstration of brazing, soldering & gas cutting

Machine Shop Practice

9. Job on lathe with one step turning and chamfering operations

Fitting and Sheet Metal Shop

10. Finishing of two sides of a square piece by filing
11. Making mechanical joint and soldering of joint on sheet metal
12. To cut a square notch using hacksaw and to drill a hole and tapping

I & II Semester
Common to all branches of UG Engineering & Technology

1FY3-26/ 2FY3-26: Basic Electrical Engineering Lab

Credit: 1 **Max. Marks: 50 (IA:30, ETE:20)**
0L+0T+2P

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
2. Transformers: Observation of the no-load current waveform on an oscilloscope. Loading of a transformer: measurement of primary and secondary voltages and currents, and power.
3. Three-phase transformers: Star and Delta connections. Voltage and Current relationships (line-line voltage, phase-to-neutral voltage, line and phase currents).Phase-shifts between the primary and secondary side.
4. Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winging - slip ring arrangement) and single-phase induction machine.
5. Torque Speed Characteristic of separately excited dc motor.
6. Demonstration of (a) dc-dc converters (b) dc-ac converters – PWM waveform (c) the use of dc-ac converter for speed control of an induction motor and (d) Components of LT switchgear.

I & II Semester
Common to all branches of UG Engineering & Technology

1FY3-27/ 2FY3-27: Basic Civil Engineering Lab

Credit: 1 **Max. Marks: 50 (IA:30, ETE:20)**
0L+0T+2P

1. Linear Measurement by Tape:
   a) Ranging and Fixing of Survey Station along straight line and across obstacles.
   b) Laying perpendicular offset along the survey line
2. Compass Survey: Measurement of bearing of linesusing Surveyor's and Prismatic compass
3. Levelling: Using Tilting/ Dumpy/ Automatic Level
   a) To determine the reduced levels in closed circuit.
   b) To carry out profile levelling and plot longitudinal and cross sections for road by Height of Instrument and Rise & Fall Method.
4. To study and take measurements using various electronic surveying instruments like EDM, Total Station etc.
5. To determine pH, hardness and turbidity of the given sample of water.
6. To study various water supply Fittings.
7. To determine the pH and total solids of the given sample of sewage.
8. To study various Sanitary Fittings.

I & II Semester
Common to all branches of UG Engineering & Technology

1FY3-28/ 2FY3-28: Computer Aided Engineering Graphics

Credit: 1.5 **Max. Marks: 75 (IA:45, ETE:30)**
0L+0T+3P

Introduction: Principles of drawing, lines, type of lines, usage of Drawing instruments, lettering, Conic sections including parabola, hyperbola, Rectangular Hyperbola (General method only); Scales-Plain, Diagonal and Vernier Scales.

Projections of Point & Lines: Position of Point, Notation System, Systematic Approach for projections of points, front view & Top view of point, Position of straight lines, line parallel to Both the RPs, Line perpendicular to either of the RPs, Line inclined to one RP and parallel to the other, Line inclined to Both the RPs, Traces of a line (One drawing sheet, one assignment in sketch book).

Projection of Planes: Positions of planes, Terms used in projections of planes, plane parallel to RP, plane inclined to one RP and perpendicular to the other RP, plane perpendicular to Both the RPs, plane Inclined to Both the RPs, True shape of the plane, Distance of a point from plane, Angle between two planes.

Projections of Regular Solids: frustum and truncated solids, those inclined to both the Planes-Auxiliary Views.

Section of Solids: Theory of sectioning, section of prisms and cubes, section of pyramids and Tetrahedron section of Cylinders, section of cones, section of spheres (One drawing sheet, one assignment in sketch book)

Overview of Computer Graphics : Covering theory of CAD software [such as: The menu System, Toolbars (standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.: Isometric Views of lines, Planes, Simple and compound Solids.

I & II Semester
Common to all branches of UG Engineering & Technology

1FY3-29/ 2FY3-29: Computer Aided Machine Drawing

Credit: 1.5 **Max. Marks: 75 (IA:45, ETE:30)**
0L+0T+3P

Introduction: Principles of drawing, conventional representation of machine components and materials, lines, types of lines, dimensioning types, rules of dimensioning.

Conversion of pictorial views into orthographic views: (1 drawing sheet) Introduction to orthographic projection, concept of first angle and third angle projection, drawing of simple machine elements in first angle projection, missing view problems covering Principles of Orthographic Projections.

Sectional views of mechanical components: (1 drawing sheet) Introduction, cutting plane line, type of sectional views-full section, half section, partial or broken section, revolved section, removed section, offset section, sectioning conventions-spokes, web rib, shaft, pipes, different types of holes, conventions of section lines for different metals and materials.

Fasteners and other mechanical components: (Free hand sketch) Temporary and permanent fasteners, thread nomenclature and forms, thread series, designation, representation of threads, bolted joints, locking arrangement of nuts, screws, washers, foundation bolts etc., keys, types of keys, cotter and knuckle joints. Riveted joints, rivets and riveting, type of rivets, types of riveted joints etc. Bearing: Ball, roller, needle, foot step bearing. Coupling: Protected type, flange, and pin type flexible coupling. Other components: Welded joints, belts and pulleys, pipes and pipe joints, valves etc.

Overview of Computer Graphics: (2 drawing sheets) Covering theory of CAD software such as: The menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), Command Line (Where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.: Isometric Views of Lines, Planes, Simple and compound Solids.

II Semester
Common to all branches of UG Engineering & Technology

2FY2-01: Engineering Mathematics-II

Credit: 4 **Max. Marks: 200 (IA:40, ETE:160)**
3L+1T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	Hours
1	**Matrices:** Rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Eigenvalues and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, and Orthogonal transformation.	10
2	**First order ordinary differential equations:** Linear and Bernoulli's equations, Exact equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.	6
3	**Ordinary differential equations of higher orders:** Linear Differential Equations of Higher order with constant coefficients, Simultaneous Linear Differential Equations, Second order linear differential equations with variable coefficients: Homogenous and Exact forms, one part of CF is known, Change of dependent and independent variables, method of variation of parameters, Cauchy-Euler equation; Power series solutions including Legendre differential equation and Bessel differential equations.	12
4	**Partial Differential Equations – First order:** Order and Degree, Formation; Linear Partial differential equations of First order, Lagrange's Form, Non Linear Partial Differential equations of first order, Charpit's method, Standard forms.	6
5	**Partial Differential Equations– Higher order:** Classification of Second order partial differential equations, Separation of variables method to simple problems in Cartesian coordinates including two dimensional Laplace, one dimensional Heat and one dimensional Wave equations.	6
	TOTAL	40

Scheme and Syllabus

Rajasthan Technical University, Kota

B. Tech. in Computer Engineering

(Session 2019-20)

Scheme of

UNDERGRADUATE DEGREE COURSE

Computer Science and Engineering

Rajasthan Technical University, Kota

Effective from session: 2018 – 2019

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Teaching & Examination Scheme
B.Tech. : Computer Science & Engineering
2nd Year - III Semester

SN	Category	Course		Contact hrs/week			Marks				Cr
		Code	Title	L	T	P	Exm Hrs	IA	ETE	Total	
THEORY											
1	BSC	3CS2-01	Advanced Engineering Mathematics	3	0	0	3	30	120	**150**	**3**
2	HSMC	3CS1-02/ 3CS1-03	Technical Communication/ Managerial Economics and Financial Accounting	2	0	0	2	20	80	**100**	**2**
3	ESC	3CS3-04	Digital Electronics	3	0	0	3	30	120	**150**	**3**
4	PCC	3CS4-05	Data Structures and Algorithms	3	0	0	3	30	120	**150**	**3**
5		3CS4-06	Object Oriented Programming	3	0	0	3	30	120	**150**	**3**
6		3CS4-07	Software Engineering	3	0	0	3	30	120	**150**	**3**
			Sub Total	**17**	**0**	**0**		**170**	**680**	**850**	**17**
PRACTICAL & SESSIONAL											
7	PCC	3CS4-21	Data Structures and Algorithms Lab	0	0	3		45	30	**75**	**1.5**
8		3CS4-22	Object Oriented Programming Lab	0	0	3		45	30	**75**	**1.5**
9		3CS4-23	Software Engineering Lab	0	0	3		45	30	**75**	**1.5**
10		3CS4-24	Digital Electronics Lab	0	0	3		45	30	**75**	**1.5**
11	PSIT	3CS7-30	Industrial Training	0	0	1		0	0	**50**	**1**
12	SODECA	3CS8-00	Social Outreach, Discipline & Extra Curricular Activities							**25**	**0.5**
			Sub- Total	**0**	**0**	**13**		**180**	**120**	**375**	**7.5**
			TOTAL OF III SEMESTER	**17**	**0**	**13**		**350**	**800**	**1225**	**24.5**

L: *Lecture,* ***T:*** *Tutorial,* ***P:*** *Practical,* ***Cr:*** *Credits*

ETE: *End Term Exam,* ***IA:*** *Internal Assessment*

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

Scheme of

UNDERGRADUATE DEGREE COURSE

Computer Science and Engineering

Rajasthan Technical University, Kota

Effective from session: 2018 – 2019

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Teaching & Examination Scheme
B.Tech. : Computer Science & Engineering
2nd Year - IV Semester

SN	Category	Course		Contact hrs/week			Marks				Cr
		Code	Title	L	T	P	Exm Hrs	IA	ETE	Total	
THEORY											
1	BSC	4CS2-01	Discrete Mathematics Structure	3	0	0	3	30	120	**150**	**3**
2	HSMC	4CS1-03/ 4CS1-02	Managerial Economics and Financial Accounting /Technical Communication	2	0	0	2	20	80	**100**	**2**
3	ESC	4CS3-04	Microprocessor & Interfaces	3	0	0	3	30	120	**150**	**3**
4	PCC	4CS4-05	Database Management System	3	0	0	3	30	120	**150**	**3**
5		4CS4-06	Theory of Computation	3	0	0	3	30	120	**150**	**3**
6		4CS4-07	Data Communication and Computer Networks	3	0	0	3	30	120	**150**	**3**
			Sub Total	**17**	**0**	**0**		**170**	**680**	**850**	**17**
PRACTICAL & SESSIONAL											
7	PCC	4CS4-21	Microprocessor & Interfaces Lab	0	0	2		30	20	**50**	**1**
8		4CS4-22	Database Management System Lab	0	0	3		45	30	**75**	**1.5**
9		4CS4-23	Network Programming Lab	0	0	3		45	30	**75**	**1.5**
10		4CS4-24	Linux Shell Programming Lab	0	0	2		30	20	**50**	**1**
11		4CS4-25	Java Lab	0	0	2		30	20	**50**	**1**
12	SODECA	4CS8-00	Social Outreach, Discipline & Extra Curricular Activities							**25**	**0.5**
			Sub- Total	**0**	**0**	**12**		**180**	**120**	**325**	**6.5**
			TOTAL OF IV SEMEESTER	**17**	**0**	**12**		**350**	**800**	**1175**	**23.5**

L: *Lecture,* ***T:*** *Tutorial,* ***P:*** *Practical,* ***Cr:*** *Credits*

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Office of Dean Academic Affairs
Rajasthan Technical University, Kota

Scheme of

UNDERGRADUATE DEGREE COURSE

B.Tech. V & VI Semester

Computer Science and Engineering

Rajasthan Technical University, Kota

Effective from session: 2019 – 2020

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Teaching & Examination Scheme
B.Tech. : Computer Science & Engineering
3rd Year – V Semester

SN	Category	Course		Contact hrs/week			Marks				Cr
		Code	Title	L	T	P	Exm Hrs	IA	ETE	Total	
THEORY											
1	ESC	5CS3-01	Information Theory & Coding	2	0	0	2	20	80	**100**	**2**
2	PCC/ PEC	5CS4-02	Compiler Design	3	0	0	3	30	120	**150**	**3**
3		5CS4-03	Operating System	3	0	0	3	30	120	**150**	**3**
4		5CS4-04	Computer Graphics & Multimedia	3	0	0	3	30	120	**150**	**3**
6		5CS4-05	Analysis of Algorithms	3	0	0	3	30	120	**150**	**3**
7		Professional Elective 1: (any one)		2	0	0	2	20	80	**100**	**2**
		5CS5-11	Wireless Communication								
		5CS5-12	Human-Computer Interaction								
		5CS5-13	Bioinformatics								
			Sub Total	**16**	**0**	**0**		**160**	**640**	**800**	**16**
PRACTICAL & SESSIONAL											
8	PCC	5CS4-21	Computer Graphics & Multimedia Lab	0	0	2	2	30	20	**50**	**1**
9		5CS4-22	Compiler Design Lab	0	0	2	2	30	20	**50**	**1**
10		5CS4-23	Analysis of Algorithms Lab	0	0	2	2	30	20	**50**	**1**
11		5CS4-24	Advance Java Lab	0	0	2	2	30	20	**50**	**1**
12	PSIT	5CS7-30	Industrial Training	0	0	1		75	50	**125**	**2.5**
13	SODECA	5CS8-00	Social Outreach, Discipline &Extra Curricular Activities						25	**25**	**0.5**
			Sub- Total	**0**	**0**	**9**		**195**	**155**	**350**	**7**
			TOTAL OF V SEMESTER	**16**	**0**	**9**		**355**	**795**	**1150**	**23**

L: *Lecture,* ***T:*** *Tutorial,* ***P:*** *Practical,* ***Cr:*** *Credits*
ETE: *End Term Exam,* ***IA:*** *Internal Assessment*

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

Teaching & Examination Scheme
B.Tech. : Computer Science & Engineering
3rd Year – VI Semester

SN	Category	Course		Contact hrs/week			Marks				Cr
		Code	Title	L	T	P	Exm Hrs	IA	ETE	Total	
THEORY											
1	ESC	6CS3-01	Digital Image Processing	2	0	0	2	20	80	**100**	**2**
2	PCC/ PEC	6CS4-02	Machine Learning	3	0	0	3	30	120	**150**	**3**
3		6CS4-03	Information Security System	2	0	0	2	20	80	**100**	**2**
4		6CS4-04	Computer Architecture and Organization	3	0	0	3	30	120	**150**	**3**
5		6CS4-05	Artificial Intelligence	2	0	0	2	20	80	**100**	**2**
6		6CS4-06	Cloud Computing	3	0	0	3	30	120	**150**	**3**
7		Professional Elective 1 (any one)		2	0	0	2	20	80	**100**	**2**
		6CS5-11	Distributed System								
		6CS5-12	Software Defined Network								
		6CS5-13	Ecommerce and ERP								
		Sub-Total		**17**	**0**	**0**		**170**	**680**	**850**	**17**
PRACTICAL & SESSIONAL											
8	PCC	6CS4-21	Digital Image Processing Lab	0	0	3	2	45	30	**75**	**1.5**
9		6CS4-22	Machine Learning Lab	0	0	3	2	45	30	**75**	**1.5**
10		6CS4-23	Python Lab	0	0	3	2	45	30	**75**	**1.5**
11		6CS4-24	Mobile Application Development Lab	0	0	3	2	45	30	**75**	**1.5**
12	SODECA	6CS8-00	Social Outreach, Discipline &Extra Curricular Activities						25	**25**	**0.5**
		Sub- Total		**0**	**0**	**12**		**180**	**145**	**325**	**6.5**
		TOTAL OF VI SEMESTER		**17**	**0**	**12**		**350**	**825**	**1175**	**23.5**

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Office of Dean Academic Affairs
Rajasthan Technical University, Kota

VII	Computer Science and Engineering	Teaching Hrs			Exm Hrs	Max. Marks			Comments
Course Code	Subject Name (Revised)	L	T	P		IA	TE	TOTAL	Common to
7CS1A	Cloud Computing	3	-		3	20	80	100	
7CS2A	Information System Security	3			3	20	80	100	CS, IT
7CS3A	Data Mining & Ware Housing	3			3	20	80	100	CS, IT
7CS4A	Computer Aided Design for VLSI	3	-		3	20	80	100	
7CS5A	Compiler Construction	3			3	20	80	100	
7CS6.1A	Advance DataBase Management Systems	3	-		3	20	80	100	
7CS6.2A	Robotics								
7CS6.3A	Data Compression Techniques								
7CS7A	Web Development Lab			2		30	20	50	
7CS8A	VLSI Physical Design Lab			3		45	30	75	
7CS9A	Compiler Design Lab			3		45	30	75	
7CSPR	Project-I			2		50		50	CS, IT
7CSTR	Practical Training*			2			100	100	CS, IT
7CSDC	Discipline & Extra Curricular Activities							50	CS, IT
		18	0	12				1000	

VIII	Computer Science and Engineering	Teaching Hrs			Exm Hrs	Max. Marks			Comments
Course Code	Subject Name (Revised)	L	T	P		IA	TE	TOTAL	Common to
8CS1A	Mobile Computing	3			3	20	80	100	CS, IT
8CS2A	Digital Image Processing	3	-		3	20	80	100	CS, IT
8CS3A	Distributed Systems	3			3	20	80	100	
8CS4.1A	Hardware Testing & Fault Tolerance	3	-		3	20	80	100	CS, IT
8CS4.2A	Real Time Systems								CS, IT
8CS4.3A	Information Retrieval								CS, IT
8CS5A	Unix Network Programming & Simulation Lab			3		60	40	100	
8CS6A	FPGA Lab.			3		60	40	100	
8CS7A	Digital Image Processing lab			2		30	20	50	CS, IT
8CSPR	Project-II			2		120	80	200	CS, IT
8CSSM	Seminar			2		60	40	100	CS, IT
8CSDC	Discipline & Extra Curricular Activities							50	CS, IT
		12	0	12				1000	

Syllabus of
UNDERGRADUATE DEGREE COURSE

Computer Science and Engineering



Rajasthan Technical University, Kota

Effective from session: 2018 – 2019

3CS2-01: Advanced Engineering Mathematics

Credit-3 **Max. Marks : 150 (IA:30,ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	Hours
1	**Random Variables:** Discrete and Continuous random variables, Joint distribution, Probability distribution function, conditional distribution.Mathematical Expectations: Moments, Moment Generating Functions, variance and correlation coefficients, Chebyshev's Inequality, Skewness and Kurtosis.	7
2	**Binomial distribution**, Normal Distribution, Poisson Distribution and their relations, Uniform Distribution, Exponential Distribution. Correlation: Karl Pearson's coefficient, Rank correlation. Curve fitting. Line of Regression.	5
3	**Historical development**, Engineering Applications of Optimization, Formulation of Design Problems as a Mathematical Programming Problems, Classification of Optimization Problems	8
4	**Classical Optimization using Differential Calculus:** Single Variable and Multivariable Optimization with & without Constraints, Langrangian theory, Kuhn Tucker conditions	6
5	**Linear Programming:** Simplex method, Two Phase Method and Duality in Linear Programming. Application of Linear Programming: Transportation and Assignment Problems.	14
	TOTAL	40

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Syllabus

II Year-III Semester: B.Tech. Computer Science and Engineering

3CS1-02/4CS1-02: Technical Communication

Credit-2 **Max. Marks : 100 (IA:20,ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hours
1	**Introduction to Technical Communication-** Definition of technical communication, Aspects of technical communication, forms of technical communication, importance of technical communication, technical communication skills (Listening, speaking, writing, reading writing), linguistic ability, style in technical communication.	4
2	**Comprehension of Technical Materials/Texts and Information Design & development-** Reading of technical texts, Readingand comprehending instructions and technical manuals, Interpreting and summarizing technical texts, Note-making. Introduction of different kinds of technical documents, Information collection, factors affecting information and document design, Strategies for organization, Information design and writing for print and online media.	6
3	**Technical Writing, Grammar and Editing**- Technical writing process, forms of technical discourse, Writing, drafts and revising, Basics of grammar, common error in writing and speaking, Study of advanced grammar, Editing strategies to achieve appropriate technical style, Introduction to advanced technical communication. Planning, drafting and writing Official Notes, Letters, E-mail, Resume, Job Application, Minutes of Meetings.	8
4	**Advanced Technical Writing**- Technical Reports, types of technical reports, Characteristics and formats and structure of technical reports. Technical Project Proposals, types of technical proposals, Characteristics and formats and structure of technical proposals. Technical Articles, types of technical articles, Writing strategies, structure and formats of technical articles.	8
	TOTAL	**26**

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Syllabus

II Year-III Semester: B.Tech. Computer Science and Engineering

3CS1-03/ 4CS1-03: Managerial Economics and Financial Accounting

Credit-2 **Max. Marks : 100 (IA:20,ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hours
1	**Basic economic concepts-** Meaning, nature and scope of economics, deductive vs inductive methods, static and dynamics, Economic problems: scarcity and choice, circular flow of economic activity, national income-concepts and measurement.	4
2	**Demand and Supply analysis-** Demand-types of demand, determinants of demand, demand function, elasticity of demand, demand forecasting –purpose, determinants and methods, Supply-determinants of supply, supply function, elasticity of supply.	5
3	**Production and Cost analysis-** Theory of production- production function, law of variable proportions, laws of returns to scale, production optimization, least cost combination of inputs, isoquants. Cost concepts-explicit and implicit cost, fixed and variable cost, opportunity cost, sunk costs, cost function, cost curves, cost and output decisions, cost estimation.	5
4	**Market structure and pricing theory-** Perfect competition, Monopoly, Monopolistic competition, Oligopoly.	4
5	**Financial statement analysis-** Balance sheet and related concepts, profit and loss statement and related concepts, financial ratio analysis, cash-flow analysis, funds-flow analysis, comparative financial statement, analysis and interpretation of financial statements, capital budgeting techniques.	8
	TOTAL	**26**

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

3CS3-04: Digital Electronics

Credit-3 **Max. Marks : 150 (IA:30,ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	Hours
1	**Fundamental concepts:** Number systems and codes, Basic logic Gates and Boolean algebra: Sign & magnitude representation, Fixed point representation, complement notation, various codes & arithmetic in different codes & their inter conversion. Features of logic algebra, postulates of Boolean algebra.Theorems of Boolean algebra.	8
2	**Minimization Techniques and Logic Gates**: Principle of Duality - Boolean expression -Minimization of Boolean expressions — Minterm – Maxterm - Sum of Products (SOP) – Product of Sums (POS) – Karnaugh map Minimization – Don't care conditions – Quine - McCluskey method of minimization.	8
3	**Digital Logic Gate Characteristics:** TTL logic gate characteristics. Theory & operation of TTL NAND gate circuitry. Open collector TTL. Three state output logic. TTL subfamilies.MOS& CMOS logic families. Realization of logic gates in RTL, DTL, ECL, C-MOS & MOSFET.	8
4	**Combinational Circuits:** Combinational logic circuit design, adder, subtractor, BCD adder encoder, decoder, BCD to 7-segment decoder, multiplexer demultiplexer.	8
5	**Sequential Circuits:** Latches, Flip-flops - SR, JK, D, T, and Master-Slave Characteristic table and equation,counters and their design, Synchronous counters – Synchronous Up/Down counters – Programmable counters – State table and state transition diagram ,sequential circuits design methodology. Registers –shift registers.	8
	TOTAL	**40**

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

3CS4-05: Data Structures and Algorithms

Credit-3 **Max. Marks: 150 (IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	Hours
1	Stacks: Basic Stack Operations, Representation of a Stack using Static Array and Dynamic Array, Multiple stack implementation using single array, Stack Applications: Reversing list, Factorial Calculation, Infix to postfix Transformation, Evaluating Arithmetic Expressions and Towers of Hanoi.	8
2	Queues: Basic Queue Operations, Representation of a Queue using array, Implementation of Queue Operations using Stack, Applications of Queues- Round Robin Algorithm. Circular Queues, DeQueue Priority Queues. Linked Lists:Introduction, single linked list, representation of a linked list in memory, Different Operations on a Single linked list, Reversing a single linked list, Advantages and disadvantages of single linked list, circular linked list, double linked list and Header linked list.	10
3	Searching Techniques: Sequential and binary search.Sorting Techniques: Basic concepts, Sorting by: bubble sort, Insertion sort, selection sort, quick sort, heap sort, merge sort, radix sort and counting sorting algorithms.	7
4	Trees: Definition of tree, Properties of tree, Binary Tree, Representation of Binary trees using arrays and linked lists, Operations on a Binary Tree, Binary Tree Traversals (recursive), Binary search tree, B-tree , B+ tree, AVL tree, Threaded binary tree.	7
5	Graphs: Basic concepts, Different representations of Graphs, Graph Traversals (BFS & DFS), Minimum Spanning Tree(Prims &Kruskal), Dijkstra's shortest path algorithms.Hashing: Hash function, Address calculation techniques, Common hashing functions, Collision resolution: Linear and Quadratic probing, Double hashing.	8
	TOTAL	**40**

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

3CS4-06: Object Oriented Programming

Credit-3 **Max. Marks : 150 (IA:30,ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	Hours
1	Introduction to different programming paradigm, characteristics of OOP, Class, Object, data member, member function, structures in C++, different access specifiers, defining member function inside and outside class, array of objects.	8
2	Concept of reference, dynamic memory allocation using new and delete operators, inline functions, function overloading, function with default arguments, constructors and destructors, friend function and classes, using this pointer.	8
3	Inheritance, types of inheritance, multiple inheritance, virtual base class, function overriding, abstract class and pure virtual function	9
4	Constant data member and member function, static data member and member function, polymorphism, operator overloading, dynamic binding and virtual function	9
5	Exception handling, Template, Stream class, File handling.	6
	TOTAL	40

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

3CS4-07: Software Engineering

Credit-3
3L+0T+0P

Max. Marks : 150 (IA:30,ETE:120)
End Term Exam: 3 Hours

SN	CONTENTS	Hours
1	Introduction, software life-cycle models, software requirements specification, formal requirements specification, verification and validation.	8
2	Software Project Management: Objectives, Resources and their estimation, LOC and FP estimation, effort estimation, COCOMO estimation model, risk analysis, software project scheduling.	8
3	Requirement Analysis: Requirement analysis tasks, Analysis principles. Software prototyping and specification data dictionary, Finite State Machine (FSM) models. Structured Analysis: Data and control flow diagrams, control and process specification behavioral modeling	8
4	Software Design: Design fundamentals, Effective modular design: Data architectural and procedural design, design documentation.	8
5	Object Oriented Analysis: Object oriented Analysis Modeling, Data modeling. Object Oriented Design: OOD concepts, Class and object relationships, object modularization, Introduction to Unified Modeling Language	8
	TOTAL	**40**

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

3CS4-21: Data Structures and Algorithms Lab

Credit-1.5 **Max. Marks :75 (IA:45,ETE:30)**

0L+0T+3P

SN	CONTENTS
1	Write a simple C program on a 32 bit compiler to understand the concept of array storage, size of a word. The program shall be written illustrating the concept of row major and column major storage. Find the address of element and verify it with the theoretical value. Program may be written for arrays up to 4-dimensions.
2	Simulate a stack, queue, circular queue and dequeue using a one dimensional array as storage element. The program should implement the basic addition, deletion and traversal operations.
3	Represent a 2-variable polynomial using array. Use this representation to implement addition of polynomials
4	Represent a sparse matrix using array. Implement addition and transposition operations using the representation.
5	Implement singly, doubly and circularly connected linked lists illustrating operations like addition at different locations, deletion from specified locations and traversal.
6	Repeat exercises 2, 3 & 4 with linked structure.
7	Implementation of binary tree with operations like addition, deletion, traversal.
8	Depth first and breadth first traversal of graphs represented using adjacency matrix and list.
9	Implementation of binary search in arrays and on linked Binary Search Tree.
10	Implementation of different sorting algorithm like insertion, quick, heap, bubble and many more sorting algorithms.

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3CS4-22 : Object Oriented Programming Lab

Credit-1.5 **Max. Marks :75 (IA:45,ETE:30)**

0L+0T+3P

SN	CONTENTS
1	Understand the basics of C++ library, variables, data input-output.
2	C++ program using with the concept of structures.
3	Implement class and object concepts and function overloading.
4	Write programs to understand dynamic memory allocation and array of objects.
5	Program to understand different types of constructors and destructor.
6	Implement friend function to access private data of a class and usage of this pointer.
7	Write programs to understand the usage of constant data member and member function, static data member and member function in a class.
8	Implement different types of inheritance, function overriding and virtual function
9	Implement Operator overloading concepts.
10	Write programs to understand function template and class template.
11	Write programs to understand exception handling techniques.
12	Write programs to understand file handling techniques.

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3CS4-23: Software Engineering Lab

Credit-1.5 **Max. Marks :75 (IA:45,ETE:30)**

0L+0T+3P

SN	CONTENTS
1	Development of requirements specification, function oriented design using SA/SD, object-oriented design using UML, test case design, implementation using Java and testing. Use of appropriate CASE tools and other tools such as configuration management tools, program analysis tools in the software life cycle.
2	Develop Software Requirements Specification (SRS) for a given problem in IEEE template.
3	Develop DFD model (level-0, level-1 DFD and Data dictionary) of the project.
4	Develop structured design for the DFD model developed.
5	Developed all Structure UML diagram of the given project.
6	Develop Behavior UML diagram of the given project.
7	Manage file, using ProjectLibre project management software tool.

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3CS4-24: Digital Electronics Lab

Credit-1.5 **Max. Marks :75 (IA:45,ETE:30)**

0L+0T+3P

SN	CONTENTS
1	To verify the truth tables of basic logic gates: AND, OR, NOR, NAND, NOR. Also to verify truth table of Ex-OR, Ex-NOR (For 2, 3, & 4 inputs using gateswith 2, 3, & 4 inputs).
2	To verify the truth table of OR, AND, NOR, Ex-OR, Ex-NOR realized usingNAND& NOR gates.
3	To realize an SOP and POS expression.
4	To realize Half adder/ Subtractor& Full Adder/ Subtractor using NAND & NOR gatesand to verify their truth tables.
5	To realize a 4-bit ripple adder/ Subtractor using basic Half adder/ Subtractor& basic Full Adder/ Subtractor.
6	To verify the truth table of 4-to-1 multiplexer and 1-to-4 demultiplexer. Realize the multiplexer using basic gates only. Also to construct and 8-to-1 multiplexer and 1-to-8 demultiplexer using blocks of 4-to-1 multiplexer and 1-to-4 demultiplexer.
7	Design & Realize a combinational circuit that will accept a 2421 BCD code and drive a TIL -312 seven-segment display.
8	Using basic logic gates, realize the R-S, J-K and D-flip flops with and without clock signal and verify their truth table.
9	Construct a divide by 2,4& 8 asynchronous counter. Construct a 4-bit binary counter and ring counter for a particular output pattern using D flip flop.
10	Perform input/output operations on parallel in/Parallel out and Serial in/Serial out registers using clock. Also exercise loading only one of multiple values into the register using multiplexer. Note: As far as possible, the experiments shall be performed on bread board. However, experiment Nos. 1-4 are to be performed on bread board only.

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Syllabus of
UNDERGRADUATE DEGREE COURSE

Computer Science and Engineering



Rajasthan Technical University, Kota

Effective from session: 2018 – 2019

4CS2-01: Discrete Mathematics Structure

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Set Theory:** Definition of sets, countable and uncountable sets, Set operations, Partition of set, Cardinality (Inclusion-Exclusion & Addition Principles) Venn Diagrams, proofs of some general identities on sets. **Relation:** Definition, types of relation, composition of relations, Pictorial representation of relation, Equivalence relation, Partial ordering relation, Job-Scheduling problem. **Function:** Definition, type of functions, one to one, into and onto function, inverse function, composition of functions, recursively defined functions, pigeonhole principle. Theorem proving Techniques: Mathematical induction, Proof by contradiction. Composition of Functions. The Pigeonhole and Generalized Pigeonhole Principles.	7
3	**Propositional Logic:** Proposition, First order logic, Basic logical operation, truth tables, tautologies, Contradictions, Algebra of Proposition, logical implications, logical equivalence, predicates, Normal Forms, Universal and existential quantifiers. 2 way predicate logic. Introduction to finite state machine Finite state machines as models of physical system equivalence machines, Finite state machines as language recognizers.	8
4	**Posets, Hasse Diagram and Lattices:** Introduction, ordered set, Hasse diagram of partially, ordered set, isomorphic ordered set, well ordered set, properties of Lattices, bounded and complemented lattices. **Combinatorics:** Introduction, Permutation and combination, Binomial Theorem, Multimodal Coefficients Recurrence Relation and Generating Function: Introduction to Recurrence Relation and Recursive algorithms, linear recurrence relations with constant coefficients, Homogeneous solutions, Particular solutions, Total solutions, Generating functions, Solution by method of generating functions.	8
5	**Algebraic Structures:** Definition, Properties, types: Semi Groups, Monoid, Groups, Abelian group, properties of groups, Subgroup, cyclic groups, Cosets, factor group, Permutation groups, Normal subgroup, Homomorphism and isomorphism of Groups, example and standard results, Rings and Fields: definition and standard results.	8
6	**Graph Theory:** Introduction and basic terminology of graphs, Planer graphs, Multigraphs and weighted graphs, Isomorphic graphs, Paths, Cycles and connectivity, Shortest path in weighted graph, Introduction to Eulerian paths and circuits, Hamiltonian paths and circuits, Graph coloring, chromatic number, Isomorphism and Homomorphism of graphs, matching, vertex/edge covering.	8
	Total	40

Office of Dean Academic Affairs
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RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Syllabus

II Year-IV Semester: B.Tech. Computer Science and Engineering

4CS1-03/3CS1-03: Managerial Economics and Financial Accounting

Credit-2 **Max. Marks : 100 (IA:20,ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Basic economic concepts-** Meaning, nature and scope of economics, deductive vs inductive methods, static and dynamics, Economic problems: scarcity and choice, circular flow of economic activity, national income-concepts and measurement.	3
3	**Demand and Supply analysis-** Demand-types of demand, determinants of demand, demand function, elasticity of demand, demand forecasting –purpose, determinants and methods, Supply-determinants of supply, supply function, elasticity of supply.	5
4	**Production and Cost analysis-** Theory of production- production function, law of variable proportions, laws of returns to scale, production optimization, least cost combination of inputs, isoquants. Cost concepts-explicit and implicit cost, fixed and variable cost, opportunity cost, sunk costs, cost function, cost curves, cost and output decisions, cost estimation.	5
5	**Market structure and pricing theory-** Perfect competition, Monopoly, Monopolistic competition, Oligopoly.	4
6	**Financial statement analysis-** Balance sheet and related concepts, profit and loss statement and related concepts, financial ratio analysis, cash-flow analysis, funds-flow analysis, comparative financial statement, analysis and interpretation of financial statements, capital budgeting techniques.	8
	TOTAL	26

Office of Dean Academic Affairs
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4CS1-02/3CS1-02: Technical Communication

Credit-2 **Max. Marks : 100 (IA:20,ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Introduction to Technical Communication-** Definition of technical communication, Aspects of technical communication, forms of technical communication, importance of technical communication, technical communication skills (Listening, speaking, writing, reading writing), linguistic ability, style in technical communication.	3
3	**Comprehension of Technical Materials/Texts and Information Design & development-** Reading of technical texts, Reading and comprehending instructions and technical manuals, Interpreting and summarizing technical texts, Note-making. Introduction of different kinds of technical documents, Information collection, factors affecting information and document design, Strategies for organization, Information design and writing for print and online media.	6
4	**Technical Writing, Grammar and Editing**- Technical writing process, forms of technical discourse, Writing, drafts and revising, Basics of grammar, common error in writing and speaking, Study of advanced grammar, Editing strategies to achieve appropriate technical style, Introduction to advanced technical communication. Planning, drafting and writing Official Notes, Letters, E-mail, Resume, Job Application, Minutes of Meetings.	8
5	**Advanced Technical Writing**- Technical Reports, types of technical reports, Characteristics and formats and structure of technical reports. Technical Project Proposals, types of technical proposals, Characteristics and formats and structure of technical proposals. Technical Articles, types of technical articles, Writing strategies, structure and formats of technical articles.	8
	TOTAL	26

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4CS3-04: Microprocessor & Interfaces

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	Introduction to Microprocessors, microcontroller; 8085 Microprocessor Architecture, pin description, Bus concept and organization; concept of multiplexing and de-multiplexing of buses; concept of static and dynamic RAM, type of ROM, memory map.	7
3	Software architecture registers and signals, Classification of instruction, Instruction set, addressing modes, Assembly Language Programming and Debugging, Programming Technique, instruction Format and timing.	8
4	Advance Assembly Language Programming, Counter and time delay; types of Interrupt and their uses, RST instructions and their uses, 8259 programmable interrupt controller; Macros, subroutine; Stack-implementation and uses with examples; Memory interfacing.	8
5	8085 Microprocessor interfacing:, 8255 Programmable Peripheral Interface, 8254 programmable interval timer, interfacing of Input/output device, 8279 Key board/Display interface.	8
6	Microprocessor Application: Interfacing scanned multiplexed display and liquid crystal display, Interfacing and Matrix Keyboard, MPU Design; USART 8251, RS232C and RS422A, Parallel interface-Centronics and IEEE 488.	8
	Total	40

Office of Dean Academic Affairs
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4CS4-05: Database Management System

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Introduction to database systems:** Overview and History of DBMS. File System v/s DBMS.Advantage of DBMS Describing and Storing Data in a DBMS.Queries in DBMS.Structure of a DBMS. **Entity Relationship model:** Overview of Data Design Entities, Attributes and Entity Sets, Relationship and Relationship Sets. Features of the ER Model- Key Constraints, Participation Constraints, Weak Entities, Class Hierarchies, Aggregation, Conceptual Data Base, and Design with ER Model- Entity v/s Attribute, Entity vs Relationship Binary vs Ternary Relationship and Aggregation v/s ternary Relationship Conceptual Design for a Large Enterprise.	7
3	**Relationship Algebra and Calculus:** Relationship Algebra Selection and Projection, Set Operations, Renaming, Joints, Division, Relation Calculus, Expressive Power of Algebra and Calculus. **SQL queries programming and Triggers:** The Forms of a Basic SQL Query, Union, and Intersection and Except, Nested Queries, Correlated Nested Queries, Set-Comparison Operations, Aggregate Operators, Null Values and Embedded SQL, Dynamic SQL, ODBC and JDBC, Triggers and Active Databases.	8
4	**Schema refinement and Normal forms:** Introductions to Schema Refinement, Functional Dependencies, Boyce-Codd Normal Forms, Third Normal Form, Normalization-Decomposition into BCNF Decomposition into 3-NF.	8
5	**Transaction Processing:** Introduction-Transaction State, Transaction properties, Concurrent Executions. Need of Serializability, Conflict vs. View Serializability, Testing for Serializability, Recoverable Schedules, Cascadeless Schedules.	8
6	**Concurrency Control: Implementation of Concurrency:** Lock-based protocols, Timestamp-based protocols, Validation-based protocols, Deadlock handling, **Database Failure and Recovery:** Database Failures, Recovery Schemes: Shadow Paging and Log-based Recovery, Recovery with Concurrent transactions.	8
	Total	40

Office of Dean Academic Affairs
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4CS4-06: Theory Of Computation

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	Finite Automata & Regular Expression: Basic machine, Finite state machine, Transition graph, Transition matrix, Deterministic and non-deterministic finite automation, Equivalence of DFA and NDFA, Decision properties, minimization of finite automata, Mealy & Moore machines. Alphabet, words, Operations, Regular sets, relationship and conversion between Finite automata and regular expression and vice versa, designing regular expressions, closure properties of regular sets, Pumping lemma and regular sets, Myhill- Nerode theorem , Application of pumping lemma, Power of the languages.	7
3	Context Free Grammars (CFG), Derivations and Languages, Relationship between derivation and derivation trees, leftmost and rightmost derivation, sentential forms, parsing and ambiguity, simplification of CFG, normal forms, Greibach and Chomsky Normal form , Problems related to CNF and GNF including membership problem.	8
4	Nondeterministic PDA, Definitions, PDA and CFL, CFG for PDA, Deterministic PDA, and Deterministic PDA and Deterministic CFL , The pumping lemma for CFL's, Closure Properties and Decision properties for CFL, Deciding properties of CFL.	8
5	Turing Machines: Introduction, Definition of Turing Machine, TM as language Acceptors and Transducers, Computable Languages and functions, Universal TM & Other modification, multiple tracks Turing Machine. Hierarchy of Formal languages: Recursive & recursively enumerable languages, Properties of RL and REL, Introduction of Context sensitive grammars and languages, The Chomsky Hierarchy.	8
6	Tractable and Untractable Problems: P, NP, NP complete and NP hard problems, Un-decidability, examples of these problems like vertex cover problem, Hamiltonian path problem, traveling sales man problem.	8
	Total	40

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4CS4-07: Data Communication and Computer Networks

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	Introductory Concepts: Network hardware, Network software, topologies, Protocols and standards, OSI model, TCP model, TCP/IP model, Physical Layer: Digital and Analog Signals, Periodic Analog Signals, Signal Transmission, Limitations of Data Rate, Digital Data Transmission, Performance Measures, Line Coding, Digital Modulation, Media and Digital Transmission System	7
3	Data Link Layer: Error Detection and Correction, Types of Errors, Two dimensional parity check, Detection verses correction, Block Coding, Linear Block Coding, Cyclic Codes, Checksum, Standardized Polynomial Code, Error Correction Methods, Forward Error Correction, Protocols: Stop and wait, Go-back-N ARQ, Selective Repeat ARQ, Sliding window, Piggy backing, Pure ALOHA, Slotted ALOHA, CSMA/CD, CSMA/CA	9
4	Network Layer: Design issues, Routing algorithms: IPV4, IPV6, Address mapping: ARQ, RARQ, Congestion control, Unicast, Multicast, Broadcast routing protocols, Quality of Service, Internetworking	8
5	Transport Layer: Transport service, Elements of transport protocols, User Datagram Protocol, Transmission Control Protocol, Quality of service, Leaky Bucket and Token Bucket algorithm	8
6	Application Layer**:** WWW, DNS, Multimedia, Electronic mail, FTP, HTTP, SMTP, Introduction to network security	7
	Total	40

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4CS4-21: Microprocessor & Interfaces Lab

Credit: 1 **Max. Marks: 50(IA:30, ETE:20)**

0L+0T+2P

List of Experiments:

1. Add the contents of memory locations XX00 &XX01 & place the result in memory location XX02.
2. Add the 16 bit numbers stored in memory location & store the result in another memory location.
3. Transfer a block of data from memory location XX00 to another memory location XX00 in forward & reverse order.
4. Write a program to swap two blocks of data stored in memory.
5. Write a program to find the square of a number.
6. Write a main program and a conversion subroutine to convert Binary to its equivalent BCD.
7. Write a program to find largest & smallest number from a given array.
8. Write a program to Sort an array in ascending & descending order.
9. Write a program to multiply two 8 bit numbers whose result is 16 bit.
10. Write a program of division of two 8 bit numbers.
11. Generate square wave from SOD pin of 8085 & observe on CRO.
12. Write a program to perform traffic light control operation.
13. Write a program to control the speed of a motor.

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4CS4-22: Database Management System Lab

Credit: 1.5 **Max. Marks: 75(IA:45, ETE:30)**

0L+0T+3P

List of Experiments:

1. Design a Database and create required tables. For e.g. Bank, College Database
2. Apply the constraints like Primary Key, Foreign key, NOT NULL to the tables.
3. Write a SQL statement for implementing ALTER,UPDATE and DELETE.
4. Write the queries to implement the joins.
5. Write the query for implementing the following functions: MAX (), MIN (), AVG () and COUNT ().
6. Write the query to implement the concept of Integrity constrains.
7. Write the query to create the views.
8. Perform the queries for triggers.
9. Perform the following operation for demonstrating the insertion , updation and deletion
10. Using the referential integrity constraints.
11. Write the query for creating the users and their role.

Data Base Designing Project:

For better understanding students (group of 3-4 students) should design data base for any data base project, understand the requirement and design methodology of project by its own.

Some example of data base design project like:

College management system, Inventory management system and Hospital management system.

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4CS4-23: Network Programming Lab

Credit: 1.5 **Max. Marks: 75(IA:45, ETE:30)**

0L+0T+3P

List of Experiments:

1. Study of Different Type of LAN& Network Equipments.
2. Study and Verification of standard Network topologies i.e. Star, Bus, Ring etc.
3. LAN installations and Configurations.
4. Write a program to implement various types of error correcting techniques.
5. Write a program to implement various types of framing methods.
6. Write two programs in C: hello_client and hello_server
    a. The server listens for, and accepts, a single TCP connection; it reads all the data it can from that connection, and prints it to the screen; then it closes the connection
    b. The client connects to the server, sends the string “Hello, world!”, then closes the connection
7. Write an Echo_Client and Echo_server using TCP to estimate the round trip time from client to the server. The server should be such that it can accept multiple connections at any given time.
8. Repeat Exercises 6 & 7 for UDP.
9. Repeat Exercise 7 with multiplexed I/O operations.
10. Simulate Bellman-Ford Routing algorithm in NS2.

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4CS4-24: Linux Shell Programming Lab

Credit: 1 **Max. Marks: 50(IA:30, ETE:20)**

0L+0T+2P

List of Experiments:

1. Use of Basic Unix Shell Commands: ls, mkdir, rmdir, cd, cat, banner, touch, file, wc, sort, cut, grep, dd, dfspace, du, ulimit.
2. Commands related to inode, I/O redirection and piping, process control commands, mails.
3. Shell Programming: Shell script based on control structure- **If-then-fi, if-then-else-if, nested if-else, to find:**
   - 3.1 Greatest among three numbers.
   - 3.2 To find a year is leap year or not.
   - 3.3 To input angles of a triangle and find out whether it is valid triangle or not.
   - 3.4 To check whether a character is alphabet, digit or special character.
   - 3.5 To calculate profit or loss.
4. Shell Programming - Looping- while, until, for loops
   - 4.1 Write a shell script to print all even and odd number from 1 to 10.
   - 4.2 Write a shell script to print table of a given number
   - 4.3 Write a shell script to calculate factorial of a given number.
   - 4.4 Write a shell script to print sum of all even numbers from 1 to 10.
   - 4.5 Write a shell script to print sum of digit of any number.
5. Shell Programming - case structure, use of break
   - 5.1 Write a shell script to make a basic calculator which performs addition, subtraction, Multiplication, division
   - 5.2 Write a shell script to print days of a week.
   - 5.3 Write a shell script to print starting 4 months having 31 days.
6. Shell Programming - Functions
   - 6.1 Write a shell script to find a number is Armstrong or not.
   - 6.2 Write a shell script to find a number is palindrome or not.
   - 6.3 Write a shell script to print Fibonacci series.
   - 6.4 Write a shell script to find prime number.
   - 6.5 Write a shell script to convert binary to decimal and decimal to binary
7. Write a shell script to print different shapes- Diamond, triangle, square, rectangle, hollow square etc.
8. Shell Programming – Arrays
   - 8.1 Write a C program to read and print elements of array.
   - 8.2 Write a C program to find sum of all array elements.
   - 8.3 Write a C program to find reverse of an array.
   - 8.4 Write a C program to search an element in an array.
   - 8.5 Write a C program to sort array elements in ascending or descending order.

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4CS4-25: Java Lab

Credit: 1 **Max. Marks: 50(IA:30, ETE:20)**

0L+0T+2P

List of Experiment:

1. Develop an in depth understanding of programming in Java: data types, variables, operators, operator precedence, Decision and control statements, arrays, switch statement, Iteration Statements, Jump Statements, Using break, Using continue, return.
2. Write Object Oriented programs in Java: Objects, Classes constructors, returning and passing objects as parameter, Inheritance, Access Control, Using super, final with inheritance Overloading and overriding methods, Abstract classes, Extended classes.
3. Develop understanding to developing packages & Interfaces in Java: Package, concept of CLASSPATH, access modifiers, importing package, Defining and implementing interfaces.
4. Develop understanding to developing Strings and exception handling: String constructors, special string operations, character extraction, searching and comparing strings, string Buffer class. Exception handling fundamentals, Exception types, uncaught exceptions, try, catch and multiple catch statements. Usage of throw, throws and finally.
5. Develop applications involving file handling: I/O streams, File I/O.
6. Develop applications involving concurrency: Processes and Threads, Thread Objects, Defining and Starting a Thread, Pausing Execution with Sleep, Interrupts, Joins, and Synchronization.

Indicative List of exercises:

7. Programs to demonstrate basic concepts e.g. operators, classes, constructors, control & iteration statements, recursion etc. such as complex arithmetic, matrix arithmetic, tower of Hanoi problem etc.
8. Development of programs/projects to demonstrate concepts like inheritance, exception handling, packages, interfaces etc. such as application for electricity department, library management, ticket reservation system, payroll system etc.
9. Development of a project to demonstrate various file handling concepts.
10. Develop applications involving Applet: Applet Fundamentals, using paint method and drawing polygons. It is expected that each laboratory assignments to given to the students with an aim to In order to achieve the above objectives.

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Syllabus of

UNDERGRADUATE DEGREE COURSE

B.Tech. V Semester

Computer Science and Engineering

Rajasthan Technical University, Kota

Effective from session: 2019 – 2020

5CS3-01: Information Theory & Coding

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	**Introduction:**Objective, scope and outcome of the course.	01
2	**Introduction to information theory:** Uncertainty, Information and Entropy, Information measures for continuous random variables, source coding theorem. Discrete Memory less channels, Mutual information, Conditional entropy.	05
3	**Source coding schemes for data compaction:** Prefix code, Huffman code, Shanon-Fane code &Hempel-Ziv coding channel capacity. Channel coding theorem. Shannon limit.	05
4	**Linear Block Code:** Introduction to error connecting codes, coding & decoding of linear block code, minimum distance consideration, conversion of non-systematic form of matrices into systematic form.	05
5	**Cyclic Code:** Code Algebra, Basic properties of Galois fields (GF) polynomial operations over Galois fields, generating cyclic code by generating polynomial, parity check polynomial. Encoder & decoder for cyclic codes.	06
6	**Convolutional Code:** Convolutional encoders of different rates. Code Tree, Trllis and state diagram. Maximum likelihood decoding of convolutional code: The viterbi Algorithm fee distance of a convolutional code.	06
	Total	28

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

5CS4-02: Compiler Design

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:**Objective, scope and outcome of the course.	01
2	**Introduction:** Objective, scope and outcome of the course. Compiler, Translator, Interpreter definition, Phase of compiler, Bootstrapping, Review of Finite automata lexical analyzer, Input, Recognition of tokens, Idea about LEX: A lexical analyzer generator, Error handling.	06
3	**Review of CFG Ambiguity of grammars:** Introduction to parsing. Top down parsing, LL grammars & passers error handling of LL parser, Recursive descent parsing predictive parsers, Bottom up parsing, Shift reduce parsing, LR parsers, Construction of SLR, Conical LR & LALR parsing tables, parsing with ambiguous grammar. Operator precedence parsing, Introduction of automatic parser generator: YACC error handling in LR parsers.	10
4	**Syntax directed definitions;** Construction of syntax trees, S-Attributed Definition, L-attributed definitions, Top down translation. Intermediate code forms using postfix notation, DAG, Three address code, TAC for various control structures, Representing TAC using triples and quadruples, Boolean expression and control structures.	10
5	**Storage organization;** Storage allocation, Strategies, Activation records, Accessing local and non-local names in a block structured language, Parameters passing, Symbol table organization, Data structures used in symbol tables.	08
6	**Definition of basic block control flow graphs;** DAG representation of basic block, Advantages of DAG, Sources of optimization, Loop optimization, Idea about global data flow analysis, Loop invariant computation, Peephole optimization, Issues in design of code generator, A simple code generator, Code generation from DAG.	07
	Total	42

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5CS4-03: Operating System

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:**Objective, scope and outcome of the course.	01
2	**Introduction and History of Operating systems:** Structure and operations; processes and files Processor management: inter process communication, mutual exclusion, semaphores, wait and signal procedures, process scheduling and algorithms, critical sections, threads, multithreading	04
3	**Memory management:** contiguous memory allocation, virtual memory, paging, page table structure, demand paging, page replacement policies, thrashing, segmentation, case study	05
4	**Deadlock:** Shared resources, resource allocation and scheduling, resource graph models, deadlock detection, deadlock avoidance, deadlock prevention algorithms **Device management:** devices and their characteristics, device drivers, device handling, disk scheduling algorithms and policies	15
5	**File management:** file concept, types and structures, directory structure, cases studies, access methods and matrices, file security, user authentication	07
6	**UNIX and Linux operating systems as case studies;** Time OS and case studies of Mobile OS	08
	Total	40

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5CS4-04: Computer Graphics & Multimedia

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Basic of Computer Graphics:**Basic of Computer Graphics, Applications of computer graphics, Display devices, Random and Raster scan systems, Graphics input devices, Graphics software and standards	06
3	**Graphics Primitives:**Points, lines, circles and ellipses as primitives, scan conversion algorithms for primitives, Fill area primitives including scan-line polygon filling, inside-outside test, boundary and flood-fill, character generation, line attributes, area-fill attributes, character attributers. Aliasing, and introduction to Anti Aliasing (No anti aliasing algorithm).	07
4	**Two Dimensional Graphics:**Transformations (translation, rotation, scaling), matrix representation, homogeneous coordinates, composite transformations, reflection and shearing, viewing pipeline and coordinates system, window-to-viewport transformation, clipping including point clipping, line clipping (cohen-sutherland, liang- bersky, NLN), polygon clipping	08
5	**Three Dimensional Graphics:**3D display methods, polygon surfaces, tables, equations, meshes, curved lies and surfaces, quadric surfaces, spline representation, cubic spline interpolation methods, Bazier curves and surfaces, B-spline curves and surfaces.3D scaling, rotation and translation, composite transformation, viewing pipeline and coordinates, parallel and perspective transformation, view volume and general (parallel and perspective) projection transformations.	08
6	**Illumination and Colour Models:**Light sources – basic illumination models – halftone patterns and dithering techniques; Properties of light – Standard primaries and chromaticity diagram; Intuitive colour concepts – RGB colour model – YIQ colour model – CMY colour model – HSV colour model – HLS colour model; Colour selection.	06
7	**Animations &Realism:**Design of Animation sequences – animation function – raster animation – key frame systems – motion specification – morphing – tweening. **ComputerGraphics Realism:** Tiling the plane – Recursively defined curves – Koch curves – C curves – Dragons – space filling curves – fractals – Grammar based models – fractals – turtle graphics – ray tracing.	06
	Total	42

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5CS4-05: Analysis of Algorithms

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Background**: Review of Algorithm, Complexity Order Notations: definitions and calculating complexity. **Divide And Conquer Method**: Binary Search, Merge Sort, Quick sort and Strassen's matrix multiplication algorithms.	06
3	**Greedy Method**: Knapsack Problem, Job Sequencing, Optimal Merge Patterns and Minimal Spanning Trees. **Dynamic Programming**: Matrix Chain Multiplication. Longest CommonSubsequence and 0/1 Knapsack Problem.	10
4	**Branch And Bound**: Traveling Salesman Problem and Lower Bound Theory. Backtracking Algorithms and queens problem. **Pattern Matching Algorithms**: Naïve and Rabin Karp string matching algorithms, KMP Matcher and Boyer Moore Algorithms.	08
5	**Assignment Problems:** Formulation of Assignment and Quadratic Assignment Problem. **Randomized Algorithms-** Las Vegas algorithms, Monte Carlo algorithms, randomized algorithm for Min-Cut, randomized algorithm for 2- SAT. Problem definition of Multicommodity flow, Flow shop scheduling and Network capacity assignment problems.	08
6	**Problem Classes Np, Np-Hard And Np-Complete:** Definitions of P, NP-Hard and NP-Complete Problems. Decision Problems.Cook's Theorem. Proving NP-Complete Problems - Satisfiability problem and Vertex Cover Problem. Approximation Algorithms for Vertex Cover andSet Cover Problem.	08
	Total	41

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5CS5-11: Wireless Communication

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Wireless Channels:**Large scale path loss – Path loss models: Free Space and Two-Ray models -Link Budget design – Small scale fading- Parameters of mobile multipath channels – Time dispersion parameters-Coherence bandwidth – Doppler spread & Coherence time, Fading due to Multipath time delay spread – flat fading – frequency selective fading – Fading due to Doppler spread – fast fading – slow fading.	06
3	**Cellular Architecture:** Multiple Access techniques - FDMA, TDMA, CDMA – Capacity calculations–Cellular concept- Frequency reuse - channel assignment- hand off- interference & system capacity- trunking & grade of service – Coverage and capacity improvement.	05
4	**Digital Signaling For Fading Channels:** Structure of a wireless communication link, Principles of Offset-QPSK, p/4-DQPSK, Minimum Shift Keying, Gaussian Minimum Shift Keying, Error performance in fading channels, OFDM principle – Cyclic prefix, Windowing, PAPR.	05
5	**Multipath Mitigation Techniques:** Equalisation – Adaptive equalization, Linear and Non-Linear equalization, Zero forcing and LMS Algorithms. Diversity – Micro and Macrodiversity, Diversity combining techniques, Error probability in fading channels with diversity reception, Rake receiver,	06
6	**Multiple Antenna Techniques:** MIMO systems – spatial multiplexing -System model -Pre-coding - Beam forming - transmitter diversity, receiver diversity- Channel state information-capacity in fading and non-fading channels.	05
	Total	28

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5CS5-12: Human Computer Interaction

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	Historical evolution of the field, Interactive system design, Concept of usability -definition and elaboration, HCI and software Engineering, GUI design and Aesthetics, Prototyping techniques.	02
2	**Model-based Design and evaluation:** Basic idea, introduction to different types of models, GOMS family of models (KLM and CMN-GOMS), Fitts' law and Hick-Hyman's law, Model-based design case studies,	03
3	**Guidelines in HCI:**Shneiderman's eight, golden rules, Norman's seven principles, Norman's model of interaction, Nielsen's ten heuristics with example of its use Heuristic evaluation, Contextual inquiry, Cognitive walkthrough	05
4	**Empirical research methods in HCI:** Introduction (motivation, issues, research question formulation techniques), Experiment design and data analysis (with explanation of one-way ANOVA)	06
5	**Task modelling and analysis:** Hierarchical task analysis (HTA), Engineering task models and Concur Task Tree (CTT),ıintroduction to formalism in dialog design, design using FSM (finite state machines) State charts and (classical) Petri Nets in dialog design	06
6	**Introduction to CA**, CA types, relevance of CA in IS design Model Human Processor (MHP), OOP- Introduction OOM- Object Oriented Modeling of User Interface Design	05
	Total	28

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5CS5-13: Bioinformatics

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Introduction:** Basics of biology	02
3	**Sequences:** Problem Statement, Edit distance and substitution matrices, HMMs and pairwise HMMs, Global and local alignments, Spliced alignment, Space-efficient sequence alignment, Multiple alignment, Database searching tools, Sequence by hybridization, Profile HMMs	07
4	**Structures:** Protein structure alignment, Protein structure prediction	06
5	**Phylogenetic trees:** Large parsimony and small parsimony problems, Probabilistic approaches, Grammar-based approaches	07
6	**Miscellaneous topics:** Pathways and networks, Microarrays, Biomedical images	05
	Total	28

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5CS4-21: Computer Graphics & Multimedia Lab

Credit: 1 **Max. Marks:50 (IA:30, ETE:20)**
0L+0T+2P **End Term Exam: 2 Hours**

SN	List of Experiments
1	Implementation of Line, Circle and ellipse attributes
2	To plot a point (pixel) on the screen
3	To draw a straight line using DDA Algorithm
4	Implementation of mid-point circle generating Algorithm
5	Implementation of ellipse generating Algorithm
6	Two Dimensional transformations - Translation, Rotation, Scaling, Reflection, Shear
7	Composite 2D Transformations
8	Cohen Sutherland 2D line clipping and Windowing
9	Sutherland – Hodgeman Polygon clipping Algorithm
10	Three dimensional transformations - Translation, Rotation, Scaling
11	Composite 3D transformations
12	Drawing three dimensional objects and Scenes
13	Generating Fractal images

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5CS4-22: Compiler Design Lab

Credit: 1 **Max. Marks:50 (IA:30, ETE:20)**
0L+0T+2P **End Term Exam: 2 Hours**

SN	List of Experiments
1	Introduction: Objective, scope and outcome of the course.
2	To identify whether given string is keyword or not.
3	Count total no. of keywords in a file. [Taking file from user]
4	Count total no of operators in a file. [Taking file from user]
5	Count total occurrence of each character in a given file. [Taking file from user]
6	Write a C program to insert, delete and display the entries in Symbol Table.
7	Write a LEX program to identify following: 1. Valid mobile number 2. Valid url 3. Valid identifier 4. Valid date (dd/mm/yyyy) 5. Valid time (hh:mm:ss)
8	Write a lex program to count blank spaces,words,lines in a given file.
9	Write a lex program to count the no. of vowels and consonants in a C file.
10	Write a YACC program to recognize strings aaab,abbb using a^nb^n, where b>=0.
11	Write a YACC program to evaluate an arithmetic expression involving operators +,-,* and /.
12	Write a YACC program to check validity of a strings abcd,aabbcd using grammar a^nb^nc^md^m, where n , m>0
13	Write a C program to find first of any grammar.

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5CS4-23: Analysis of Algorithms Lab

Credit: 1 **Max. Marks:50 (IA:30, ETE:20)**
0L+0T+2P **End Term Exam: 2 Hours**

SN	List of Experiments
1	Sort a given set of elements using the Quicksort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.
2	Implement a parallelized Merge Sort algorithm to sort a given set of elements and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.
3	a. Obtain the Topological ordering of vertices in a given digraph. b. Compute the transitive closure of a given directed graph using Warshall's algorithm.
4	Implement 0/1 Knapsack problem using Dynamic Programming.
5	From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.
6	Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.
7	a. Print all the nodes reachable from a given starting node in a digraph using BFS method. b. Check whether a given graph is connected or not using DFS method.
8.	Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm.
9.	Implement All-Pairs Shortest Paths Problem using Floyd's algorithm.
10	Implement N Queen's problem using Back Tracking.

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5CS4-24: Advance Java Lab

Credit: 1 **Max. Marks:50 (IA:30, ETE:20)**
L+0T+2P **End Term Exam: 2 Hours**

SN	List of Experiments
1	Introduction To Swing, MVC Architecture, Applets, Applications and Pluggable Look and Feel, Basic swing components : Text Fields, Buttons, Toggle Buttons, Checkboxes, and Radio Buttons
2	Java database Programming, java.sql Package, JDBC driver, Network Programming With java.net Package, Client and Server Programs, Content And Protocol Handlers
3	RMI architecture, RMI registry, Writing distributed application with RMI, Naming services, Naming And Directory Services, Overview of JNDI, Object serialization and Internationalization
4	J2EE architecture, Enterprise application concepts, n-tier application concepts, J2EE platform, HTTP protocol, web application, Web containers and Application servers
5	Server side programming with Java Servlet, HTTP and Servlet, Servlet API, life cycle, configuration and context, Request and Response objects, Session handling and event handling, Introduction to filters with writing simple filter application
6	JSP architecture, JSP page life cycle, JSP elements, Expression Language, Tag Extensions, Tag Extension API, Tag handlers, JSP Fragments, Tag Files, JSTL, Core Tag library, overview of XML Tag library, SQL Tag library and Functions Tag library

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Syllabus of

UNDERGRADUATE DEGREE COURSE

B.Tech. VI Semester

Computer Science and Engineering

Rajasthan Technical University, Kota

Effective from session: 2019 – 2020

6CS3-01: Digital Image Processing

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Introduction to Image Processing:** Digital Image representation, Sampling & Quantization, Steps in image Processing, Image acquisition, color image representation.	04
3	**Image Transformation & Filtering:** Intensity transform functions, histogram processing, Spatial filtering, Fourier transforms and its properties, frequency domain filters, colour models, Pseudo colouring, colour transforms, Basics of Wavelet Transforms.	06
4	**Image Restoration:** Image degradation and restoration process, Noise Models, Noise Filters, degradation function, Inverse Filtering, Homomorphism Filtering.	07
5	**Image Compression:** Coding redundancy, Interpixel redundancy, Psychovisual redundancy, Huffman Coding, Arithmetic coding, Lossy compression techniques, JPEG Compression.	05
6	**Image Segmentation & Representation:** Point, Line and Edge Detection, Thresholding, Edge and Boundary linking, Hough transforms, Region Based Segmentation, Boundary representation, Boundary Descriptors.	05
	Total	28

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6CS4-02:Machine Learning

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Supervised learning algorithm:** Introduction, types of learning, application, Supervised learning: Linear Regression Model, Naive Bayes classifier Decision Tree, K nearest neighbor, Logistic Regression, Support Vector Machine, Random forest algorithm	09
3	**Unsupervised learning algorithm:** Grouping unlabelled items using k-means clustering, Hierarchical Clustering, Probabilistic clustering, Association rule mining, Apriori Algorithm, f-p growth algorithm, Gaussian mixture model.	08
4	**Introduction to Statistical Learning Theory**, Feature extraction - Principal component analysis, Singular value decomposition. Feature selection – feature ranking and subset selection, filter, wrapper and embedded methods, Evaluating Machine Learning algorithms and Model Selection.	08
5	**Semi supervised learning, Reinforcement learning:** Markov decision process (MDP), Bellman equations, policy evaluation using Monte Carlo, Policy iteration and Value iteration, Q-Learning, State-Action-Reward-State-Action (SARSA), Model-based Reinforcement Learning.	08
6	**Recommended system,** Collaborative filtering, Content-based filtering Artificial neural network, Perceptron, Multilayer network, Backpropagation, Introduction to Deep learning.	08
	Total	42

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6CS4-03: Information Security System

Credit:2 **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Introduction to security attacks:** services and mechanism, classical encryption techniques- substitution ciphers and transposition ciphers, cryptanalysis, stream and block ciphers.	06
3	**Modern block ciphers**: Block Cipher structure, Data Encryption standard (DES) with example, strength of DES, Design principles of block cipher, AES with structure, its transformation functions, key expansion, example and implementation. Multiple encryption and triple DES, Electronic Code Book, Cipher Block Chaining Mode, Cipher Feedback mode, Output Feedback mode, Counter mode.	06
4	**Public Key Cryptosystems with Applications:** Requirements and Cryptanalysis, RSA cryptosystem, Rabin cryptosystem, Elgamal cryptosystem, Elliptic curve cryptosystem.	06
5	**Cryptographic Hash Functions, their applications:** Simple hash functions, its requirements and security, Hash functions based on Cipher Block Chaining, Secure Hash Algorithm (SHA). Message Authentication Codes, its requirements and security, MACs based on Hash Functions, Macs based on Block Ciphers. Digital Signature, its properties, requirements and security, various digital signature schemes (Elgamal and Schnorr), NIST digital Signature algorithm.	05
6	**Key management and distribution:** symmetric key distribution using symmetric and asymmetric encryptions, distribution of public keys, X.509 certificates, Public key infrastructure. Remote user authentication with symmetric and asymmetric encryption, Kerberos Web Security threats and approaches, SSL architecture and protocol, Transport layer security, HTTPS and SSH.	04
	Total	28

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6CS4-04: Computer Architecture and Organization

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Computer Data Representation:** Basic computer data types, Complements, Fixed point representation, Register Transfer and Micro-operations: Floating point representation, Register Transfer language, Register Transfer, Bus and Memory Transfers (Tree-State Bus Buffers, Memory Transfer), Arithmetic Micro-Operations, Logic Micro-Operations, Shift Micro-Operations, Arithmetic logical shift unit. Basic Computer Organization and DesignInstruction codes, Computer registers, computer instructions, Timing and Control, Instruction cycle, Memory-Reference Instructions, Input-output and interrupt, Complete computer description, Design of Basic computer, design of Accumulator Unit.	10
3	**Programming The Basic Computer:** Introduction, Machine Language, Assembly Language, assembler, Program loops, Programming Arithmetic and logic operations, subroutines, I-O Programming. Micro programmed Control: Control Memory, Address sequencing, Micro program Example, design of control Unit	7
4	**Central Processing Unit:** Introduction, General Register Organization, Stack Organization, Instruction format, Addressing Modes, data transfer and manipulation, Program Control, Reduced Instruction Set Computer (RISC)Pipeline And Vector Processing, Flynn's taxonomy, Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction, Pipeline, RISC Pipeline, Vector Processing, Array Processors	8
5	**Computer Arithmetic:** Introduction, Addition and subtraction, Multiplication Algorithms (Booth Multiplication Algorithm), Division Algorithms, Floating Point Arithmetic operations, Decimal Arithmetic Unit. Input-Output Organization, Input-Output Interface, Asynchronous Data Transfer, Modes Of Transfer, Priority Interrupt, DMA, Input-Output Processor (IOP), CPUIOP Communication, Serial communication.	8
6	**Memory Organization:** Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory. Multipreocessors: Characteristics of Multiprocessors, Interconnection Structures, Inter-processor Arbitration, Inter-processor Communication and Synchronization, Cache Coherence, Shared Memory Multiprocessors.	8
	Total	42

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6CS4-05: Artificial Intelligence

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Introduction to AI and Intelligent agent:** Different Approach of AI, Problem Solving : Solving Problems by Searching, Uninformed search, BFS, DFS, Iterative deepening, Bi directional search, Hill climbing, Informed search techniques: heuristic, Greedy search, A* search, AO* search, constraint satisfaction problems.	03
3	**Game Playing:** Minimax, alpha-beta pruning, jug problem, chess problem, tiles problem	06
4	**Knowledge and Reasoning:** Building a Knowledge Base: Propositional logic, first order logic, situation calculus. Theorem Proving in First Order Logic. Planning, partial order planning. Uncertain Knowledge and Reasoning, Probabilities, Bayesian Networks.	06
5	**Learning:** Overview of different forms of learning, Supervised base learning: Learning Decision Trees, SVM, Unsupervised based learning, Market Basket Analysis, Neural Networks.	07
6	**Introduction to Natural Language Processing:** Different issue involved in NLP, Expert System, Robotics.	05
	Total	28

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6CS4-06: Cloud Computing

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Introduction:** Objective, scope and outcome of the course. Introduction Cloud Computing: Nutshell of cloud computing, Enabling Technology, Historical development, Vision, feature Characteristics and components of Cloud Computing. Challenges, Risks and Approaches of Migration into Cloud. Ethical Issue in Cloud Computing, Evaluating the Cloud's Business Impact and economics, Future of the cloud. Networking Support for Cloud Computing. Ubiquitous Cloud and the Internet of Things	06
3	**Cloud Computing Architecture:** Cloud Reference Model, Layer and Types of Clouds, Services models, Data centre Design and interconnection Network, Architectural design of Compute and Storage Clouds. Cloud Programming and Software: Fractures of cloud programming, Parallel and distributed programming paradigms-Map Reduce, Hadoop, High level Language for Cloud. Programming of Google App engine.	10
4	**Virtualization Technology:** Definition, Understanding and Benefits of Virtualization. Implementation Level of Virtualization, Virtualization Structure/Tools and Mechanisms, Hypervisor VMware, KVM, Xen. Virtualization: of CPU, Memory, I/O Devices, Virtual Cluster and Resources Management, Virtualization of Server, Desktop, Network, and Virtualization of data-centre.	10
5	**Securing the Cloud:** Cloud Information security fundamentals, Cloud security services, Design principles, Policy Implementation, Cloud Computing Security Challenges, Cloud Computing Security Architecture . Legal issues in cloud Computing. Data Security in Cloud: Business Continuity and Disaster Recovery , Risk Mitigation , Understanding and Identification of Threats in Cloud, SLA-Service Level Agreements, Trust Management	08
6	**Cloud Platforms in Industry:** Amazon web services , Google AppEngine, Microsoft Azure Design, Aneka: Cloud Application Platform -Integration of Private and Public Clouds Cloud applications: Protein structure prediction, Data Analysis, Satellite Image Processing, CRM	07
	Total	42

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RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Syllabus

III Year-VI Semester: B.Tech. Computer Science and Engineering

6CS5-11: Distributed System

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Distributed Systems:** Features of distributed systems, nodes of a distributed system, Distributed computation paradigms, Model of distributed systems, Types of Operating systems: Centralized Operating System, Network Operating Systems, Distributed Operating Systems and Cooperative Autonomous Systems, design issues in distributed operating systems. Systems Concepts and Architectures: Goals, Transparency, Services, Architecture Models, Distributed Computing Environment (DCE). Theoretical issues in distributed systems: Notions of time and state, states and events in a distributed system, time, clocks and event precedence, recording the state of distributed systems.	06
3	**Concurrent Processes and Programming:** Processes and Threads, Graph Models for Process Representation, Client/Server Model, Time Services, Language Mechanisms for Synchronization, Object Model Resource Servers, Characteristics of Concurrent Programming Languages (Language not included).Inter-process Communication and Coordination: Message Passing, Request/Reply and Transaction Communication, Name and Directory services, RPC and RMI case studies	05
4	**Distributed Process Scheduling:** A System Performance Model, Static Process Scheduling with Communication, Dynamic Load Sharing and Balancing, Distributed Process Implementation. Distributed File Systems: Transparencies and Characteristics of DFS, DFS Design and implementation, Transaction Service and Concurrency Control, Data and File Replication. Case studies: Sun network file systems, General Parallel file System and Window's file systems. Andrew and Coda File Systems	06
5	**Distributed Shared Memory:** Non-Uniform Memory Access Architectures, Memory Consistency Models, Multiprocessor Cache Systems, Distributed Shared Memory, Implementation of DSM systems. Models of Distributed Computation: Preliminaries, Causality, Distributed Snapshots, Modelling a Distributed Computation, Failures in a Distributed System, Distributed Mutual Exclusion, Election, Distributed Deadlock handling, Distributed termination detection.	06
6	**Distributed Agreement:** Concept of Faults, failure and recovery, Byzantine Faults, Adversaries, Byzantine Agreement, Impossibility of Consensus and Randomized Distributed Agreement. Replicated Data Management: concepts and issues, Database Techniques, Atomic Multicast, and Update Propagation. CORBA case study: Introduction, Architecture, CORBA RMI, CORBA Services.	05
	Total	28

Office of Dean Academic Affairs
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6CS5-12: Software Defined Network

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**History and Evolution of Software Defined Networking (SDN):** Separation of Control Plane and Data Plane, IETF Forces, Active Networking. **Control and Data Plane Separation:** Concepts, Advantages and Disadvantages, the Open Flow protocol.	03
3	**Network Virtualization:** Concepts, Applications, Existing Network Virtualization Framework (VMWare and others), Mininet based examples. **Control Plane:** Overview, Existing SDN Controllers including Floodlight and Open Daylight projects.	05
4	**Customization of Control Plane:** Switching and Firewall Implementation using SDN Concepts. **Data Plane:** Software-based and Hardware-based; Programmable Network Hardware.	07
5	**Programming SDNs:** Northbound Application Programming Interface, Current Languages and Tools, Composition of SDNs. Network Functions Virtualization (NFV) and **Software Defined Networks:** Concepts, Implementation and Applications.	07
6	**Data Center Networks:** Packet, Optical and Wireless Architectures, Network Topologies. **Use Cases of SDNs:** Data Centers, Internet Exchange Points, Backbone Networks, Home Networks, Traffic Engineering. Programming Assignments for implementing some of the theoretical concepts listed above.	05
	Total	28

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6CS5-13: Ecommerce & ERP

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Introduction to E-Commerce:** Defining Commerce; Main Activities of Electronic Commerce; Benefits of E-Commerce; Broad Goals of Electronic Commerce; Main Components of E-Commerce; Functions of Electronic Commerce – Communication, Process Management, Service Management, Transaction Capabilities; Process of E-Commerce; Types of E-Commerce; Role of Internet and Web in E-Commerce; Technologies Used; E-Commerce Systems; Pre-requisites of E-Commerce; Scope of E-Commerce; E-Business Models.	03
3	**E-Commerce Activities:** Various Activities of E-Commerce; Various Modes of Operation Associated with E-Commerce; Matrix of E-Commerce Types; Elements and Resources Impacting E-Commerce and Changes; Types of E-Commerce Providers and Vendors; Man Power Associated with E-Commerce Activities; Opportunity Development for E-Commerce Stages; Development of E-Commerce Business Case; Components and Factors for the Development of the Business Case; Steps to Design and Develop an E-Commerce Website.	05
4	**Internet – The Backbone for E-Commerce:** Early Ages of Internet; Networking Categories; Characteristics of Internet; Components of Internet – Internet Services, Elements of Internet, Uniform Resource Locators, Internet Protocol; Shopping Cart, Cookies and E-Commerce; Web Site Communication; Strategic Capabilities of Internet.	07
5	**ISP, WWW and Portals:** Internet Service Provider (ISP); World Wide Web (WWW); Portals – Steps to build homepage, Metadata; Advantages of Portal; Enterprise Information Portal (EIP).**E-Commerce & Online Publishing:** This unit explains the concept of online publishing, strategies and approaches of online publishing, and online advertising.	07
6	**XML and Data Warehousing:** Definition of eXtensible Markup Language (XML); XML Development Goals; Comparison between HTML and XML; Business importance in using XML Based Technology; Advantages, Disadvantages and Applications of XML; Structure of an XML Document; XHTML and X/Secure; Data Warehousing; Data Marts and Operational Data Stores. **E-Marketing:** Traditional Marketing; E-Marketing; Identifying Web Presence Goals – Achieving web presence goals, Uniqueness of the web, Meeting the needs of website visitors, Site Adhesion: Content, format and access; Maintaining a Website; Metrics Defining Internet Units of Measurement; Online Marketing; Advantages of Online Marketing.	05
		28

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6CS4-21: Digital Image Processing Lab

Credit: 1.5 **Max. Marks: 75(IA:45, ETE:30)**
0L+0T+3P **End Term Exam: 2 Hours**

SN	List of Experiments
1	Point-to-point transformation. This laboratory experiment provides for thresholding an image and the evaluation of its histogram. Histogram equalization. This experiment illustrates the relationship among the intensities (gray levels) of an image and its histogram.
2	Geometric transformations. This experiment shows image rotation, scaling, and translation. Two-dimensional Fourier transform
3	Linear filtering using convolution. Highly selective filters.
4	Ideal filters in the frequency domain. Non Linear filtering using convolutional masks. Edge detection. This experiment enables students to understand the concept of edge detectors and their operation in noisy images.
5	Morphological operations: This experiment is intended so students can appreciate the effect of morphological operations using a small structuring element on simple binary images. The operations that can be performed are erosion, dilation, opening, closing, open-close, close-open.

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6CS4-22: Machine Learning Lab

Credit: 1.5 **Max. Marks: 75(IA:45, ETE:30)**
0L+0T+3P **End Term Exam: 2 Hours**

SN	List of Experiments
1	Implement and demonstrate the FIND-Salgorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
2	For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithmto output a description of the set of all hypotheses consistent with the training examples.
3	Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge toclassify a new sample
4	Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets
5	Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
6	Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
7	Write a program to construct aBayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
8	Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
9	Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
10	Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

6CS4-23: Python Lab

Credit: 1.5 **Max. Marks: 75(IA:45, ETE:30)**
0L+0T+3P **End Term Exam: 2 Hours**

SN	List of Experiments
1	Write a program to demonstrate basic data type in python.
2	Write a program to compute distance between two points taking input from the user Write a program add.py that takes 2 numbers as command line arguments and prints its sum.
3	Write a Program for checking whether the given number is an even number or not. Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4, . . . , 1/10
4	Write a Program to demonstrate list and tuple in python. Write a program using a for loop that loops over a sequence. Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.
5	Find the sum of all the primes below two million. By considering the terms in the Fibonacci sequence whose values do not exceed four million, WAP to find the sum of the even-valued terms.
6	Write a program to count the numbers of characters in the string and store them in a dictionary data structure Write a program to use split and join methods in the string and trace a birthday of a person with a dictionary data structure
7	Write a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file? Write a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file?
8	Write a program to print each line of a file in reverse order. Write a program to compute the number of characters, words and lines in a file.
9	Write a function nearly equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on. Write function to compute gcd, lcm of two numbers. Each function shouldn't exceed one line.
10	Write a program to implement Merge sort. Write a program to implement Selection sort, Insertion sort.

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6CS4-24: Mobile Application Development Lab

Credit: 1.5 **Max. Marks: 75(IA:45, ETE:30)**
0L+0T+3P **End Term Exam: 2 Hours**

SN	List of Experiments
1	To study Android Studio and android studio installation. Create "Hello World" application.
2	To understand Activity, Intent, Create sample application with login module.(Check username and password).
3	Design simple GUI application with activity and intents e.g. calculator.
4	Develop an application that makes use of RSS Feed.
5	Write an application that draws basic graphical primitives on the screen
6	Create an android app for database creation using SQLite Database.
7	Develop a native application that uses GPS location information
8	Implement an application that writes data to the SD card.
9	Design a gaming application
10	Create an application to handle images and videos according to size.

7CS1A Cloud Computing

Class: VII Sem. B.Tech.	Evaluation
Branch: Computer Engg. **Schedule per Week** **Lectures: 3**	**Examination Time = Three (3) Hours** **Maximum Marks = 100** **[Mid-term (20) & End-term (80)]**

Units	Contents of the subject
I	Introduction Cloud Computing: Nutshell of cloud computing, Enabling Technology, Historical development, Vision, feature Characteristics and components of Cloud Computing. Challenges, Risks and Approaches of Migration into Cloud. Ethical Issue in Cloud Computing, Evaluating the Cloud's Business Impact and economics, Future of the cloud. Networking Support for Cloud Computing. Ubiquitous Cloud and the Internet of Things
II	Cloud Computing Architecture: Cloud Reference Model, Layer and Types of Clouds, Services models, Data center Design and interconnection Network, Architectural design of Compute and Storage Clouds. Cloud Programming and Software: Fractures of cloud programming, Parallel and distributed programming paradigms-MapReduce, Hadoop , High level Language for Cloud. Programming of Google App engine,
III	Virtualization Technology: Definition, Understanding and Benefits of Virtualization. Implementation Level of Virtualization, Virtualization Structure/Tools and Mechanisms , Hypervisor VMware, KVM, Xen. Virtualization: of CPU, Memory, I/O Devices, Virtual Cluster and Resources Management, Virtualization of Server , Desktop, Network, and Virtualization of data-center
IV	Securing the Cloud : Cloud Information security fundamentals, Cloud security services, Design principles, Policy Implementation, Cloud Computing Security Challenges, Cloud Computing Security Architecture . Legal issues in cloud Computing. Data Security in Cloud: Business Continuity and Disaster Recovery , Risk Mitigation , Understanding and Identification of Threats in Cloud, SLA-Service Level Agreements, Trust Management
V	*Cloud Platforms in Industry:* Amazon web services , Google AppEngine, Microsoft Azure Design, Aneka: Cloud Application Platform -Integration of Private and Public Clouds *Cloud applications:* Protein structure prediction, Data Analysis, Satellite Image Processing, CRM and ERP ,Social networking . Cloud Application- Scientific Application, Business Application. *Advance Topic in Cloud Computing:* Federated Cloud/InterCloud, Third Party Cloud Services

Recommended Text:

1. " Distributed and Cloud Computing " By Kai Hawang , Geofrey C.Fox, Jack J. Dongarra Pub: Elservier
2. Cloud Computing ,Principal and Paradigms, Edited By Rajkumar Buyya, Jemes Broberg, A. Goscinski, Pub.- Wiley
3. Kumar Saurabh, "Cloud Computing" , Wiley Pub
4. Krutz , Vines, "Cloud Security " , Wiley Pub
5. Velte, "Cloud Computing- A Practical Approach" ,TMH Pub

7CS2A Information System Security (Common to CS & IT)

Class: VII Sem. B.Tech.	Evaluation
Branch: Computer Engg. **Schedule per Week** **Lectures: 3**	**Examination Time = Three (3) Hours** **Maximum Marks = 100** **[Mid-term (20) & End-term (80)]**

Units	Contents of the subject
I	Introduction to security attacks, services and mechanism, classical encryption techniques- substitution ciphers and transposition ciphers, cryptanalysis, stream and block ciphers. Modern Block Ciphers: Block ciphers principals, Shannon's theory of confusion and diffusion, fiestal structure, data encryption standard(DES), differential and linear cryptanalysis of DES, block cipher modes of operations, triple DES.
II	AES, RC6, random number generation. S-box theory: Boolean Function, S-box design criteria, Bent functions, Propagation and nonlinearity, construction of balanced functions, S-box design.
III	Public Key Cryptosystems: Principles of Public Key Cryptosystems, RSA Algorithm, security analysis of RSA, Exponentiation in Modular Arithmetic. Key Management in Public Key Cryptosystems: Distribution of Public Keys, Distribution of Secret keys using Public Key Cryptosystems. X.509 Discrete Logarithms, Diffie-Hellman Key Exchange.
IV	Message Authentication and Hash Function: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions and MAC, MD5 message digest algorithm, Secure hash algorithm(SHA). Digital Signatures: Digital Signatures, authentication protocols, digital signature standards (DSS), proof of digital signature algorithm. Remote user Authentication using symmetric and Asymmetric Authentication
V	Pretty Good Privacy. IP Security: Overview, IP Security Architecture, Authentication Header, Encapsulation Security Payload in Transport and Tunnel mode with multiple security associations (Key Management not Included). Strong Password Protocols: Lamport's Hash, Encrypted Key Exchange.

Text/References:

1. Stalling Williams: Cryptography and Network Security: Principles and Practices, 4th Edition, Pearson Education, 2006.
2. Kaufman Charlie et.al; Network Security: Private Communication in a Public World, 2nd Ed., PHI/Pearson.
3. Pieprzyk Josef and et.al; Fundamentals of Computer Security, Springer-Verlag, 2008.
4. Trappe & Washington, Introduction to Cryptography, 2nd Ed. Pearson.

7CS3A Data Mining & Ware Housing (Common to CS & IT)

Class: VII Sem. B.Tech.	Evaluation
Branch: Computer Engg. Schedule per Week Lectures: 3	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the subject
I	Overview, Motivation(for Data Mining),Data Mining-Definition & Functionalities, Data Processing, Form of Data Preprocessing, Data Cleaning: Missing Values, Noisy Data, (Binning, Clustering, Regression, Computer and Human inspection), Inconsistent Data, Data Integration and Transformation. Data Reduction:-Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Clustering, Discretization and Concept hierarchy generation.
II	Concept Description: Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisons, Statistical measures in large Databases. Measuring Central Tendency, Measuring Dispersion of Data, Graph Displays of Basic Statistical class Description, Mining Association Rules in Large Databases, Association rule mining, mining Single-Dimensional Boolean Association rules from Transactional Databases– Apriori Algorithm, Mining Multilevel Association rules from Transaction Databases and Mining Multi- Dimensional Association rules from Relational Databases.
III	What is Classification & Prediction, Issues regarding Classification and prediction, Decision tree, Bayesian Classification, Classification by Back propagation, Multilayer feed-forward Neural Network, Back propagation Algorithm, Classification methods K-nearest neighbour classifiers, Genetic Algorithm. Cluster Analysis: Data types in cluster analysis, Categories of clustering methods, Partitioning methods. Hierarchical Clustering- CURE and Chameleon. Density Based Methods-DBSCAN, OPTICS. Grid Based Methods- STING, CLIQUE. Model Based Method –Statistical Approach, Neural Network approach, Outlier Analysis
IV	Data Warehousing: Overview, Definition, Delivery Process, Difference between Database System and Data Warehouse, Multi Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Process Architecture, 3 Tier Architecture, Data Mining.
V	Aggregation, Historical information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining interface, Security, Backup and Recovery, Tuning Data Warehouse, Testing Data Warehouse.

Text Books & References:

1. Data Warehousing in the Real World – Anahory and Murray, Pearson Education.
2. Data Mining – Concepts and Techniques – Jiawai Han and Micheline Kamber.
3. Building the Data Warehouse – WH Inmon, Wiley.

7CS4A COMPUTER AIDED DESIGN FOR VLSI

Class: VII Sem. B.Tech.	Evaluation
Branch: Computer Engg. **Schedule per Week** **Lectures: 3**	**Examination Time = Three (3) Hours** **Maximum Marks = 100** **[Mid-term (20) & End-term (80)]**

Units	Contents of the subject
I	Complexity in microelectronic circuit design and Moore's Law, design styles -Full-custom design, standard-cell design, Programmable Logic Devices, Field Programmable Gate Arrays, Design Stages, Computer-Aided Synthesis and Optimizations, design flow and related problems.
II	Boolean functions and its representations – co-factor, unite, derivatives, consensus and smoothing; tabular representations and Binary Decision Diagram (BDD), OBDD, ROBDD and Bryant's reduction algorithm and ITE algorithm. Hardware abstract models – structures and logic networks, State diagram, data-flow and sequencing graphs, hierarchical sequencing graphs. Compilation and behavioral optimizations.
III	Architectural Synthesis – Circuit description and problem definition, temporal and spatial domain scheduling, synchronization problem. Scheduling algorithms - ASAP and ALAP scheduling algorithms, scheduling under constraints, relative scheduling, list scheduling heuristic. Scheduling in pipelined circuits.
IV	Resource Sharing & Binding in sequencing graphs for resource dominated circuits, sharing of registers and busses; binding variables to registers. Two-level logic optimization principles – definitions and exact logic minimizations. Positional cube notations, functions with multi-valued logic. List-oriented manipulations.
V	Physical Design. Floor planning – goals and objectives. Channel definition, I/O and power planning. Clock Planning. Placement – goals and objectives. Placement algorithms. Iterative improvement algorithms. Simulated Annealing. Timing-driven Placement. Global routing – goals and objectives. Global routing methods. Timing-driven global routing. Detailed Routing – goals and objectives. Left-edge algorithm. Constraints and routing graphs. Channel routing algorithms. Via minimization. Clock routing, power routing, circuit extraction and Design Rule Checking.

Text Books:

1. S.H. Gerez. Algorithms VLSI Design Automation. Wiley India. (Indian edition available.)
2. Michael John Sebastian Smith. Application-Specific Integrated Circuits. Addison-Wesley. (Low-priced edition is available.)
3. G.D. Micheli, Synthesis and optimization of digital circuits, TMH.

References:

1. http://www.fie-conference.org/fie98/papers/1002.pdf
2. S. Sait and H. Youssef. VLSI Physical Design Automation: Theory and Practice.

7CS5A COMPILER CONSTRUCTION

Class: VII Sem. B.Tech.	**Evaluation**
Branch: Computer Engg. **Schedule per Week** **Lectures: 3**	**Examination Time = Three (3) Hours** **Maximum Marks = 100** **[Mid-term (20) & End-term (80)]**

Units	**Contents of the subject**
I	Compiler, Translator, Interpreter definition, Phase of compiler introduction to one pass & Multipass compilers, Bootstrapping, Review of Finite automata lexical analyzer, Input, buffering, Recognition of tokens, Idea about LEX: A lexical analyzer generator, Error handling.
II	Review of CFG Ambiguity of grammars, Introduction to parsing. Bottom up parsing Top down parsing techniques, Shift reduce parsing, Operator precedence parsing, Recursive descent parsing predictive parsers. LL grammars & passers error handling of LL parser. LR parsers, Construction of SLR, Conical LR & LALR parsing tables, parsing with ambiguous grammar. Introduction of automatic parser generator: YACC error handling in LR parsers.
III	Syntax directed definitions; Construction of syntax trees, L-attributed definitions, Top down translation. Specification of a type checker, Intermediate code forms using postfix notation and three address code, Representing TAC using triples and quadruples, Translation of assignment statement. Boolean e xpression and control structures.
IV	Storage organization, Storage allocation, Strategies, Activation records, Accessing local and non local names in a block structured language, Parameters passing, Symbol table organization, Data structures used in symbol tables.
V	Definition of basic block control flow graphs, DAG representation of basic block, Advantages of DAG, Sources of optimization, Loop optimization, Idea about global data flow analysis, Loop invariant computation, Peephole optimization, Issues in design of code generator, A simple code generator, Code generation from DAG.

Text/References:

1. Aho, Ullman and Sethi: Compilers, Addison Wesley.

2. Holub, Compiler Design in C, PHI.

7CS6.1A ADVANCE DATABASE MANGEMENT SYSTEMS

Class: VII Sem. B.Tech.	**Evaluation**
Branch: Computer Engg. **Schedule per Week** **Lectures: 3**	**Examination Time = Three (3) Hours** **Maximum Marks = 100** **[Mid-term (20) & End-term (80)]**

Units	**Contents of the subject**
I	Query Processing and Optimization: Overview of Relational Query Optimization, System Catalog in a Relational DBMS, Alternative Plans, Translating SQL, Queries into Algebra, Estimating the Cost of a Plan, Relational Algebra Equivalences, Enumeration of Alternative Plans. [2]
II	Object Database Systems: Motivating Examples, Structured Data Types, Operations On Structured Data, Encapsulation and ADT's, Inheritance, Objects, OIDs and Reference Types, Database Design for an ORDBMS, ORDBMS Implementation Challenges, ORDBMS, Comparing RDBMS, OODBMS, and ORDBMS.
III	Parallel and Distributed Databases: Architectures for Parallel, Databases, Parallel Query Evaluation, Parallelizing Individual Operations, Parallel Query Optimization, Distributed DBMS Architectures, Storing Data in a Distributed DBMS, Distributed Catalog Management, Distributed Query Processing, Updating Distributed Data, Introduction to Distributed Transactions, Distributed Concurrency Control, Distributed Recovery. [2]
IV	Database Security and Authorization: Introduction to Database Security, Access Control, Discretionary Access Control- Grant and Revoke on Views and Integrity Constraints, Mandatory Access Control- Multilevel Relations and Polyinstantiation, Covert Channels, DoD Security Levels, Additional Issues Related to Security- Role of the Database Administrator, Security in Statistical Databases, Encryption. [2]
V	POSTGES: POSTGRES user interfaces, sql variations and extensions, Transaction Management, Storage and Indexing, Query processing and optimizations, System Architectures. XML: Motivation, Structure of XML data, XML Document Schema, Querying and Transformation, Application Program Interface to XML, Storage of XML Data, XML applications. [2]

Text/References

1. Elmasri R and Navathe SB, Fundamentals of Database Systems, 3rd Edition, Addison Wesley,2000.
2. Connolly T, Begg C and Strachan A, Database Systems, 2nd Edition, Addison Wesley, 1999
3. Ceri Pelagatti , Distributed Database: Principles and System - (McGraw Hill)
4. Simon AR, Strategic Database Technology: Management for the Year 2000, Morgan Kaufmann, 1995
5. A. Silversatz, H. Korth and S. Sudarsan: Database Cocepts 5th edition, Mc-Graw Hills 2005.

7CS6.2A Robotics

Class: Vll Sem. B.Tech.	Evaluation
Branch: Computer Engg. **Schedule per Week** **Lectures: 3**	**Examination Time = Three (3) Hours** **Maximum Marks = 100** **[Mid-term (20) & End-term (80)]**

Unit	Contents
I	Introduction -- brief history, types, classification and usage, Science and Technology of robots, Some useful websites, textbooks and research journals.
II	Elements of robots -- joints, links, actuators, and sensors Position and orientation of a rigid body, Homogeneous transformations, Representation of joints, link representation using D-H parameters, Examples of D-H parameters and link transforms, different kinds of actuators – stepper, DC servo and brushless motors, model of a DC servo motor, Types of transmissions, Purpose of sensors, internal and external sensors, common sensors – encoders, tachometers, strain gauge based force-torque sensors
III	Introduction, Direct and inverse kinematics problems, Examples of kinematics of common serial manipulators, workspace of a serial robot, Inverse kinematics of constrained and redundant robots, Tractrix based approach for fixed and free robots and multi-body systems, simulations and experiments, Solution procedures using theory of elimination, Inverse kinematics solution for the general 6R serial manipulator.
IV	Degrees-of-freedom of parallel mechanisms and manipulators, Active and passive joints, Constraint and loop-closure equations, Direct kinematics problem, Mobility of parallel manipulators, Closed-from and numerical solution, Inverse kinematics of parallel manipulators and mechanisms, Direct kinematics of Gough-Stewart platform.
V	Linear and angular velocity of links, Velocity propagation, Manipulator Jacobians for serial and parallel manipulators, Velocity ellipse and ellipsoids, Singularity analysis for serial and parallel manipulators, Loss and gain of degree of freedom, Statics of serial and parallel manipulators, Statics and force transformation matrix of a Gough-Stewart platform, Singularity analysis and statics.

Text Books :

1. Mittal and Nagrath, Robotics and Control, Tata McGraw-Hill Education, 2003.

2. Fred G. Martin, Robotic Explorations: A Hands On Introduction to Engineering, Pearson Education, 2001.

7CS6.3A Data Compression Techniques

Class: VII Sem. B.Tech.	Evaluation
Branch: Computer Engg. **Schedule per Week** **Lectures: 3**	**Examination Time = Three (3) Hours** **Maximum Marks = 100** **[Mid-term (20) & End-term (80)]**

Units	Contents of the subject
I	Compression Techniques: Lossless, lossy, measure of performance, modeling & coding. Lossless compression: Derivation of average information, data models, uniquely decodable codes with tests, prefix codes, Kraft-Mc Millan inequality. Huffman coding: Algorithms, minimum variance Huffman codes, optimality, length extended codes, adaptive coding, Rice codes, using Huffman codes for lossless image compression.
II	Arithmetic coding with application to lossless compression. Dictionary Techniques: LZ77, LZ78, LZW Predictive coding: Burrows-Wheeler Transform and move-to-front coding, JPEG-LS Facsimile Encoding: Run length, T.4 and T.6
III	Lossy coding- Mathematical preliminaries: Distortion criteria, conditional entropy, average mutual information, differential entropy, rate distortion theory, probability and linear system models. Scalar quantization: The quantization problem, uniform quantizer, Forward adaptive quantization, non-uniform quantization-Formal adopting quantization, companded Quantization Vector quantization: Introduction, advantages, The Linde-Ruzo-Grey algorithm, lattice vector quantization.
IV	Differential encoding – Introduction, Basic algorithm, Adaptive DPCM, Delta modulation, speech and image coding using delta modulation. Sampling in frequency and time domain, z-transform, DCT, DST, DWHT, quantization and coding of transform coefficient.
V	Sub band coding: Introduction, Filters, Basic algorithm, Design of Filter banks, G.722, MPEG. Wavelet based compression: Introduction, wavelets multi-resolution analysis and the scaling function implementation using filters.

Text Books & References:

1. Sayood K: Introduction to Data Compression: ELSEVIER 2005.

7CS7A Web Development Lab

Class: VII Sem. B.Tech.	Evaluation
Branch: Computer Engg. **Schedule per Week** **Practical Hrs: 2**	**Examination Time = Three (3) Hours** **Maximum Marks = 50** **[Mid-term (60) & End-term (40)]**

S. No.	List of Experiment
1	. Creation of HTML Files
2	Working with Client Side Scripting : VBScript, JavaScript
3	Configuration of web servers: Apache Web Server, Internet Information Server (IIS)
4	Working with ActiveX Controls in web documents
5	Experiments in Java Server Pages: Implementing MVC Architecture using Servlets, Data Access Programming (using ADO), Session and Application objects, File System Management
6	Working with other Server Side Scripting: Active Server Pages, Java Servlets, PHP
7	Experiments in Ajax Programming
8	Developing Web Services
9	Developing any E-commerce application (Mini Project)
10	Application Development in cloud computing Environment
11	Experiment Using Open Source Tool e.g. ANEKA

7CS8A VLSI PHYSICAL DESIGN LAB

Class: VII Sem. B.Tech.	**Evaluation**
Branch: Computer Engg. **Schedule per Week** **Practical Hrs : 3**	**Examination Time = Four (4) Hours** **Maximum Marks = 75** **[Sessional/Mid-term (45) & End-term (30)]**

VLSI Physical Design Automation is essentially the research, development and productization of algorithms and data structures related to the physical design process. The objective is to investigate optimal arrangements of devices on a plane (or in three dimensions) and efficient interconnection schemes between these devices to obtain the desired functionality and performance. Since space on a wafer is very expensive real estate, algorithms must use the space very efficiently to lower costs and improve yield. In addition, the arrangement of devices plays a key role in determining the performance of a chip. Algorithms for physical design must also ensure that the layout generated abides by all the rules required by the fabrication process. Fabrication rules establish the tolerance limits of the fabrication process. Finally, algorithms must be efficient and should be able to handle very large designs. Efficient algorithms not only lead to fast turn-around time, but also permit designers to make iterative improvements to the layouts. The VLSI physical design process manipulates very simple geometric objects, such as polygons and lines. As a result, physical design algorithms tend to be very intuitive in nature, and have significant overlap with graph algorithms and combinatorial optimization algorithms. In view of this observation, many consider physical design automation the study of graph theoretic and combinatorial algorithms for manipulation of geometric objects in two and three dimensions. However, a pure geometric point of view ignores the electrical (both digital and analog) aspect of the physical design problem. In a VLSI circuit, polygons and lines have inter-related electrical properties, which exhibit a very complex behavior and depend on a host of variables. Therefore, it is necessary to keep the electrical aspects of the geometric objects in perspective while developing algorithms for VLSI physical design automation. With the introduction of Very Deep Sub-Micron (VDSM), which provides very small features and allows dramatic increases in the clock frequency, the effect of electrical parameters on physical design will play a more dominant role in the design and development of new algorithms.

(Source: Algorithms For VLSI Physical Design Automation, by Naveed A. Sherwani).

The exercise should be such that the above objectives are met.

Automation tools such as Synopsis/ Cadence are available in the area. However, to begin, the students shall be assigned exercises on route optimization, placement & floor planning. Small circuits may be taken & algorithms implemented. At a later stage, the students may use tools and design more complex circuits.

7CS9A COMPILER DESIGN LAB

Class: VII Sem. B.Tech.	**Evaluation**
Branch: Computer Engg. **Schedule per Week** **Practical Hrs : 3**	**Examination Time = Four (4) Hours** **Maximum Marks = 75** **[Sessional/Mid-term (60) & End-term (40)]**

Objectives: At the end of the semester, the students should have clearly understood and implemented the following:

1. Develop an in depth understanding of system programming concept. Lexical analysis, syntax analysis, semantics analysis, code optimization, code generation. Language specification and processing

2. Develop an Understanding of Scanning by using concept of Finite state automaton. Parse tree and syntax tree, Top down parsing (recursive decent parsing, LL (1) parser) Bottom up parsing (operator precedence parsing) .Managing symbol table, opcode table, literal table, pool table

3. Develop an Understanding of Intermediate code form: Three address code, Polish notation (Postfix strings)

4. Develop an Understanding of Allocation data structure. Heaps

5. Develop an Understanding about Language processor development tools: LEX, YACC. Language processing activities (Program generation and execution)

It is expected that each laboratory assignments to given to the students with an aim to In order to achieve the above objectives

Indicative List of exercises:

1. Write grammar for a fictitious language and create a lexical analyzer for the same.
2. Develop a lexical analyzer to recognize a few patterns in PASCAL and C (ex: identifiers, constants, comments, operators etc.)
3. Write a program to parse using Brute force technique of Top down parsing
4. Develop on LL (1) parser (Construct parse table also).
5. Develop an operator precedence parser (Construct parse table also)
6. Develop a recursive descent parser
7. Write a program for generating for various intermediate code forms

   i) Three address code ii) Polish notation
8. Write a program to simulate Heap storage allocation strategy
9. Generate Lexical analyzer using LEX
10. Generate YACC specification for a few syntactic categories
11. Given any intermediate code form implement code optimization techniques

Reference

V.V Das, Compiler Design using FLEX and YACC, PHI

8CS1A MOBILE COMPUTING (Common to CS & IT)

Class: VIII Sem. B.Tech.	**Evaluation**
Branch: Computer Engg. **Schedule per Week** **Lectures: 3**	**Examination Time = Three (3) Hours** **Maximum Marks = 100** **[Mid-term (20) & End-term (80)]**

Units	**Contents of the subject**
I	Mobile computing: Definitions, adaptability issues (transparency, Environmental Constraints, application aware adaptation), mechanisms for adaptation and incorporating adaptations. Mobility management: mobility management, location management principle and techniques, PCS location management Scheme.
II	Data dissemination and management: challenges, Data dissemination, bandwidth allocation for publishing, broadcast disk scheduling, mobile cache maintenance schemes, Mobile Web Caching. Introduction to mobile middleware.
III	Middleware for application development: adaptation, Mobile agents. Service Discovery Middleware: Service Discovery & standardization Methods (universally Unique Identifiers, Textual Description & using interfaces), unicast Discovery, Multicast Discovery & advertisement, service catalogs, Garbage Collection, Eventing.
IV	Mobile IP, Mobile TCP, Database systems in mobile environments, World Wide Web and mobility
V	Ad Hoc networks, localization, MAC issues, Routing protocols, global state routing (GSR), Destination sequenced distance vector routing (DSDV), Dynamic source routing (DSR), Ad Hoc on demand distance vector routing (AODV), Temporary ordered routing algorithm (TORA), QoS in Ad Hoc Networks, applications.

Text/References:

1. Frank Adelstein, Sandeep Gupta, Golden Richard III, Loren Schwiebert, Fundamentals of Mobile and Pervasive Computing, TMH.
2. Principles of mobile computing Hansmann & Merk., Springer
3. Mobile communications Jochen Schiller , Pearson
4. 802.11 wireless networks Matthew S.Gast, O'REILLY.
5. Wireless LANs: Davis & McGuffin, McGraw Hill
6. Mobile Communications Handbook by Jerry D. Gybson
7. Mobile Communications Handbook by R

8CS2A Digital Image Processing (Common to CS & IT)

Class: VIII Sem. B.Tech.	Evaluation
Branch: Computer Engg. **Schedule per Week** **Lectures: 3**	**Examination Time = Three (3) Hours** **Maximum Marks = 100** **[Mid-term (20) & End-term (80)]**

Units	Contents of the subject
I	**Introduction to Image Processing:** Digital Image representation, Sampling & Quantization, Steps in image Processing, Image acquisition, color image representation
II	**Image Transformation & Filtering:** Intensity transform functions, histogram processing, Spatial filtering, Fourier transforms and its properties, frequency domain filters, colour models, Pseudo colouring, colour transforms, Basics of Wavelet Transforms
III	**Image Restoration:** Image degradation and restoration process, Noise Models, Noise Filters, degradation function, Inverse Filtering, Homomorphism Filtering
IV	**Image Compression:** Coding redundancy, Interpixel redundancy, Psychovisual redundancy, Huffman Coding, Arithmetic coding, Lossy compression techniques, JPEG Compression
V	**Image Segmentation & Representation:** Point, Line and Edge Detection, Thresholding, Edge and Boundary linking, Hough transforms, Region Based Segmentation, Boundary representation, Boundary Descriptors, Regional

References:

1. Gonzalez and Woods: Digital Image Processing ISDN 0-201-600- 781, Addison Wesley 1992.

Boyle and Thomas: Computer Vision - A First Gurse 2nd Edition, ISBN 0-632-028-67X, Blackwell

Science 1995.

2. Gonzalez and Woods: Digital Image Processing ISDN 0-201-600- 781, Addison Wesley 1992.

3. Pakhera Malay K: Digital Image Processing and Pattern Recogination, PHI.

4. Trucco&Verri: Introductory Techniques for 3-D Computer Vision, Prentice Hall, Latest Edition

5. Low: Introductory Computer Vision and Image Processing, McGraw-Hill 1991, ISBN 0-07-707403-3.

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8CS3A DISTRIBUTED SYSTEMS

Class: VIII Sem. B.Tech.	**Evaluation**
Branch: Computer Engg. **Schedule per Week** **Lectures: 3**	**Examination Time = Three (3) Hours** **Maximum Marks = 100** **[Mid-term (20) & End-term (80)]**

Units	**Contents of the subject**
I	Distributed Systems: Features of distributed systems, nodes of a distributed system, Distributed computation paradigms, Model of distributed systems, Types of Operating systems: Centralized Operating System, Network Operating Systems, Distributed Operating Systems and Cooperative Autonomous Systems, design issues in distributed operating systems. Systems Concepts and Architectures: Goals, Transparency, Services, Architecture Models, Distributed Computing Environment (DCE).[1.2] Theoretical issues in distributed systems: Notions of time and state, states and events in a distributed system, time, clocks and event precedence, recording the state of distributed systems.[2]
II	Concurrent Processes and Programming: Processes and Threads, Graph Models for Process Representation, Client/Server Model, Time Services, Language Mechanisms for Synchronization, Object Model Resource Servers, Characteristics of Concurrent Programming Languages (Language not included).[1] Inter-process Communication and Coordination: Message Passing, Request/Reply and Transaction Communication, Name and Directory services, RPC and RMI case studies.[1]
III	Distributed Process Scheduling: A System Performance Model, Static Process Scheduling with Communication, Dynamic Load Sharing and Balancing, Distributed Process Implementation.[1] Distributed File Systems: Transparencies and Characteristics of DFS, DFS Design and implementation, Transaction Service and Concurrency Control, Data and File Replication.[1,2] Case studies: Sun network file systems, General Parallel file System and Window's file systems. Andrew and Coda File Systems [2,3]
IV	Distributed Shared Memory: Non-Uniform Memory Access Architectures, Memory Consistency Models, Multiprocessor Cache Systems, Distributed Shared Memory, Implementation of DSM systems.[1] Models of Distributed Computation: Preliminaries, Causality, Distributed Snapshots, Modeling a Distributed Computation, Failures in a Distributed System, Distributed Mutual Exclusion, Election, Distributed Deadlock handling, Distributed termination detection. [1]
V	Distributed Agreement: Concept of Faults, failure and recovery, Byzantine Faults, Adversaries, Byzantine Agreement, Impossibility of Consensus and Randomized Distributed Agreement.[1] Replicated Data Management: concepts and issues, Database Techniques, Atomic Multicast, and Update Propagation.[1] CORBA case study: Introduction, Architecture, CORBA RMI, CORBA Services.[3]

Text Books:

1. Distributed operating systems and algorithm analysis by Randy Chow and T. Johnson, Pearson
2. Operating Systems A concept based approach by DM Dhamdhere, TMH
3. Distributed Systems- concepts and Design, Coulouris G., Dollimore J, and Kindberg T., Pearson

8CS4.1A Hardware Testing and Fault Tolerance

Class: VIII Sem. B.Tech.	**Evaluation**
Branch: Computer Engg. **Schedule per Week** **Lectures: 3**	**Examination Time = Three (3) Hours** **Maximum Marks = 100** **[Mid-term (20) & End-term (80)]**

Units	**Contents of the subject**
I	Overview of hardware testing. Reliability and Testing, Difference between Verification and Testing, Concepts of fault models, test pattern generation and fault coverage. Types of tests – exhaustive testing, pseudo-exhaustive testing, pseudo-random testing, and deterministic testing. Test Application. Design for Test. Testing Economics. Defects, Failures and Faults. How are physical defects modeled as faults. Stuck-at faults, Single stuck-at-faults multiple stuck-at faults, bridging faults, delay faults, transient faults.
II	Relation between VLSI Design and Testing. a) Design Representation for the purpose of testing – Representation in the form of mathematical equations, tabular format, graphs, Binary Decision Diagrams, Netlists, or HDL descriptions. b) Recap of VLSI Design Flow and where testing fits in the flow. Importance of Simulation and Fault Simulation. Compiled and event-driven simulation. Parallel and deductive fault simulation. Using fault simulation to estimate fault coverage and building a fault dictionary
III	Combinational Test Pattern Generation. D-algorithm. Critical Path Tracking. PODEM algorithm for test generation. Testing sequential circuits. Functional and deterministic ATPG for sequential circuits and the associated challenges. Motivation for Design for Testability. Test Points, Partitioning for Testability. Scan Testing. Scan Architectures. Cost of Scan Testing. Boundary Scan Testing. Board-level testing. Boundary-scan Architecture and various modes of operation.
IV	a) Built-in Self Test. Pseudo-random test generation. Response Compaction. Random pattern-resistant faults. BIST architectures – Circular BIST, BILBO, STUMPS. b) Testing of Memories – Fault models, Functional tests for memories, Memory BIST. c) Testing of microprocessors.
V	Hardware fault tolerance. Failure Rate, Reliability, Mean Time to Failure. Different kinds of redundancy schemes for fault-tolerance (Space, Time, and Information Redundancy). N-modular Redundancy. Watch Dog Processors, Byzantine Failures. Information Redundancy – parity codes, checksums, m-of-n codes. RAID architectures for disk storage systems. Fault tolerance in interconnection networks. Fault-tolerant routing techniques.

Text Book:

1. Samiha Mourad and Yervant Zorian. Principles of Electronic Systems. Wiley Student Editon. [Available in Indian Edition].
2. Koren and C. Mani Krishna. Fault-Tolerant Systems. Elsevier. (Indian Edition Available.)

Text/References:

1. Abramovici, M., Breuer, M. A. and Friedman, A. D. Digital systems testing and testable design. IEEE press (Indian edition available through Jayco Publishing house), 2001.2. Essentials of Electronic Testing for Digital, Memory and Mixed-Signal VLSI Circuits by Bushnell and Agrawal, Springer, 2000.

8CS4.2A REAL TIME SYSTEMS

Class: VIII Sem. B.Tech.	Evaluation
Branch: Computer Engg. Schedule per Week Lectures: 3	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the subject
I	Introduction: Definition, Typical Real Time Applications, concept of tasks, types of tasks and real time systems, block diagram of RTS, and tasks parameters -Release Times, execution time, period, Deadlines, and Timing Constraints etc. RTS requirements.
II	Reference Models for Real Time Systems: processors and Resources, Temporal Parameters of Real-Time Workload, Periodic and Aperiodic Task Model, Precedence Constrains and Data Dependency, Other Types of Dependencies, Functional Parameters, Resource Parameters. Real Time Scheduling: classification of Real Time Scheduling, scheduling criteria, performance metrics, schedulability analysis, Introduction to Clock Driven scheduling, Weighted Round Robin Approach and Priority Driven Approach. Dynamic Versus Static systems, Offline Versus Online Scheduling.
III	Periodic tasks scheduling: Clock Driven Scheduling – definition, notations and assumption, scheduler concepts, general scheduling structure, cyclic executives. Priority Driven Scheduling; notations and assumption, fixed priority verses dynamic priority, fixed priority scheduling algorithms (RM and DM) and their schedulability analysis, concept of schedulability tests – Inexact and exact schedulability tests for RM and DM, Optimality of the RM and DM algorithms, practical factors.
IV	Aperiodic task scheduling; assumption and approaches, server based and non-server based fixed priority scheduling algorithms – polling server, deferrable server , simple sporadic server, priority exchange, extended priority exchange, slack stealing. Introduction to scheduling of flexible computations –flexible applications, imprecise computation model and firm deadline model.
V	Resources Access Control: Assumptions on Resources and their usage, Effect of Resource Contention and Resource Access Control (RAC), Non-preemptive Critical Sections, priority inversion problem, need of new resource synchronization primitives/protocols for RTS, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority-Ceiling Protocol, Use of Priority- Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Unit Resources, Controlling Concurrent Accesses to Data Objects.

Text & References:

1. J.W.S.Liu: Real-Time Systems, Pearson Education Asia
2. P.D.Laurence, K.Mauch: Real-time Microcomputer System Design, An Introduction, McGraw Hill
3. C.M. Krisna & K. G. Shim- Real time systems- TMH

8CS4.3A AInformation Retrieval (Common to CS & IT)

Class: VIII Sem. B.Tech.	Evaluation
Branch: Computer Engg. **Schedule per Week** **Lectures: 3**	**Examination Time = Three (3) Hours** **Maximum Marks = 100** **[Mid-term (20) & End-term (80)]**

Units	Contents of the subject
I	Knowledge Representation: Knowledge representation, Basics of Prepositional logic, Predicate logic, reasoning using first order logic, unification, forward chaining, backward chaining, resolution Production rules, frames, semantic networks scripts.
II	Ontology Development: Description logic-taxonomies, Topic maps Ontology, Definition expressing ontology, logically ontology representations, – XML, RDF, RDFS, OWL, OIL, ontology development for specific domain, ontology engineering, Semantic web services.
III	Information Retrieval Modeling: Information retrieval, taxonomy, formal characterization, classic information retrieval, set theoretic model, algebraic model, probabilistic model, structured text, retrieval models, models for browsing, retrieval performance evaluation, keyword based querying, pattern matching, structural queries, query operations.
IV	Text and Multimedia Languages and Properties: Introduction, metadata, markup languages, multimedia. Text operations: document preprocessing, document clustering text Compressionbasic concepts - statistical methods. Indexing and searching: inverted files, suffix trees, signature file, Boolean queries, sequential searching, pattern matching.
V	Recent Trends in IR: Parallel and distributed IR, multimedia IR, data modeling, query languages, A generic Multimedia indexing Approach, one dimensional time series, two dimensional color images, Automatic feature extraction. Web Searching, Characterizing the Web, Search Engines, Browsing, Meta searchers, Searching using hyperlinks

TEXT BOOKS :

1. Stuart Russell and Peter Norvig, “Artificial Intelligence – A Modern Approach”, Pearson Education, Second edition, 2003. (UNIT I)

2. Michael C. Daconta, Leo J. Obart and Kevin J. Smith,”Semantic Web – A Guide to the Future of XML, Web Services and Knowledge Management”, Wiley Publishers, 2003 (UNIT II)

3. Ricardo Baeza-Yates, BerthierRibeiro-Neto, “Modern Information Retrieval”, Addison Wesley, 1999. (UNITs III, IV & V)

REFERENCES

1. Elain Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw-Hill, Third edition, 2003

2. Christopher D. Manning, PrabhakarRaghavan and HinrichSchutze, “Introduction to Information Retrieval”, Cambridge University Press, 2008.

8CS5A UNIX NETWORK PROGRAMMING & SIMULATION LAB

Class: VIII Sem. B.Tech.	**Evaluation**
Branch: Computer Engg. **Schedule per Week** **Practical Hrs.: 3**	**Examination Time = Four (4) Hours** **Maximum Marks = 100** **[Sessional/Mid-term (60) & End-term (40)]**

Objectives:

At the end of course, the students should be able to

- Understand various distributions of Unix viz. BSD, POSIX etc.
- Write client/server applications involving unix sockets involving TCP or UDP involving iterative or concurrent server.
- Understand IPV4 & IPV6 interoperability issues
- Use fork( ) system call.
- Understand the network simulator NS2 and Simulate routing algorithm on NS2 (Available on http://www.isi.edu/nsnam/ns/).

Suggested Platform: For Socket Programming- Linux, For NS2 Any of Microsoft Windows or Linux (In case of Microsoft, Virtual environment cygwin will also be required).

Suggested Exercises

S.No.	**List of Experiments**
1.	Write two programs in C: hello_client and hello_server • The server listens for, and accepts, a single TCP connection; it reads all the data it can from that connection, and prints it to the screen; then it closes the connection • The client connects to the server, sends the string "Hello, world!", then closes the connection
2.	Write an Echo_Client and Echo_server using TCP to estimate the round trip time from client to the server. The server should be such that it can accept multiple connections at any given time.
3.	Repeat Exercises 1 & 2 for UDP.
4.	Repeat Exercise 2 with multiplexed I/O operations
5.	Simulate Bellman-Ford Routing algorithm in NS2

References:

- **Stevens, Unix Network Programming, Vol-I**

8CS6A FPGA LAB.

Class: VIII Sem. B.Tech.	**Evaluation**
Branch: Computer Engg. **Schedule per Week** **Practical Hrs : 3**	**Examination Time = Four (4) Hours** **Maximum Marks = 100** **[Sessional/Mid-term (60) & End-term (40)]**

S. No.	**List of Experiments**
1.	Fundamental Theory Introduction to DSP architectures and programming Sampling Theory, Analog-to-Digital Converter (ADC), Digital-to-Analog Converter (DAC), and Quantization; Decimation, Interpolation, Convolution, Simple Moving Average; Periodic Signals and harmonics; Fourier Transform (DFT/FFT), Spectral Analysis, and time/spectrum representations; FIR and IIR Filters;
2.	Design (Simulation) using MATLAB/ Simulink Simulate the lab exercises using MATLAB/Simulink
3.	Implementation using pure DSP, pure FPGA and Hybrid DSP/FPGA platforms Digital Communications: On-Off- Keying (OOK), BPSK modulation, and a simple transceiver design Adaptive Filtering: Echo/Noise Cancellation, Least Mean Square (LMS) algorithm (2 weeks) Wireless Communications: Channel coding/decoding, Equalization, Simple Detection Algorithm, OFDM Speech Processing: Prediction Algorithms, Speech Classification and Synthesis

8CS7A Digital Image Processing lab(Common to Comp. Engg. & Info. Tech)

Class: VIII Sem. B.Tech.	Evaluation
Branch: Computer Engg. **Schedule per Week** **Practical Hrs: 2**	**Examination Time = Three (3) Hours** **Maximum Marks = 50** **[Mid-term (60) & End-term (40)]**

S. No.	List of Experiment
1	Color image segmentation algorithm development
2	Wavelet/vector quantization compression
3	Deformable templates applied to skin tumor border finding
4	Helicopter image enhancement
5	High-speed film image enhancement
6	Computer vision for skin tumor image evaluation
7	New Border Images

Scheme and Syllabus

Rajasthan Technical University, Kota

B. Tech. in Electronics & Communication Engineering

(Session 2019-20)

Scheme of
UNDERGRADUATE DEGREE COURSE
in
Electronics & Communication Engineering



Rajasthan Technical University, Kota

Effective from session: 2018 – 2019

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Teaching & Examination Scheme
B.Tech. : Electronics & Communication Engineering
2nd Year - III Semester

SN	Category	Course		Contact hrs/week			Marks				Cr
		Code	Title	L	T	P	Exm Hrs	IA	ETE	Total	
THEORY											
1	BSC	3EC2-01	Advanced Engineering Mathematics-I	3	0	0	3	30	120	**150**	**3**
2	HSMC	3EC1-02/ 3EC1-03	Technical Communication/Managerial Economics and Financial Accounting	2	0	0	2	20	80	**100**	**2**
3	PCC	3EC4-04	Digital System Design	3	0	0	3	30	120	**150**	**3**
4		3EC4-05	Signal & Systems	3	0	0	3	30	120	**150**	**3**
5		3EC4-06	Network Theory	3	1	0	3	40	160	**200**	**4**
6		3EC4-07	Electronics Devices	3	1	0	3	40	160	**200**	**4**
			Sub Total	17	2	0		190	760	**950**	**19**
PRACTICAL & SESSIONAL											
8	PCC	3EC4-21	Electronics Devices Lab	0	0	2		30	20	**50**	**1**
9		3EC4-22	Digital System Design Lab	0	0	2		30	20	**50**	**1**
10		3EC4-23	Signal Processing Lab	0	0	2		30	20	**50**	**1**
11	ESC	3EC3-24	Computer Programming Lab-I	0	0	2		30	20	**50**	**1**
13	PSIT	3EC7-30	Industrial Training	0	0	1				**50**	**1**
14	SODECA	3EC8-00	Social Outreach, Discipline & Extra Curricular Activities							**25**	**0.5**
			Sub- Total	0	0	9		120	80	**275**	**5.5**
			TOTAL OF III SEMESTER	17	2	9		310	840	**1225**	**24.5**

L: *Lecture,* ***T:*** *Tutorial,* ***P:*** *Practical,* ***Cr:*** *Credits*

ETE: *End Term Exam,* ***IA:*** *Internal Assessment*

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

Scheme of
UNDERGRADUATE DEGREE COURSE
in
Electronics & Communication Engineering



Rajasthan Technical University, Kota

Effective from session: 2018 – 2019

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Teaching & Examination Scheme
B.Tech. : Electronics & Communication Engineering
2nd Year - IV Semester

SN	Category	Course		Contact hrs/week			Marks				Cr
		Code	Title	L	T	P	Exm Hrs	IA	ETE	Total	
THEORY											
1	BSC	4EC2-01	Advanced Engineering Mathematics-II	3	0	0	3	30	120	**150**	**3**
2	HSMC	4EC1-03/ 4EC1-02	Managerial Economics and Financial Accounting/ Technical Communication	2	0	0	2	20	80	**100**	**2**
3	PCC	4EC4-04	Analog Circuits	3	0	0	3	30	120	**150**	**3**
4		4EC4-05	Microcontrollers	3	0	0	3	30	120	**150**	**3**
5	ESC	4EC3-06	Electronics Measurement & Instrumentation	3	0	0	3	30	120	**150**	**3**
6	PCC	4EC4-07	Analog and Digital Communication	3	0	0	3	30	120	**150**	**3**
			Sub Total	17	0	0		170	680	**850**	**17**
PRACTICAL & SESSIONAL											
8	PCC	4EC4-21	Analog and Digital Communication Lab	0	0	3		45	30	**75**	**1.5**
9		4EC4-22	Analog Circuits Lab	0	0	3		45	30	**75**	**1.5**
10		4EC4-23	Microcontrollers Lab	0	0	3		45	30	**75**	**1.5**
11		4EC4-24	Electronics Measurement & Instrumentation Lab	0	0	3		45	30	**75**	**1.5**
12	SODECA	4EC18-00	Social Outreach, Discipline & Extra Curricular Activities							**25**	**0.5**
			Sub- Total	0	0	12		180	120	**325**	**6.5**
			TOTAL OF IV SEMEESTER	17	0	12		350	800	**1175**	**23.5**

L: *Lecture,* ***T:*** *Tutorial,* ***P:*** *Practical,* ***Cr:*** *Credits*

ETE: *End Term Exam,* ***IA:*** *Internal Assessment*

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

Scheme of

UNDERGRADUATE DEGREE COURSE

B.Tech. V & VI Semester

Electronics & Communication Engineering



Rajasthan Technical University, Kota

Effective from session: 2019-20

Teaching & Examination Scheme
B.Tech. : Electronics & Communication Engineering
3rd Year –V Semester

SN	Category	Course Code	Course Title	Contact hrs/week L	T	P	Marks Exm Hrs	IA	ETE	Total	Cr
THEORY											
1	ESC	5EC 3-01	Computer Architecture	2	0	0	2	20	80	**100**	**2**
2	PCC/ PEC	5EC 4-02	Electromagnetics Waves	3	0	0	3	30	120	**150**	**3**
3		5EC 4-03	Control system	3	0	0	3	30	120	**150**	**3**
4		5EC 4-04	Digital Signal Processing	3	0	0	3	30	120	**150**	**3**
5		5EC 4-05	Microwave Theory & Techniques	3	0	0	3	30	120	**150**	**3**
6		Professional Elective I (any one)		2	0	0	2	20	80	**100**	**2**
		5EC 5-11	Bio-Medical Electronics								
		5EC 5-12	Embedded Systems								
		5EC 5-13	Probability Theory & Stochastic Process								
		5EC 5-14	Satellite Communication								
		Sub Total		**16**	**0**	**0**		**160**	**640**	**800**	**16**
PRACTICAL & SESSIONAL											
7	PCC	5EC 4-21	RF Simulation Lab	0	0	3	2	45	30	**75**	**1.5**
8		5EC 4-22	Digital Signal Processing Lab	0	0	3	2	45	30	**75**	**1.5**
9		5EC 4-23	Microwave Lab	0	0	2	2	30	20	**50**	**1**
10	PSIT	5EC 7-30	Industrial Training	0	0	1		75	50	**125**	**2.5**
11	SODECA	5EC 8-00	Social Outreach, Discipline & Extra Curricular Activities	0	0	0			25	**25**	**0.5**
		Sub- Total		**0**	**0**	**9**		**195**	**155**	**350**	**7**
		TOTAL OF V SEMESTER		**16**	**0**	**9**		**355**	**795**	**1150**	**23**

L: Lecture, **T:** Tutorial, **P:** Practical, **Cr:** Credits

ETE: End Term Exam, **IA:** Internal Assessment

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Teaching & Examination Scheme
B. Tech.: Electronics & Communication Engineering
3rd Year – VI Semester

THEORY												
SN	Category	Course		Contact hrs/week			Marks				Cr
		Code	Title	L	T	P	Exm Hrs	IA	ETE	Total	
1	ESC	6EC 3-01	Power Electronics	2	0	0	2	20	80	**100**	**2**
2	PCC/ PEC	6EC 4-02	Computer Network	3	0	0	3	30	120	**150**	**3**
3		6EC 4-03	Fiber Optics Communications	3	0	0	3	30	120	**150**	**3**
4		6EC 4-04	Antennas and Propagation	3	0	0	3	30	120	**150**	**3**
5		6EC 4-05	Information theory and coding	3	0	0	3	30	120	**150**	**3**
6		Professional Elective II (any one)		3	0	0	3	30	120	**150**	**3**
		6EC 5-11	Introduction to MEMS								
		6EC 5-12	Nano Electronics								
		6EC 5-13	Neural Network And Fuzzy Logic Control								
		6EC 5-14	High Speed Electronics								
		Sub Total		**17**	**0**	**0**		**170**	**680**	**850**	**17**
PRACTICAL & SESSIONAL											
7	PCC	6EC 4-21	Computer Network Lab	0	0	4	2	60	40	**100**	**2**
8		6EC 4-22	Antenna and wave propagation Lab	0	0	2	2	30	20	**50**	**1**
9		6EC 4-23	Electronics Design Lab	0	0	4	2	60	40	**100**	**2**
10		6EC 4-24	Power Electronics Lab	0	0	2	2	30	20	**50**	**1**
11	SODECA	6EC 8-00	Social Outreach, Discipline & Extra Curricular Activities	0	0	0			25	**25**	**0.5**
		Sub- Total		**0**	**0**	**12**		**180**	**145**	**325**	**6.5**
		TOTAL OF VI SEMESTER		**17**	**0**	**12**		**350**	**825**	**1175**	**23.5**

L: Lecture, **T:** Tutorial, **P:** Practical, **Cr:** Credits

ETE: End Term Exam, **IA:** Internal Assessment

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

BRANCH CODE	EC						
Course Code	ELECTRONICS AND COMMUNICATION ENGG		Hrs. / Week				
SEMESTER - VII		L	T	P	IA	Exam	Total
7EC1A	Antenna & Wave Propagation	3	0		20	80	100
7EC2A	Digital Signal Processing	3	1		20	80	100
7EC3A	Digital Image Processing	3	1		20	80	100
7EC4A	Wireless Communication	3	0		20	80	100
7EC5A	VLSI Design	3	0		20	80	100
7EC6A	Elective (any one of the following)						
7EC6.1A	Advanced Microprocessors	3	0		20	80	100
7EC6.2A	Artificial Intelligence and Expert Systems						
7EC6.3A	VHDL						
	Total						600
7EC7A	Signal & Image Processing Lab			3	60	40	100
7EC8A	Wireless Communication Lab			3	60	40	100
7EC9A	Practical Training & Industrial Visit			2	60	40	100
7EC10A	Project-I			2	50		50
7ECDCA	Discipline & Extra Curricular Activity						50
	Total						400
	Grand Total	18	2	10			1000

BRANCH CODE	EC						
Course Code	ELECTRONICS AND COMMUNICATION ENGG		Hrs. / Week				
SEMESTER - VIII		L	T	P	IA	Exam	Total
8EC1A	IC Technology	3	0		20	80	100
8EC2A	Radar & TV Engineering	3	1		20	80	100
8EC3A	MEMS and Nanotechnology	3	1		20	80	100
8EC4.1A	Computer Networks	3	0		20	80	100
8EC4.2A	Operating Systems						
8EC4.3A	Microcontroller and Embedded Systems						
	Total						400
8EC5A	RF Fabrication Lab			3	60	40	100
8EC6A	Industrial Economics & Management.			2	30	20	50
8EC7A	VLSI & Optical Fiber Lab			3	60	40	100
8EC8A	Project -II			4	120	80	200
8EC9A	Seminar			2	60	40	100
8ECDCA	Discipline & Extra Curricular Activity						50
	Total						600
	Grand Total	12	2	14			1000

Syllabus of

UNDERGRADUATE DEGREE COURSE

Electronics & Communication Engineering

Rajasthan Technical University, Kota

Effective from session: 2018 – 2019

3EC2-01: Advance Engineering Mathematics-I

3 Credits **Max. Marks: 150 (IA:30, ETE:120)**
3L:0T:0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Numerical Methods – 1:** Finite differences, Relation between operators, Interpolation using Newton's forward and backward difference formulae. Gauss's forward and backward interpolation formulae. Stirling's Formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae. Numerical Differentiation, Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules.	**10**
2	**Numerical Methods – 2:** Numerical solution of ordinary differential equations: Taylor's series, Euler and modified Euler's methods. Runge- Kutta method of fourth order for solving first and second order equations. Milne's and Adam's predicator-corrector methods. Solution of polynomial and transcendental equations-Bisection method, Newton-Raphson method and Regula-Falsi method.	**8**
3	**Laplace Transform:** Definition and existence of Laplace transform, Properties of Laplace Transform and formulae, Unit Step function, Dirac Delta function, Heaviside function, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem. Evaluation of integrals by Laplace transform, solving ODEs by Laplace transforms method.	**10**
4	**Fourier Transform:** Fourier Complex, Sine and Cosine transform, properties and formulae, inverse Fourier transforms, Convolution theorem, application of Fourier transforms to partial ordinary differential equation (One dimensional heat and wave equations only).	**7**
5	**Z-Transform:** Definition, properties and formulae, Convolution theorem, inverse Z-transform, application of Z-transform to difference equation.	**5**
	Total	**40**

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

3EC1-02/4EC1-02: Technical Communication

2 Credit **Max. Marks: 100 (IA:20, ETE:80)**
2L:0T:0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	**Introduction to Technical Communication-** Definition of technical communication, Aspects of technical communication, forms of technical communication, importance of technical communication, technical communication skills (Listening, speaking, writing, reading writing), linguistic ability, style in technical communication.	4
2	**Comprehension of Technical Materials/Texts and Information Design & development-** Reading of technical texts, Readingand comprehending instructions and technical manuals, Interpreting and summarizing technical texts, Note-making. Introduction of different kinds of technical documents, Information collection, factors affecting information and document design, Strategies for organization, Information design and writing for print and online media.	6
3	**Technical Writing, Grammar and Editing**- Technical writing process, forms of technical discourse, Writing, drafts and revising, Basics of grammar, common error in writing and speaking, Study of advanced grammar, Editing strategies to achieve appropriate technical style, Introduction to advanced technical communication. Planning, drafting and writing Official Notes, Letters, E-mail, Resume, Job Application, Minutes of Meetings.	8
4	**Advanced Technical Writing**- Technical Reports, types of technical reports, Characteristics and formats and structure of technical reports. Technical Project Proposals, types of technical proposals, Characteristics and formats and structure of technical proposals. Technical Articles, types of technical articles, Writing strategies, structure and formats of technical articles.	8
	Total	**26**

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3EC1-03/4EC1-03: Managerial Economics And Financial Accounting

2 Credit **Max. Marks: 100 (IA:20, ETE:80)**

2L:0T:0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	Basic economic concepts- Meaning, nature and scope of economics, deductive vs inductive methods, static and dynamics, Economic problems: scarcity and choice, circular flow of economic activity, national income-concepts and measurement.	4
2	Demand and Supply analysis- Demand-types of demand, determinants of demand, demand function, elasticity of demand, demand forecasting –purpose, determinants and methods, Supply-determinants of supply, supply function, elasticity of supply.	5
3	Production and Cost analysis- Theory of production- production function, law of variable proportions, laws of returns to scale, production optimization, least cost combination of inputs, isoquants. Cost concepts-explicit and implicit cost, fixed and variable cost, opportunity cost, sunk costs, cost function, cost curves, cost and output decisions, cost estimation.	5
4	Market structure and pricing theory- Perfect competition, Monopoly, Monopolistic competition, Oligopoly.	4
5	Financial statement analysis- Balance sheet and related concepts, profit and loss statement and related concepts, financial ratio analysis, cash-flow analysis, funds-flow analysis, comparative financial statement, analysis and interpretation of financial statements, capital budgeting techniques.	8
	Total	**26**

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3EC4-04: Digital System Design

3 Credits **Max. Marks: 150 (IA:30, ETE:120)**
3L:0T:0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	Logic Simplification and Combinational Logic Design: Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Karnaugh maps up to 6 variables, Binary codes, Code Conversion.	7
2	MSI devices like Comparators, Multiplexers, Encoder, Decoder, Driver & Multiplexed Display, Half and Full Adders, Subtractors, Serial and Parallel Adders, BCD Adder, Barrel shifter and ALU	8
3	Sequential Logic Design: Building blocks like S-R, JK and Master-Slave JK FF, Edge triggered FF, Ripple and Synchronous counters, Shift registers, Finite state machines, Design of Synchronous FSM, Algorithmic State Machines charts. Designing synchronous circuits like Pulse train generator, Pseudo Random Binary Sequence generator, Clock generation.	9
4	Logic Families and Semiconductor Memories: TTL NAND gate, Specifications, Noise margin, Propagation delay, fan-in, fan-out, Tristate TTL, ECL, CMOS families and their interfacing, memory elements, Concept of Programmable logic devices like FPGA. Logic implementation using programmable devices.	8
5	VLSI Design flow: Design entry: Schematic, FSM & HDL, different modeling styles in VHDL, Data types and objects, Dataflow, Behavioral and Structural Modeling, Synthesis and Simulation VHDL constructs and codes for combinational and sequential circuits.	8
	Total	**40**

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Course Outcome:

Course Code	Course Name	Course Outcome	Details
3EC4-04	Digital System Design	CO 1	Develop the understanding of number system and its application in digital electronics.
		CO 2	Development and analysis of K-map to solve the Boolean function to the simplest form for the implementation of compact digital circuits.
		CO 3	Design various combinational and sequential circuits using various metrics: switching speed, throughput/latency, gate count and area, energy dissipation and power.
		CO 4	Understanding Interfacing between digital circuits and analog component using Analog to Digital Converter (ADC), Digital to Analog Converter (DAC) etc.
		CO 5	Design and implement semiconductor memories, programmable logic devices (PLDs) and field programmable gate arrays (FPGA) in digital electronics.

CO-PO Mapping:

Subject	Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
3EC4-04 Digital System Design	CO 1	3	2	2	1		1						
	CO 2	3	2	3	2								
	CO 3	2	2	3	1	1							
	CO 4	3	2	1	1	1							
	CO 5	2	1	3	1	1							

3: Strongly **2: Moderate** **1: Weak**

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Lecture Plan:

Lecture No.	Content to be taught
Lecture 1	Zero Lecture
Lecture 2	Review of Boolean Algebra
Lecture 3	DeMorgan's Theorem, SOP & POS forms,
Lecture 4	Problem of SOP and POS forms of boolean functions.
Lecture 5	Simplification of karnaugh map up to 6 variables
Lecture 6	Simplification of karnaugh map up to 6 variables
Lecture 7	Simplification of karnaugh map up to 6 variables
Lecture 8	Binary codes and code conversion
Lecture 9	Binary codes and code conversion
Lecture 10	Encoder, Decoder
Lecture 11	Half and Full Adders, Subtractors, Serial and Parallel Adders
Lecture 12	BCD Adder, Barrel shifter
Lecture 13	S-R FF, edge triggered and level triggered
Lecture 14	D and J-K FF
Lecture 15	Master-Slave JK FF and T FF
Lecture 16	Ripple and Synchronous counters
Lecture 17	Other type of counters
Lecture 18	Shift registers, Finite state machines, Asynchronous FSM
Lecture 19	Design of synchronous FSM
Lecture 20	Design of synchronous FSM
Lecture 21	Design of synchronous FSM
Lecture 22	Designing synchronous circuits (pulse train generator, pseudo random binary sequence generator, clock generation)

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Lecture 23	TTL NAND gate, specifications, noise margin, propagation delay, fan-in, fan-out
Lecture 24	TTL NAND gate
Lecture 25	Tristate TTL, ECL
Lecture 26	CMOS families and their interfacing
Lecture 27	CMOS families and their interfacing
Lecture 28	Read-Only Memory, Random Access Memory
Lecture 29	Programmable Logic Arrays (PLA)
Lecture 30	Programmable Array Logic (PAL),
Lecture 31	Field Programmable Gate Array (FPGA)
Lecture 32	Combinational PLD-Based State Machines,
Lecture 33	State Machines on a Chip
Lecture 34	Schematic, FSM & HDL
Lecture 35	Different modeling styles in VHDL
Lecture 36	Data types and objects, Data flow
Lecture 37	Behavioral and Structural Modeling
Lecture 38	Behavioral and Structural Modeling
Lecture 39	Simulation VHDL constructs and codes for combinational and sequential circuits
Lecture 40	Simulation VHDL constructs and codes for combinational and sequential circuits

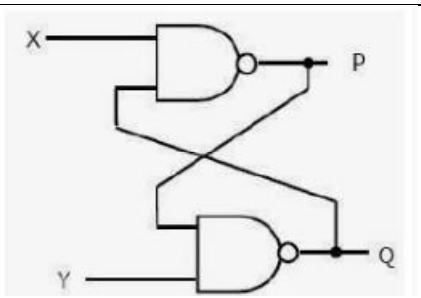
Content delivery method:

1. Chalk and Duster
2. PPT
3. Hand-outs

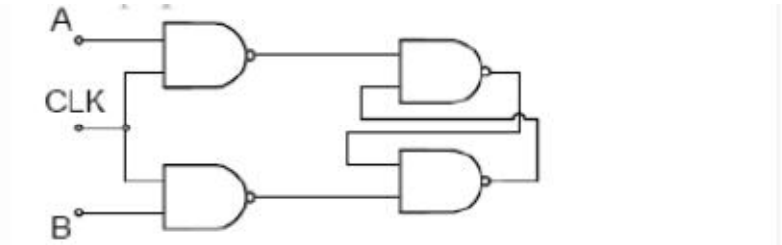
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Sample Assignments:

Assignment 1	**Q1.** Using K-maps, find the minimal Boolean expression of the following SOP and POS representations. a. f (w,x,y,z)= Σ (7,13,14,15) b. f(w,x,y,z) = Σ (1,3,4,6,9,11,14,15) c. f(w,x,y,z) = Π(1,4,5,6,11,12,13,14,15) d. f(w,x,y,z) = Σ (1,3,4,5,7,8,9,11,15) e. f(w,x,y,z) = Π (0,4,5,7,8,9,13,15)
	Q2. Find the function h(a,b,c,d) such that f = f^d. f (a,b,c,d) = a ·b· c + (a · c + b)· d + h(a,b,c,d)
	Q3. Using K-maps of the functions f1 and f2, find the following: (provide the canonical form expression and simplify) a. T1 = f1 · f2 b. T2 = f1 + f2 c. T3 = f1 ⊕ f2 where f1(w,x,y,z) = Σ (0,2,4,9,12,15), f2(w,x,y,z) = Σ (1,2,4,5,12,13)
Assignment 2	**Q1**. Draw the state diagram of a serial adder.
	Q2. In the following circuit, given binary values were applied to the Inputs X and Y inputs of the NAND latch shown in the figure. X = 0, Y = 1; X = 0, Y = 0; X = 1, Y = 1. Find out the corresponding stable output P, Q.



Q3. When the race around condition will occur in the circuit given Below:



3EC4-05: Signals & Systems

3 Credits **Max. Marks: 150 (IA:30, ETE:120)**

3L:0T:0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	Energy and power signals, continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, realizability.	6
2	Linear shift-invariant (LSI) systems, impulse response and step response, convolution, input output behavior with aperiodic convergent inputs. Characterization of causality and stability of linear shift-invariant systems. System representation through differential equations and difference equations	7
3	Periodic and semi-periodic inputs to an LSI system, the notion of a frequency response and its relation to the impulse response, Fourier series representation, the Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem. The idea of signal space and orthogonal bases	8
4	The Laplace Transform, notion ofeigen functions of LSI systems, a basis of eigen functions, region of convergence, poles and zeros of system, Laplace domain analysis, solution to differential equations and system behavior.	6
5	The z-Transform for discrete time signals and systems- eigen functions, region of convergence, z-domain analysis.	5
6	State-space analysis and multi-input, multi-output representation. The state-transition matrix and its role. The Sampling Theorem and its implications- Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first-order hold, and so on. Aliasing and its effects. Relation between continuous and discrete time systems.	8
	Total	40

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Course Outcome:

Course Code	Course Name	Course Outcome	Details
3EC4-05	Signals & Systems	CO 1	Analyze different types of signals and system properties
		CO 2	Represent continuous and discrete systems in time and frequency domain using different transforms
		CO 3	Investigate whether the system is stable.
		CO 4	Sampling and reconstruction of a signal.
		CO 5	Acquire an understanding of MIMO systems

CO-PO Mapping:

Subject	Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
3EC4-05 Signals & Systems	CO 1	3	3	1	2	2			1				2
	CO 2	3	1		2	3			1				2
	CO 3	3	2	2	3								2
	CO 4	3	2	3	3	1							
	CO 5	3	2	2	3	1			2				1

3: Strongly 2: Moderate 1: Weak

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Lecture Plan:

Lecture No.	Content to be taught
Lecture 1	Zero Lecture
Lecture 2	Energy signals power signals
Lecture 3	Continuous and discrete time signals
Lecture 4	Continuous amplitude signals
Lecture 5	and discrete amplitude signals
Lecture 6	System properties: linearity: additivity and homogeneity
Lecture 7	shift-invariance, causality
Lecture 8	stability, realizability.
Lecture 9	Linear shift-invariant (LSI) systems
Lecture 10	impulse response
Lecture 11	Step response
Lecture 12	Convolution.
Lecture 13	Input output behavior with aperiodic convergent inputs
Lecture 14	Characterization of causality and stability of linear shift-invariant systems.
Lecture 15	System representation through differential equations and difference equations.
Lecture 16	Characterization of causality and stability of linear shift-invariant systems.
Lecture 17	System representation through differential equations and difference equations.
Lecture 18	Periodic and semi-periodic inputs to an LSI system
Lecture 19	The notion of a frequency response.
Lecture 20	Its relation to the impulse response
Lecture 21	Fourier series representation
Lecture 22	Fourier Transform
Lecture 23	Convolution/multiplication and their effect in the frequency domain
Lecture 24	Magnitude and phase response
Lecture 25	Fourier domain duality.
Lecture 26	The Discrete-Time Fourier Transform (DTFT) and Discrete Fourier Transform (DFT).
Lecture 27	Parseval's Theorem. The idea of signal space and orthogonal bases
Lecture 28	The Laplace Transform
Lecture 29	Notion of eigen functions of LSI systems

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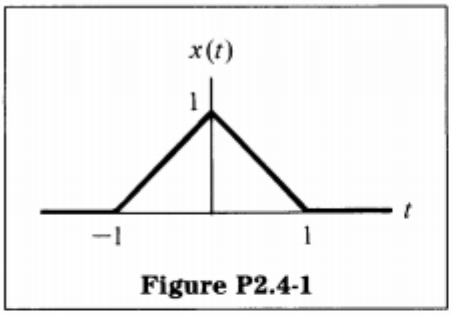
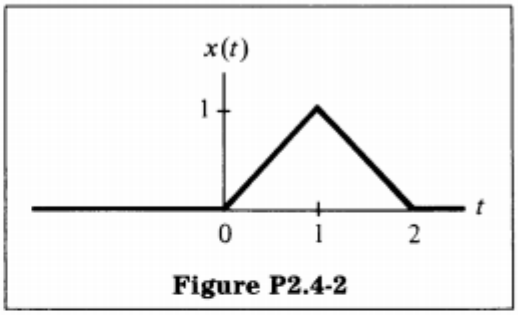
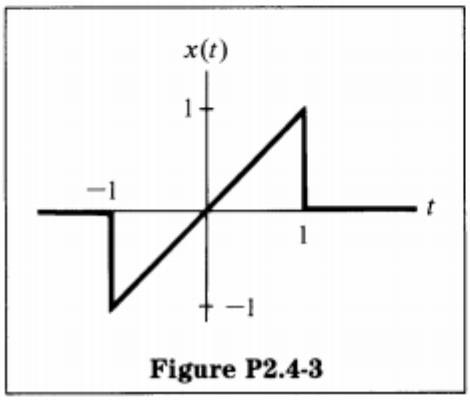
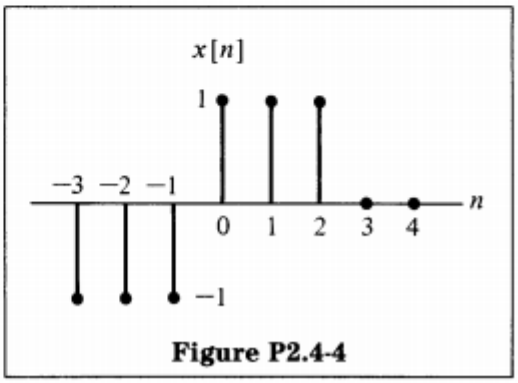
Lecture 30	A basis of eigen functions, region of convergence
Lecture 31	Poles and zeros of system, Laplace domain analysis,
Lecture 32	Solution to differential equations and system behavior.
Lecture 33	The z-Transform for discrete time signals and systems- eigen functions,
Lecture 34	Region of convergence, z-domain analysis.
Lecture 35	State-space analysis and multi-input, multi-output representation.
Lecture 36	The state-transition matrix and its role.
Lecture 37	The Sampling Theorem and its implications- Spectra of sampled signals.
Lecture 38	Reconstruction: ideal interpolator, zero-order hold, first-order hold, and so on
Lecture 39	Aliasing and its effects.
Lecture 40	Relation between continuous and discrete time systems.

Content delivery method:

1. Chalk and Duster
2. PPT
3. Animation
4. Hand-outs

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Assignments:

Assignment	For each of the following signals, determine whether it is even, odd, or neither. **(a)**  **Figure P2.4-1** **(b)**  **Figure P2.4-2** **(c)**  **Figure P2.4-3** **(d)**  **Figure P2.4-4**

Evaluate the following sums:

(a) $\sum_{n=0}^{5} 2\left(\frac{3}{a}\right)^n$

(b) $\sum_{n=2}^{6} b^n$

(c) $\sum_{n=0}^{\infty} \left(\frac{2}{3}\right)^{2n}$

Hint: Convert each sum to the form

$$C\sum_{n=0}^{N-1} \alpha^n = S_N \quad \text{or} \quad C\sum_{n=0}^{\infty} \alpha^n = S_\infty$$

and use the formulas

$$S_N = C\left(\frac{1-\alpha^N}{1-\alpha}\right), \quad S_\infty = \frac{C}{1-\alpha} \quad \text{for } |\alpha| < 1$$

The first-order difference equation $y[n] - ay[n-1] = x[n]$, $0 < a < 1$, describes a particular discrete-time system initially at rest.

(a) Verify that the impulse response $h[n]$ for this system is $h[n] = a^n u[n]$.

(b) Is the system

(i) memoryless?

(ii) causal?

(iii) stable?

Clearly state your reasoning.

(c) Is this system stable if $|a| > 1$?

Assignment

Consider a discrete-time system with impulse response

$$h[n] = (\tfrac{1}{2})^n u[n]$$

Determine the response to each of the following inputs:

(a) $x[n] = (-1)^n = e^{j\pi n}$ for all n

(b) $x[n] = e^{j(\pi n/4)}$ for all n

(c) $x[n] = \cos\left(\frac{\pi n}{4} + \frac{\pi}{8}\right)$ for all n

---

Consider two specific periodic sequences $\tilde{x}[n]$ and $\tilde{y}[n]$. $\tilde{x}[n]$ has period N and $\tilde{y}[n]$ has period M. The sequence $\tilde{w}[n]$ is defined as $\tilde{w}[n] = \tilde{x}[n] + \tilde{y}[n]$.

(a) Show that $\tilde{w}[n]$ is periodic with period MN.

(b) Since $\tilde{x}[n]$ has period N, its discrete Fourier series coefficients a_k also have period N. Similarly, since $\tilde{y}[n]$ has period M, its discrete Fourier series coefficients b_k also have period M. The discrete Fourier series coefficients of $\tilde{w}[n]$, c_k, have period MN. Determine c_k in terms of a_k and b_k.

The sequence $x[n] = (-1)^n$ is obtained by sampling the continuous-time sinusoidal signal $x(t) = \cos \omega_0 t$ at 1-ms intervals, i.e.,

$$\cos(\omega_0 nT) = (-1)^n, \qquad T = 10^{-3}\ \text{s}$$

Determine three *distinct* possible values of ω_0.

3EC4-06: Network Theory

4 Credits **Max. Marks: 200 (IA:40, ETE:160)**

3L:1T:0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	Node and Mesh Analysis, matrix approach of network containing voltage and current sources, and reactances, source transformation and duality.	7
2	Network theorems: Superposition, reciprocity, Thevenin's, Norton's, Maximum power Transfer, compensation and Tallegen's theorem as applied to AC. circuits.	7
3	Trigonometric and exponential Fourier series: Discrete spectra and symmetry of waveform, steady state response of a network to non-sinusoidal periodic inputs, power factor, effective values, Fourier transform and continuous spectra, three phase unbalanced circuit and power calculation.	8
4	Laplace transforms and properties: Partial fractions, singularity functions, waveform synthesis, analysis of RC, RL, and RLC networks with and without initial conditions with Laplace transforms evaluation of initial conditions..	8
5	Transient behavior, concept of complex frequency, Driving points and transfer functions poles and zeros of immittance function, their properties, sinusoidal response from pole-zero locations, convolution theorem and Two four port network and interconnections, Behaviors of series and parallel resonant circuits, Introduction to band pass, low pass, high pass and band reject filters.	10
	Total	40

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Course Outcome:

Course Code	Course Name	Course Outcome	Details
3EC4-06	Network Theory	CO 1	Apply the basic circuital law and simplify the network using network theorems
		CO 2	Appreciate the frequency domain techniques in different applications.
		CO 3	Apply Laplace Transform for steady state and transient analysis
		CO 4	Evaluate transient response and two-port network parameters
		CO 5	Analyze the series resonant and parallel resonant circuit and design filters

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CO-PO Mapping:

Subject	Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
3EC4-06 Network Theory	CO 1	3	2		3	2							
	CO 2	3	3	1	2	2							1
	CO 3	3	2	2		2							1
	CO 4	2	3	2	2	1							
	CO 5	2	3	3	2	1							

3: Strongly 2: Moderate 1: Weak

Lecture Plan:

Lecture No.	Content to be taught
Lecture 1	Overview of Network Theory and its significance
Lecture 2	Node and Mesh Analysis
Lecture 3	matrix approach of network containing voltage and current sources and reactances
Lecture 4	source transformation and duality
Lecture 5	Network theorems: Superposition and reciprocity
Lecture 6	Thevenin's and Norton's theorem
Lecture 7	Maximum power Transfer theorem
Lecture 8	compensation and Tallegen's theorem as applied to AC. Circuits
Lecture 9	Trigonometric and exponential Fourier series
Lecture 10	Fourier series: Discrete spectra and symmetry of waveform
Lecture 11	Steady state response of a network to non-sinusoidal periodic inputs
Lecture 12	power factor and effective values
Lecture 13	Fourier transform and continuous spectra
Lecture 14	three phase unbalanced circuit and power calculation
Lecture 15	three phase unbalanced circuit and power calculation
Lecture 16	Laplace transforms
Lecture 17	Laplace transforms
Lecture 18	Laplace transforms properties: Partial fractions
Lecture 19	singularity functions and waveform synthesis

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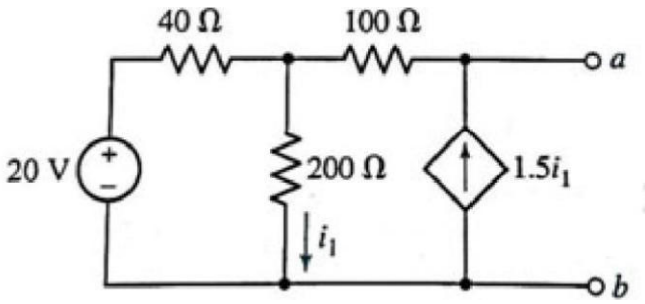
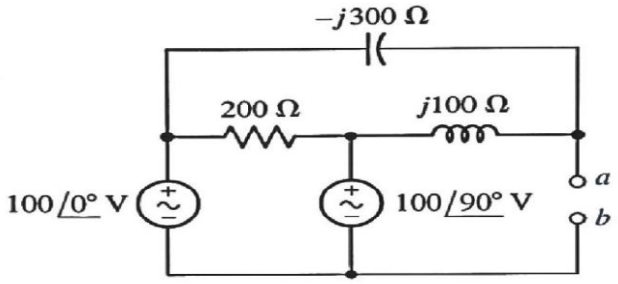
Lecture 20	analysis of RC networks
Lecture 21	analysis of RL networks
Lecture 22	analysis of RLC networks
Lecture 23	Analysis of networks with and without initial conditions
Lecture 24	Analysis of networks with and without initial conditions
Lecture 25	Analysis of networks with and without initial conditions with lapalace transforms evaluation
Lecture 26	Analysis of networks with and without initial conditions with lapalace transforms evaluation of initial condition
Lecture 27	Transient behavior
Lecture 28	concept of complex frequency
Lecture 29	Driving points and transfer functions poles and zeros of immittance function
Lecture 30	Driving points and transfer functions poles and zeros of immittance function: their properties
Lecture 31	sinusoidal response from pole-zero locations
Lecture 32	sinusoidal response from pole-zero locations
Lecture 33	convolution theorem
Lecture 34	sinusoidal response from pole-zero locations
Lecture 35	Two four port network and interconnections
Lecture 36	Two four port network and interconnections
Lecture 37	Behaviors of series and parallel resonant circuits
Lecture 38	Introduction to band pass and low pass
Lecture 39	Introduction to high pass and reject filters
Lecture 40	Spill over class

Content delivery method:

1. Chalk and Duster
2. PPT
3. Hand-outs

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Sample assignments:

Assignment 1	**Q1.**	Elaborate the significance of source transformation with relevant example
	Q2.	State and prove time differentiation theorem in Laplace Transform
	Q3.	Find the Thevenin equivalent of the network shown in figure. What power would be delivered to a load of 100 ohms at *a* and *b*? 
Assignment 2	**Q4.**	Calculate Thevenin equivalent circuit with respect to terminals *a* and *b* 
	Q5.	Derive transient current and voltage responses of sinusoidal driven RL and RC circuits.
	Q6.	Specify the restrictions on pole and zero locations for transfer functions and driving-point functions.

3EC4-07: Electronic Devices

4 Credits **Max. Marks: 200 (IA:40, ETE:160)**

3L:1T:0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction to Semiconductor Physics: Introduction, Energy band gap structures of semiconductors, Classifications of semiconductors, Degenerate and non-degenerate semiconductors, Direct and indirect band gap semiconductors, Electronic properties of Silicon, Germanium, Compound Semiconductor, Gallium Arsenide, Gallium phosphide & Silicon carbide, Variation of semiconductor conductivity, resistance and bandgap with temperature and doping. Thermistors, Sensitors.	6
2	Review of Quantum Mechanics, Electrons in periodic Lattices, E-k diagrams. Energy bands in intrinsic and extrinsic silicon; Carrier transport: diffusion current, drift current, mobility and resistivity; sheet resistance, design of resistors.	6
3	Generation and recombination of carriers; Poisson and continuity equation P-N junction characteristics, I-V characteristics, and small signal switching models; Avalanche breakdown, Zener diode, Schottky diode.	8
4	Bipolar Junction Transistor, I-V characteristics, Ebers-Moll Model, MOS capacitor, C-V characteristics, MOSFET, I-V characteristics, and small signal models of MOS transistor, LED, photodiode and solar cell.	11
5	Integrated circuit fabrication process: oxidation, diffusion, ion implantation, Photolithography, etching, chemical vapor deposition, sputtering, twin-tub CMOS process.	9
	Total	**40**

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Course Outcome:

Course Code	Course Name	Course Outcome	Details
3EC4-07	Electronic Devices	CO 1	Understanding the semiconductor physics of the intrinsic, P and N materials.
		CO 2	Understanding the characteristics of current flow in a bipolar junction transistor and MOSFET.
		CO 3	Understand and utilize the mathematical models of semiconductor junctions and MOS transistors for circuits and systems.
		CO 4	Analyze the characteristics of different electronic devices such as Amplifiers, LEDs, Solar cells, etc.
		CO 5	Theoretical as well as experimental understanding of Integrated circuit fabrication.

CO-PO Mapping:

Subject	Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
3EC4-07 Electronic Devices	CO 1	3	1		2	1	1						
	CO 2	3	2	1			2						
	CO 3	2	1		2		1	2					
	CO 4	3	1	1				2					
	CO 5	3	1	1	1	1							2

3: Strongly **2: Moderate** **1: Weak**

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Lecture Plan:

Lecture No.	Content to be taught
Lecture 1	Zero Lecture
Lecture 2	Introduction to Semiconductor Physics
Lecture 3	Introduction to Semiconductor Physics
Lecture 4	Introduction to Semiconductor Physics
Lecture 5	Review of Quantum Mechanics
Lecture 6	Electrons in periodic Lattices
Lecture 7	E-k diagrams
Lecture 8	Energy bands in intrinsic and extrinsic silicon
Lecture 9	Carrier transport: diffusion current, drift current, mobility and resistivity
Lecture 10	Sheet resistance and design of resistors
Lecture 11	Generation and recombination of carriers
Lecture 12	Poisson and continuity equation
Lecture 13	P-N junction characteristics and their I-V characteristics
Lecture 14	P-N junction characteristics and their I-V characteristics
Lecture 15	P-N junction small signal switching models
Lecture 16	P-N junction small signal switching models
Lecture 17	Avalanche breakdown
Lecture 18	Zener diode and Schottky diode
Lecture 19	Basics of Bipolar Junction Transistor
Lecture 20	I-V characteristics of BJT
Lecture 21	Ebers-Moll Model
Lecture 22	MOS capacitor
Lecture 23	MOS capacitor

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Lecture 24	C-V characteristics
Lecture 25	Basics of MOSFET
Lecture 26	Basics of MOSFET
Lecture 27	I-V characteristics of MOSFET
Lecture 28	Small signal models of MOS transistor
Lecture 29	Small signal models of MOS transistor
Lecture 30	Light Emitting Diode
Lecture 31	Photodiode and solar cell
Lecture 32	Basics of Integrated Circuits
Lecture 33	Advancement in Integrated Circuits
Lecture 34	Oxidation, diffusion and ion implantation
Lecture 35	Photolithography and etching
Lecture 36	Chemical vapor deposition
Lecture 37	Sputtering
Lecture 38	Twin-tub CMOS process
Lecture 39	Spill over class
Lecture 40	Spill over class

Content delivery method:

1. Chalk and Duster
2. PPT
3. Hand-outs

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Sample assignments:

Assignment 1	**Q1.**	Investigates the input/output characteristics of various diodes?
	Q2.	Investigate the applications of various diodes?
	Q3.	A p-type sample of silicon has a resistivity of 5 Ω-cm. In this sample, the hole mobility, μ_h, is 600 cm^2/V-s and the electron mobility, μ_e, is 1600 cm^2/V-s. Ohmic contacts are formed on the ends of the sample and a uniform electric field is imposedwhich results in a drift current density in the sample is 2 x 10^3 A/cm^2. [1]. What are the hole and electron concentrations in this sample? [2]. What are the hole and electron drift velocities under these conditions? [3]. What is the magnitude of the electric field?
Assignment 2	**Q1.**	Discuss the applications of Ebers-Moll Model.
	Q2.	Discuss different types of fabrication techniques.
	Q3.	Discuss various characteristics of CMOS transistor.

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3EC4-21: Electronics Devices Lab

1 Credit **Max. Marks: 50 (IA:30, ETE:20)**

0L:0T:2P

List of Experiments

Sr. No.	Name of Experiment
1.	Study the following devices: (a) Analog& digital multimeters (b) Function/ Signal generators (c) Regulated d. c. power supplies (constant voltage and constant current operations) (d) Study of analog and digital CRO, measurement of time period, amplitude, frequency & phase angle using Lissajous figures.
2.	Plot V-I characteristic of P-N junction diode & calculate cut-in voltage, reverse Saturation current and static & dynamic resistances.
3.	Plot the output waveform of half wave rectifier and effect of filters on waveform. Also calculate its ripple factor.
4.	Study bridge rectifier and measure the effect of filter network on D.C. voltage output & ripple factor.
5.	Plot and verify output waveforms of different clipper and clamper.
6.	Plot V-I characteristic of Zener diode
7.	Study of Zener diode as voltage regulator. Observe the effect of load changes and determine load limits of the voltage regulator
8.	Plot input-output characteristics of BJT in CB, CC and CE configurations. Find their h-parameters.
9.	Study of different biasing circuits of BJT amplifier and calculate its Q-point.
10.	Plot frequency response of two stage RC coupled amplifier & calculate its bandwidth .
11.	Plot input-output characteristics of field effect transistor and measure I_{dss} and V_p.
12.	Plot frequency response curve for FET amplifier and calculate its gain bandwidth product.

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Course Outcome:

Course Code	Course Name	Course Outcome	Details
3EC4-21	Electronic Devices Lab	CO 1	Understand the characteristics of different Electronic Devices.
		CO 2	Verify the rectifier circuits using diodes and implement them using hardware.
		CO 3	Design various amplifiers like CE, CC, common source amplifiers and implement them using hardware and also observe their frequency responses
		CO 4	Understand the construction, operation and characteristics of JFET and MOSFET, which can be used in the design of amplifiers.
		CO 5	Understand the need and requirements to obtain frequency response from a transistor so that Design of RF amplifiers and other high frequency amplifiers is feasible

CO-PO Mapping:

Subject	Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
3EC4-21 Electronic Devices Lab	CO 1	3	2	3	2	1							1
	CO 2	2	3	1	3	3							2
	CO 3	2	1	2	3	3							
	CO 4	3	2	3	2	2							1
	CO 5	3	2	1	2	2							

3: Strongly **2: Moderate** **1: Weak**

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3EC4-22: Digital System Design Lab

1 Credit **Max. Marks: 50 (IA:30, ETE:20)**

0L:0T:2P

List of Experiments

S.No.	Name of Experiment
Part A: Combinational Circuits	
1.	To verify the truth tables of logic gates: AND, OR, NOR, NAND, NOR, Ex-OR and Ex-NOR
2.	To verify the truth table of OR, AND, NOR, Ex-OR, Ex-NOR logic gates realized using NAND & NOR gates.
3.	To realize an SOP and POS expression.
4.	To realize Half adder/ Subtractor& Full Adder/ Subtractor using NAND & NOR gates and to verify their truth tables
5.	To realize a 4-bit ripple adder/ Subtractor using basic Half adder/ Subtractor& basic Full Adder/ Subtractor.
6.	To design 4-to-1 multiplexer using basic gates and verify the truth table. Also verify the truth table of 8-to-1 multiplexer using IC
7.	To design 1-to-4 demultiplexer using basic gates and verify the truth table. Also to construct 1-to-8 demultiplexer using blocks of 1-to-4 demultiplexer
8.	To design 2x4 decoder using basic gates and verify the truth table. Also verify the truth table of 3x8 decoder using IC
9.	Design & Realize a combinational circuit that will accept a 2421 BCD code and drive a TIL -312 seven-segment display
Part B: Sequential Circuits	
10.	Using basic logic gates, realize the R-S, J-K and D-flip flops with and without clock signal and verify their truth table.
11.	Construct a divide by 2, 4 & 8 asynchronous counter. Construct a 4-bit binary counter and ring counter for a particular output pattern using D flip flop.
12.	Design and construct unidirectional shift register and verify the
13.	Design and construct BCD ripple counter and verify the function.
14.	Design and construct a 4 Bit Ring counter and verify the function
15.	Perform input/output operations on parallel in/Parallel out and Serial in/Serial out registers using clock. Also exercise loading only one of multiple values into the register using multiplexer.

Note: Minimum 6 experiments to be conducted from **Part-A**& 4 experiments to be conducted from **Part-B.**

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Course Outcome:

Course Code	Course Name	Course Outcome	Details
3EC4-22	Digital System Design Lab	CO 1	
		CO 2	To minimize the complexity of digital logic circuits.
		CO 3	To design and analyse combinational logic circuits.
		CO 4	To design and analyse sequential logic circuits.
		CO 5	Able to implement applications of combinational & sequential logic circuits.

CO-PO Mapping:

Subject	Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
3EC4-22 Digital System Design Lab	CO 1	3	3	1									1
	CO 2	3	3	2	1	1							1
	CO 3	3	3	3	2	3	1						2
	CO 4	3	3	3	2	3	1						2
	CO 5	3	3	3	3	3	3						3

3: Strongly 2: Moderate 1: Weak

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3EC4-23: Signal Processing Lab

1 Credit **Max. Marks: 50 (IA:30, ETE:20)**

0L:0T:2P

List of Experiments

Sr. No.	Name of Experiment (Simulate using MATLAB environment)
1.	Generation of continuous and discrete elementary signals (periodic and non periodic) using mathematical expression.
2.	Generation of Continuous and Discrete Unit Step Signal.
3.	Generation of Exponential and Ramp signals in Continuous & Discrete domain.
4.	Continuous and discrete time Convolution (using basic definition).
5.	Adding and subtracting two given signals. (Continuous as well as Discrete signals)
6.	To generate uniform random numbers between (0, 1).
7.	To generate a random binary wave.
8.	To generate and verify random sequences with arbitrary distributions, means and variances for following: (a) Rayleigh distribution (b) Normal distributions: N(0,1). (c) Gaussion distributions: N (m, x)
9.	To plot the probability density functions. Find mean and variance for the above distributions

Course Outcome:

Course Code	Course Name	Course Outcome	Details
3EC4-23	Signal Processing Lab	CO 1	Able to generate different Continuous and Discrete time signals.
		CO 2	Understand the basics of signals and different operations on signals.
		CO 3	Develop simple algorithms for signal processing and test them using MATLAB
		CO 4	Able to generate the random signals having different distributions, mean and variance.
		CO 5	Design and conduct experiments, interpret and analyse data and report results.

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CO-PO Mapping:

Subject	Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
3EC4-23 Signal Processing Lab	CO 1	2		1		2							
	CO 2	3		1									
	CO 3	1	2	3	1	3							
	CO 4	2	1	1		2							
	CO 5	1	1	2	2	2							

3: Strongly **2: Moderate** **1: Weak**

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3EC3-24: Computer Programming Lab-I

1 Credit **Max. Marks: 50 (IA:30, ETE:20)**
0L:0T:2P

1.	Write a simple C program on a 32 bit compiler to understand the concept of array storage, size of a word. The program shall be written illustrating the concept of row major and column major storage. Find the address of element and verify it with the theoretical value. Program may be written for arrays upto 4-dimensions.
2.	Simulate a stack, queue, circular queue and dequeue using a one dimensional array as storage element. The program should implement the basic addition, deletion and traversal operations.
3.	Represent a 2-variable polynomial using array. Use this representation to implement addition of polynomials.
4.	Represent a sparse matrix using array. Implement addition and transposition operations using the representation.
5.	Implement singly, doubly and circularly connected linked lists illustrating operations like addition at different locations, deletion from specified locations and traversal.
6.	Repeat exercises 2, 3 & 4 with linked structures.
7.	Implementation of binary tree with operations like addition, deletion, traversal.
8.	Depth first and breadth first traversal of graphs represented using adjacency matrix and list.
9.	Implementation of binary search in arrays and on linked Binary Search Tree.
10.	Implementation of insertion, quick, heap, topological and bubble sorting algorithms.

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Syllabus of
UNDERGRADUATE DEGREE COURSE

Electronics & Communication Engineering



Rajasthan Technical University, Kota

Effective from session: 2018 – 2019

4EC2-01: Advance Engineering Mathematics-II

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Complex Variable – Differentiation:** Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties; Conformal mappings, Mobius transformations and their properties.	7
3	**Complex Variable - Integration:** Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof), Liouville's theorem and Maximum-Modulus theorem (without proof); Taylor's series, zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy Residue theorem (without proof).	8
4	**Applications of complex integration by residues:** Evaluation of definite integral involving sine and cosine. Evaluation of certain improper integrals.	4
5	**Special Functions:** Legendre's function, Rodrigues formula, generating function, Simple recurrence relations, orthogonal property. Bessel's functions of first and second kind, generating function, simple recurrence relations, orthogonal property.	10
6	**Linear Algebra:** Vector Spaces, subspaces, Linear independence, basis and dimension, Inner product spaces, Orthogonality, Gram Schmidt orthogonalization, characteristic polynomial, minimal polynomial, positive definite matrices and canonical forms, QR decomposition.	10
	Total	40

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4EC1-03/3EC1-03: Managerial Economics And Financial Accounting

2 Credit **Max. Marks: 100 (IA:20, ETE:80)**
2L:0T:0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Basic economic concepts:** Meaning, nature and scope of economics, deductive vs inductive methods, static and dynamics, Economic problems: scarcity and choice, circular flow of economic activity, national income-concepts and measurement.	3
3	**Demand and Supply analysis:** Demand-types of demand, determinants of demand, demand function, elasticity of demand, demand forecasting –purpose, determinants and methods, Supply-determinants of supply, supply function, elasticity of supply.	5
4	**Production and Cost analysis:** Theory of production- production function, law of variable proportions, laws of returns to scale, production optimization, least cost combination of inputs, isoquants. Cost concepts-explicit and implicit cost, fixed and variable cost, opportunity cost, sunk costs, cost function, cost curves, cost and output decisions, cost estimation.	5
5	**Market structure and pricing theory:** Perfect competition, Monopoly, Monopolistic competition, Oligopoly.	4
6	**Financial statement analysis:** Balance sheet and related concepts, profit and loss statement and related concepts, financial ratio analysis, cash-flow analysis, funds-flow analysis, comparative financial statement, analysis and interpretation of financial statements, capital budgeting techniques.	8
	Total	26

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4EC1-02/3EC1-02: Technical Communication

2 Credit **Max. Marks: 100 (IA:20, ETE:80)**
2L:0T:0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Introduction to Technical Communication-** Definition of technical communication, Aspects of technical communication, forms of technical communication, importance of technical communication, technical communication skills (Listening, speaking, writing, reading writing), linguistic ability, style in technical communication.	3
3	**Comprehension of Technical Materials/Texts and Information Design & development-** Reading of technical texts, Readingand comprehending instructions and technical manuals, Interpreting and summarizing technical texts, Note-making. Introduction of different kinds of technical documents, Information collection, factors affecting information and document design, Strategies for organization, Information design and writing for print and online media.	6
4	**Technical Writing, Grammar and Editing-** Technical writing process, forms of technical discourse, Writing, drafts and revising, Basics of grammar, common error in writing and speaking, Study of advanced grammar, Editing strategies to achieve appropriate technical style, Introduction to advanced technical communication. Planning, drafting and writing Official Notes, Letters, E-mail, Resume, Job Application, Minutes of Meetings.	8
5	**Advanced Technical Writing**- Technical Reports, types of technical reports, Characteristics and formats and structure of technical reports. Technical Project Proposals, types of technical proposals, Characteristics and formats and structure of technical proposals. Technical Articles, types of technical articles, Writing strategies, structure and formats of technical articles.	8
	Total	26

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4EC4-04: Analog Circuits

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	Diode Circuits, Amplifier models: Voltage amplifier, current amplifier, trans-conductance amplifier and trans-resistance amplifier. Biasing schemes for BJT and FET amplifiers, bias stability, various configurations (such as CE/CS, CB/CG, CC/CD) and their features, small signal analysis, low frequency transistor models, estimation of voltage gain, input resistance, output resistance etc., design procedure for particular specifications, low frequency analysis of multistage amplifiers.	8
3	High frequency transistor models, frequency response of single stage and multistage amplifiers, cascode amplifier. Various classes of operation (Class A, B, AB, C etc.), their power efficiency and linearity issues. Feedback topologies: Voltage series, current series, voltage shunt, current shunt, effect of feedback on gain, bandwidth etc., calculation with practical circuits, concept of stability, gain margin and phase margin.	8
4	Oscillators: Review of the basic concept, Barkhausen criterion, RC oscillators (phase shift, Wien bridge etc.), LC oscillators (Hartley, Colpitt, Clapp etc.), non-sinusoidal oscillators. Current mirror: Basic topology and its variants, V-I characteristics, output resistance and minimum sustainable voltage (VON), maximum usable load. Differential amplifier: Basic structure and principle of operation, calculation of differential gain, common mode gain, CMRR and ICMR. OP-AMP design: design of differential amplifier for a given specification, design of gain stages and output stages, compensation.	8
5	OP-AMP applications: review of inverting and non-inverting amplifiers, integrator and differentiator, summing amplifier, precision rectifier, Schmitt trigger and its applications. Active filters: Low pass, high pass, band pass and band stop, design guidelines.	8
6	Digital-to-analog converters (DAC): Weighted resistor, R-2R ladder, resistor string etc. Analog to digital converters (ADC): Single slope, dual slope, successive approximation, flash etc. Switched capacitor circuits: Basic concept, practical configurations, application in amplifier, integrator, ADC etc.	7
	Total	40

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Course Outcome:

Course Code	Course Name	Course Outcome	Details
4EC4-04	Analog Circuits	CO 1	Understand the characteristics of diodes and transistors
		CO 2	Design and analyze various rectifier and amplifier circuits
		CO 3	Design sinusoidal and non-sinusoidal oscillators
		CO 4	Understand the functioning of OP-AMP and design OP-AMP based circuits
		CO 5	Understanding the designing of ADCs and DACs

CO-PO Mapping:

Subject	Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
4EC4-04 Analog Circuits	CO 1	3		1	1	2							
	CO 2	1	1	2		1							
	CO 3	3	1		1								
	CO 4	2				2							
	CO 5	2	3		2								

3: Strongly **2: Moderate** **1: Weak**

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Lecture Plan:

Lecture No.	Content to be taught
Lecture 1	Zero Lecture
Lecture 2	Diode Circuits and Amplifier models
Lecture 3	Voltage amplifier, current amplifier, trans-conductance amplifier and trans-resistance amplifier
Lecture 4	Biasing schemes for BJT and FET amplifiers
Lecture 5	Bias stability in various configurations such as CE/CS, CB/CG, CC/CD
Lecture 6	Small signal analysis of BJT and FET
Lecture 7	low frequency transistor models
Lecture 8	Estimation of voltage gain, input resistance, output resistance etc.
Lecture 9	Design procedure for particular specifications, low frequency analysis of multistage amplifiers.
Lecture 10	High frequency transistor models
Lecture 11	frequency response of single stage and multistage amplifiers
Lecture 12	Cascode Amplifier
Lecture 13	Various classes of operation (Class A, B, AB, C etc.), their power efficiency and linearity issues
Lecture 14	Feedback topologies: Voltage series, current series, voltage shunt, current shunt
Lecture 15	Effect of feedback on gain, bandwidth etc.,
Lecture 16	Calculation with practical circuits
Lecture 17	Concept of stability, gain margin and phase margin.
Lecture 18	Basics of oscillator
Lecture 19	Barkhausen criterion, RC oscillators (phase shift, Wien bridge etc.)

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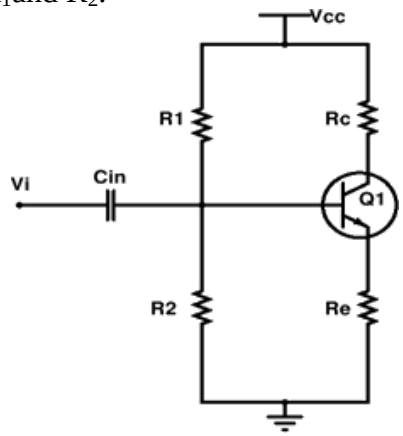
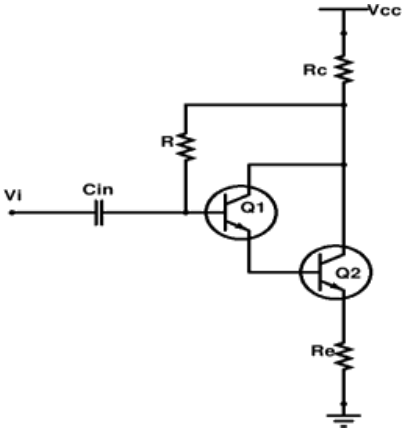
Lecture 20	LC oscillators (Hartley, Colpitt, Clapp etc.)
Lecture 21	Non-sinusoidal oscillators. Current mirror: Basic topology and its variants,
Lecture 22	V-I characteristics, output resistance and minimum sustainable voltage (VON), maximum usable load.
Lecture 23	Differential amplifier: Basic structure and principle of operation, calculation of differential gain, common mode gain, CMRR and ICMR.
Lecture 24	OP-AMP design: design of differential amplifier for a given specification
Lecture 25	Design of gain stages and output stages, compensation
Lecture 26	OP-AMP applications: review of inverting and non-inverting amplifiers
Lecture 27	Integrator and differentiator, summing amplifier
Lecture 28	Precision rectifier, Schmitt trigger and its applications
Lecture 29	Active filters: Low pass, high pass
Lecture 30	Band pass and band stop Filters
Lecture 31	Filter Design guidelines
Lecture 32	Digital-to-analog converters (DAC): Weighted resistor, R-2R ladder, resistor string etc
Lecture 33	Analog to digital converters (ADC): Single slope, dual slope
Lecture 34	successive approximation, flash TYPE ADC
Lecture 35	Switched capacitor circuits: Basic concept
Lecture 36	Switched capacitor circuits: practical configurations
Lecture 37	Switched capacitor circuits: applications
Lecture 38	Spill over classes
Lecture 39	Spill over classes
Lecture 40	Spill over classes

Content delivery method:

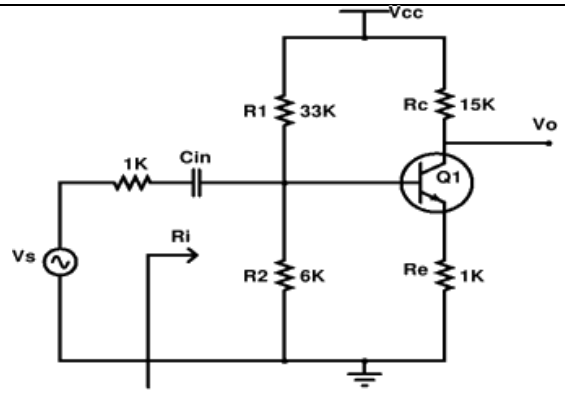
1. Chalk and Duster
2. PPT
3. Hand-outs

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Sample assignments:

Assignment 1	**Q1.** Assume that a silicon transistor with β =50, $V_{BEactive}$=0.7 V, V_{CC} =15V and R_C=10K is used in the Fig.1.It is desired to establish a Q-point at V_{CE}=7.5 V and I_C=5mA and stability factor S≤5.Find Re,$R_1$and R_2. 
	Q2. In the Darlington stage shown in Fig.2 , V_{CC}=15V , β_1=50, β_2=75,V_{BE}=0.7,R_C=750 Ω and R_E=100 Ω. If at the quiescent point V_{CE2}=6V determine the value of R. 
	Q3. For the amplifier shown in Fig.3 using a transistor whose parameters are h_{ie}=1100,h_{re}=2.5×10^{-4},h_{fe}=50,h_{oe}=24μA/V.Find A_I, A_V, A_{VS} and R_i.

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Assignment 2	**Q1.** Discuss the applications of operational amplifier.
	Q2. Discuss different types of filters.
	Q3. Discuss Dual counter type DAC and its applications

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4EC4-05: Microcontrollers

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	Overview of microcomputer systems and their building blocks, memory interfacing, concepts of interrupts and Direct Memory Access, instruction sets of microprocessors (with examples of 8085 and 8086);	10
3	Interfacing with peripherals - timer, serial I/O, parallel I/O, A/D and D/A converters; Arithmetic Coprocessors; System level interfacing design;	8
4	Concepts of virtual memory, Cache memory, Advanced coprocessor Architectures- 286, 486, Pentium; Microcontrollers: 8051 systems,	10
5	Introduction to RISC processors; ARM microcontrollers interface designs.	11
	Total	40

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Course Outcome:

Course Code	Course Name	Course Outcome	Details
4EC4-05	Microcontrollers	CO 1	Develop assembly language programming skills.
		CO 2	Able to build interfacing of peripherals like, I/O, A/D, D/A, timer etc.
		CO 3	Develop systems using different microcontrollers.
		CO 4	Explain the concept of memory organization.
		CO 5	Understand RSIC processors and design ARM microcontroller based systems.

CO-PO Mapping:

Subject	Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
4EC04-05Microcontrollers	CO 1			3	1								
	CO 2			3		1							
	CO 3	1	2	3									
	CO 4	3	2	1									
	CO 5			3	2	1							

3: Strongly 2: Moderate 1: Weak

Lecture Plan:

Lecture No.	Content to be taught
Lecture 1	Zero Lecture
Lecture 2	Overview of microcomputer systems and their building blocks
Lecture 3	Overview of microcomputer systems and their building blocks
Lecture 4	Memory interfacing
Lecture 5	Memory interfacing
Lecture 6	Concepts of interrupts

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Lecture 7	Direct Memory Access
Lecture 8	Direct Memory Access
Lecture 9	Instruction sets of microprocessors (with examples of 8085 and 8086)
Lecture 10	Instruction sets of microprocessors (with examples of 8085 and 8086)
Lecture 11	Instruction sets of microprocessors (with examples of 8085 and 8086)
Lecture 12	Instruction sets of microprocessors (with examples of 8085 and 8086)
Lecture 13	Interfacing with peripherals
Lecture 14	Timer
Lecture 15	Serial I/O
Lecture 16	Parallel I/O
Lecture 17	A/D and D/A converters;
Lecture 18	A/D and D/A converters
Lecture 19	Arithmetic Coprocessors
Lecture 20	System level interfacing design
Lecture 21	Concepts of virtual memory, Cache memory
Lecture 22	Concepts of virtual memory, Cache memory
Lecture 23	Advanced coprocessor Architectures- 286, 486, Pentium
Lecture 24	Advanced coprocessor Architectures- 286, 486, Pentium
Lecture 25	Advanced coprocessor Architectures- 286, 486, Pentium
Lecture 26	Microcontrollers: 8051 systems,
Lecture 27	Microcontrollers: 8051 systems,
Lecture 28	Microcontrollers: 8051 systems,
Lecture 29	Microcontrollers: 8051 systems,
Lecture 30	Microcontrollers: 8051 systems,
Lecture 31	Introduction to RISC processors
Lecture 32	Introduction to RISC processors
Lecture 33	Introduction to RISC processors
Lecture 34	ARM microcontrollers interface designs
Lecture 35	ARM microcontrollers interface designs
Lecture 36	ARM microcontrollers interface designs
Lecture 37	ARM microcontrollers interface designs
Lecture 38	ARM microcontrollers interface designs
Lecture 39	Spill Over Classes
Lecture 40	Spill Over Classes

Content delivery method:

1. Chalk and Duster
2. PPT
3. Hand-outs

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Assignments:

Assignment 1	**Q1.** Compare between microprocessor & microcontroller based on no. of instructions used, registers, memory and applications.
	Q2. Interface external program memory with 8051 & explain how the data is transfer.
	Q3. List the I/O ports of microcontroller 8051. Explain their alternative function?
Assignment 2	**Q1.** Explain RISC and CISC?
	Q2. Without using MUL instruction, perform multiplication operation on any two operands, with both of them being: a. Positive numbers b. One positive and other negative number c. Both negative numbers Verify the values computed.
	Q3. Can you brief up the evolution of ARM architecture?

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4EC3-06: Electronics Measurement & Instrumentation

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**THEORY OF ERRORS** - Accuracy & precision, Repeatability, Limits of errors, Systematic & random errors, Modeling of errors, Probable error & standard deviation, Gaussian error analysis, Combination of errors.	8
3	**ELECTRONIC INSTRUMENTS** - Electronic Voltmeter, Electronic Multimeters, Digital Voltmeter, and Component Measuring Instruments: Q meter, Vector Impedance meter, RF Power & Voltage Measurements, Introduction to shielding & grounding.	8
4	**OSCILLOSCOPES** – CRT Construction, Basic CRO circuits, CRO Probes, Techniques of Measurement of frequency, Phase Angle and Time Delay, Multibeam, multi trace, storage & sampling Oscilloscopes.	7
5	**SIGNAL GENERATION AND SIGNAL ANALYSIS** - Sine wave generators, Frequency synthesized signal generators, Sweep frequency generators. Signal Analysis - Measurement Technique, Wave Analyzers, and Frequency - selective wave analyser, Heterodyne wave analyser, Harmonic distortion analyser, and Spectrum analyser.	8
6	**TRANSDUCERS** - Classification, Selection Criteria, Characteristics, Construction, Working Principles and Application of following Transducers:- RTD, Thermocouples, Thermistors, LVDT, Strain Gauges, Bourdon Tubes, Seismic Accelerometers, Tachogenerators, Load Cell, Piezoelectric Transducers, Ultrasonic Flow Meters.	8
	Total	40

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Course Outcome:

Course Code	Course Name	Course Outcome	Details
4EC3-06	ELECTRONIC MEASUREMENT & INSTRUMENTATION	CO 1	**Describe** the use of various electrical/electronic instruments, their block diagram, applications, dnd principles of operation, standards eorrs and units of measurements.
		CO 2	**Develop** basic skills in the design of electronic equipments
		CO 3	**Analyse** different electrical/electronic parameters using state of equipments of measuring instruments which is require to all types of industries.
		CO 4	**Solve :**Identify electronics/ electrical instruments, understanding associated with the instruments
		CO 5	**Explain** use of transducers in different types of field applications

CO-PO Mapping:

Subject	Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
4EC3-06 ELECTRONIC MEASUREMENT & INSTRUMENTATION	CO 1	3	2	1									
	CO 2	2	2	2	3								
	CO 3	2	3										
	CO 4	2	1	1				2					
	CO 5	3	1										2

3: Strongly **2: Moderate** **1: Weak**

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Lecture Plan:

Lecture No.	Content to be taught
Lecture 1	Zero Lecture
Lecture 2	Theory of errors
Lecture 3	Accuracy & precision, Repeatability
Lecture 4	Limits of Time-Hours errors
Lecture 5	Systematic & random errors
Lecture 6	Modeling of errors
Lecture 7	Probable error
Lecture 8	standard deviation
Lecture 9	Gaussian error analysis
Lecture 10	Combination of errors
Lecture 11	Electronic instruments - Electronic Voltmeter
Lecture 12	Electronic Multimeters
Lecture 13	Digital Voltmeter
Lecture 14	Component Measuring Instruments: Q meter
Lecture 15	Vector Impedance meter
Lecture 16	RF Power & Voltage Measurements
Lecture 17	Introduction to shielding & grounding
Lecture 18	Oscilloscopes - CRT Construction
Lecture 19	Basic CRO circuits, CRO Probes
Lecture 20	Techniques of Measurement of frequency, Phase Angle and Time Delay
Lecture 21	Multibeam, multi trace, storage & sampling Oscilloscopes
Lecture 22	Multibeam, multi trace, storage & sampling Oscilloscopes
Lecture 23	Signal generation and signal analysis - Sine wave generators,
Lecture 24	Frequency synthesized signal generators
Lecture 25	Sweep frequency generators
Lecture 26	Signal Analysis - Measurement Technique
Lecture 27	Wave Analyzers, and Frequency - selective wave analyser
Lecture 28	Heterodyne wave analyser
Lecture 29	Harmonic distortion analyser
Lecture 30	Spectrum analyser
Lecture 31	Transducers – Classification
Lecture 32	Selection Criteria Characteristics
Lecture 33	Construction, Working Principles and Application of following Transducers:- RTD

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Lecture 34	Thermocouples
Lecture 35	Thermistors
Lecture 36	LVDT Strain Gauges, Bourdon Tubes
Lecture 37	Seismic Accelerometers
Lecture 38	Tachogenerators, Load Cell,
Lecture 39	Piezoelectric Transducers
Lecture 40	Ultrasonic Flow Meters

Content delivery method:

1. Chalk and Duster
2. PPT
3. Hand-outs

Sample assignments:

Assignment 1	**Q1.**	Write the principal of an AC Bridge used for the measurement of Unknown capacitor
	Q2.	Distinguish Between Accuracy and Precision?
	Q3.	Explain flow measurement with a suitable example.
Assignment 2	**Q1.**	What are primary sensing elements and transducers?
	Q2.	A Wheatstone Bridge requires to change of 7Ω in unknown arm of bridge to change in deflection of 14 mm. of galvanometer deter mine the sensitivity and deflection factor.
	Q3.	Explain the terms static error, static correction, relative error and percentage relative error.

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4EC4-07: Analog and Digital Communication

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	Review of signals and systems, Frequency domain representation of signals, Principles of Amplitude Modulation Systems- DSB, SSB and VSB modulations. Angle Modulation, Representation of FM and PM signals, Spectral characteristics of angle modulated signals.	8
3	Review of probability and random process. Gaussian and white noise characteristics, Noise in amplitude modulation systems, Noise in Frequency modulation systems. Pre-emphasis and Deemphasis, Threshold effect in angle modulation.	7
4	Pulse modulation. Sampling process. Pulse Amplitude and Pulse code modulation (PCM), Differential pulse code modulation. Delta modulation, Noise considerations in PCM, Time Division multiplexing, Digital Multiplexers.	8
5	Elements of Detection Theory, Optimum detection of signals in noise, Coherent communication with waveforms- Probability of Error evaluations. Baseband Pulse Transmission- Inter symbol Interference and Nyquist criterion. Pass band Digital Modulation schemes- Phase Shift Keying, Frequency Shift Keying, Quadrature Amplitude Modulation, Continuous Phase Modulation and Minimum Shift Keying.	8
6	Digital Modulation tradeoffs. Optimum demodulation of digital signals over band-limited channels- Maximum likelihood sequence detection (Viterbi receiver). Equalization Techniques. Synchronization and Carrier Recovery for Digital modulation.	8
	Total	40

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Course Outcome:

Course Code	Course Name	Course Outcome	Details
4EC4-07	Analog and Digital Communication	CO 1	Analyze and compare different analog modulation schemes for their efficiency and bandwidth
		CO 2	Analyze the behavior of a communication system in presence of noise
		CO 3	Investigate pulsed modulation system and analyze their system performance
		CO 4	Analyze different digital modulation schemes and can compute the bit error performance
		CO 5	Design a communication system comprised of both analog and digital modulation techniques

CO-PO Mapping:

Subject	Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
4EC4-07 Analog & Digital Communication	CO 1	3	3		3		1				1		
	CO 2	3	2		3		1						
	CO 3	3	2		3		2						
	CO 4	3	3		3		2				1		
	CO 5	3	2	3	3		3			2	2		

3: Strongly 2: Moderate 1: Weak

Content delivery method:

1. Chalk and Duster
2. PPT

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Lecture Plan:

Lecture No.	Content to be taught
Lecture 1	Introduction to the COURSE
Lecture 2	Review of signals and systems, Frequency domain representation of signals
Lecture 3	Principles of Amplitude Modulation Systems- DSB, SSB and VSB modulations
Lecture 4	Principles of Amplitude Modulation Systems- DSB, SSB and VSB modulations
Lecture 5	Principles of Amplitude Modulation Systems- DSB, SSB and VSB modulations
Lecture 6	Angle Modulation, Representation of FM and PM signals
Lecture 7	Angle Modulation, Representation of FM and PM signals
Lecture 8	Spectral characteristics of angle modulated signals.
Lecture 9	Review of probability and random process
Lecture 10	Review of probability and random process
Lecture 11	Noise in amplitude modulation systems
Lecture 12	Noise in amplitude modulation systems
Lecture 13	Noise in Frequency modulation systems
Lecture 14	Pre-emphasis and Deemphasis
Lecture 15	Threshold effect in angle modulation
Lecture 16	Pulse modulation. Sampling
Lecture 17	Pulse Amplitude and Pulse code modulation (PCM)
Lecture 18	Pulse Amplitude and Pulse code modulation (PCM)
Lecture 19	Differential pulse code modulation
Lecture 20	Delta modulation
Lecture 21	Noise considerations in PCM

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Lecture 22	Time Division multiplexing, Digital Multiplexers
Lecture 23	Elements of Detection Theory
Lecture 24	Optimum detection of signals in noise
Lecture 25	Coherent communication with waveforms- Probability of Error evaluations
Lecture 26	Coherent communication with waveforms- Probability of Error evaluations
Lecture 27	Baseband Pulse Transmission- Inter symbol Interference and Nyquist criterion
Lecture 28	Baseband Pulse Transmission- Inter symbol Interference and Nyquist criterion
Lecture 29	Pass band Digital Modulation schemes
Lecture 30	Phase Shift Keying
Lecture 31	Frequency Shift Keying
Lecture 32	Quadrature Amplitude Modulation
Lecture 33	Continuous Phase Modulation and Minimum Shift Keying.
Lecture 34	Digital Modulation tradeoffs
Lecture 35	Optimum demodulation of digital signals over band-limited channels
Lecture 36	Optimum demodulation of digital signals over band-limited channels
Lecture 37	Maximum likelihood sequence detection (Viterbi receiver)
Lecture 38	Equalization Techniques
Lecture 39	Synchronization and Carrier Recovery for Digital modulation
Lecture 40	Synchronization and Carrier Recovery for Digital modulation

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Assignments:

Assignment 1	**Q1.** Design Modulator and Demodulator of SSB-SC Modulation based on its mathematical expression.
	Q2. Derive the figure of merit in a) FM Receiver b) PM Receiver
	Q3. A Carrier signal c(t) = 20 cos ($2\pi 10^6$t) is modulated by a message signal having three frequencies 5 KHz, 10 KHz & 20 KHz. The corresponding modulation indexes are 0.4, 0.5 & 0.6. Sketch the spectrum. Calculate bandwidth, power and efficiency.
Assignment 2	**Q1.** Derive the expression for probability of error in ASK, FSK and PSK systems and compare them.
	Q2. With block diagrams explain about DPCM & DM. also compare them.
	Q3. A message signal m(t) = 4 cos ($2\pi 10^3$t) is sampled at nyquist rate and transmitted through a channel using 3-bit PCM system. i. Calculate all the parameters of the PCM. ii. If the sampled values are 3.8, 2.1, 0.5, -1.7, -3.2 & -4 then determine the quantizer output, encoder output andquantization error per each sample. iii. Sketch the transfer characteristics of the quantizer.

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4EC4-21: Analog and Digital Communication Lab

Credit: 1.5 **Max. Marks: 75(IA:45, ETE:30)**

0L+0T+3P

List of Experiments	
Sr. No.	**Name of Experiment**
1.	Observe the Amplitude modulated wave form & measure modulation index and demodulation of AM signal.
2.	Harmonic analysis of Amplitude Modulated wave form.
3.	Generation & Demodulation of DSB – SC signal.
4.	Modulate a sinusoidal signal with high frequency carrier to obtain FM signal and demodulation of the FM signal.
5.	Verification of Sampling Theorem.
6.	To study & observe the operation of a super heterodyne receiver.
7.	PAM, PWM & PPM: Modulation and demodulation.
8.	To observe the transmission of four signals over a single channel using TDM-PAM method.
9.	To study the PCM modulation & demodulation and study the effect of channel like attenuation, noise in between modulator & demodulator through the experimental setup.
10.	To study the 4 channel PCM multiplexing & de-multiplexing in telephony system.
11.	To study the Delta & Adaptive delta modulation & demodulation and also study the effect of channel like attenuation, noise in between modulator & demodulator through the experimental setup.
12.	To perform the experiment of generation and study the various data formatting schemes (Unipolar, Bipolar, Manchester, AMI etc.)
13.	To perform the experiment of generation and detection of ASK, FSK, BPSK, DBPSK signals with variable length data pattern.

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Course Outcome:

Course Code	Course Name	Course Outcome	Details
4EC4-21	Analog and Digital Communication Lab	CO 1	Understand different analog modulation schemes and evaluate modulation index
		CO 2	Able to understand the principle of superhetrodyne receiver
		CO 3	Develop time division multiplexing concepts in real time applications
		CO 4	Develop and able to comprehend different data formatting schemes
		CO 5	Comprehend and analyze the concepts of different digital modulation techniques in communication.

CO-PO Mapping:

Subject	Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
4EC4-21 Analog and Digital Communication Lab	CO 1	3	2		1								
	CO 2	3	2	1									
	CO 3	3	3	2	2	1							
	CO 4	3	3	2	2	1							
	CO 5	3	3	2	2	1							

3: Strongly **2: Moderate** **1: Weak**

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4EC4-22: Analog Circuits Lab

Credit: 1.5 **Max. Marks: 75(IA:45, ETE:30)**

0L+0T+3P

List of Experiments	
Sr. No.	**Name of Experiment**
1.	Study and implementation of Voltage Series and Current Series Negative Feedback Amplifier.
2.	Study and implementation of Voltage Shunt and Current Shunt Negative Feedback Amplifier.
3.	Plot frequency response of BJT amplifier with and without feedback in the emitter circuit and calculate bandwidth, gain bandwidth product with and without negative feedback.
4.	Study and implementation of series and shunt voltage regulators and calculate line regulation and ripple factor.
5.	Plot and study the characteristics of small signal amplifier using FET.
6.	Study and implementation of push pull amplifier. Measure variation of output power & distortion with load and calculate the efficiency.
7.	Study and implementation of Wein bridge oscillator and observe the effect of variation in oscillator frequency.
8.	Study and implementation of transistor phase shift oscillator and observe the effect of variation in R & C on oscillator frequency and compare with theoretical value.
9.	Study and implementation of the following oscillators and observe the effect of variation of capacitance on oscillator frequency: (a) Hartley (b) Colpitts.
10.	Study and implementation of the Inverting And Non-Inverting Operational Amplifier.
11.	Study and implementation of Summing, Scaling And Averaging of Operational Amplifier
12.	Implementation of active filters using OPAMP.

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Course Outcome:

Course Code	Course Name	Course Outcome	Details
4EC4-22	Analog Circuits Lab	CO 1	Discuss and observe the operation of a bipolar junction transistor and field-effect transistor in different region of operations.
		CO 2	Analyze and design of transistor Amplifier and Oscillators. Importance of negative feedback.
		CO 3	Analyze the frequency response of amplifiers and operational amplifier circuits. Develop an intuition for analog circuit behavior in both linear and nonlinear operation.
		CO 4	Design op-amps for specific gain, speed, or switching performance. Compensate operational amplifiers for stability.
		CO 5	Design and conduct experiments, interpret and analyze data, and report results.

CO-PO Mapping:

Subject	Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
4EC4-22 Analog Circuits Lab	CO 1	3	2	1	2	2							
	CO 2	2	3	1	2	3							
	CO 3	1	3	2	3	2							
	CO 4	1	2	3	2	3							
	CO 5	1	2	3	3	3							

3: Strongly **2: Moderate** **1: Weak**

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4EC4-23: Microcontrollers Lab

Credit: 1.5 **Max. Marks: 75(IA:45, ETE:30)**

0L+0T+3P

List of Experiments	
Sr. No.	**Name of Experiment**
Following exercises has to be Performed on 8085	
1.	Write a program for 1.1 Multiplication of two 8 bit numbers 1.2 Division of two 8 bit numbers
2.	Write a program to arrange a set of data in Ascending and Descending order.
3.	Write a program to find Factorial of a given number.
4.	Write a program to generate a Software Delay. 4.1 Using a Register 4.2 Using a Register Pair
8085 Interfacing Programs	
5.	5.1 Write a program to Interface ADC with 8085.
	5.2 Write a program to interface Temperature measurement module with 8085.
6.	Write a program to interface Keyboard with 8085.
7.	Write a program to interface DC Motor and stepper motor with 8085.
Following exercises has to be Performed on 8051	
8.	Write a program to convert a given Hex number to Decimal.
9.	Write a program to find numbers of even numbers and odd numbersamong 10 Numbers.
10.	Write a program to find Largest and Smallest Numbers among 10 Numbers.
11.	11.1 To study how to generate delay with timer and loop.
	11.2 Write a program to generate a signal on output pin using timer.
8051 Interfacing Programs	
12	12.1 Write a program to interface Seven Segment Display with 8051.
	12.2 Write a program to interface LCD with 8051.
13	Write a program for Traffic light Control using 8051.
14	Write a program for Elevator Control using 8051.

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Course Outcome:

Course Code	Course Name	Course Outcome	Details
4EC4-23	Microcontrollers Lab	CO 1	Develop skills related to assembly level programming of microprocessors and microcontroller.
		CO 2	Interpret the basic knowledge of microprocessor and microcontroller interfacing, delay generation, waveform generation and Interrupts.
		CO 3	Interfacing the external devices to the microcontroller and microprocessor to solve real time problems.
		CO 4	Illustrate functions of various general purpose interfacing devices.
		CO 5	Develop a simple microcontroller and microprocessor based systems

CO-PO Mapping:

Subject	Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
4EC4-23 Microcontrollers Lab	CO 1	2	1	2	1	3							
	CO 2	3	2	1	2	1							
	CO 3	1	1	3	1	3							
	CO 4	2	2	1									
	CO 5	1	1	3	2	2		2					

3: Strongly **2: Moderate** **1: Weak**

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4EC4-24: Electronics Measurement & Instrumentation Lab

Credit: 1.5 **Max. Marks: 75(IA:45, ETE:30)**

0L+0T+3P

List of Experiments	
Sr. No.	**Name of Experiment**
1.	Measure earth resistance using fall of potential method.
2.	Plot V-I characteristics & measure open circuit voltage & short circuit current of a solar panel.
3.	Measure unknown inductance capacitance resistance using following bridges (a) Anderson Bridge (b) Maxwell Bridge
4.	To measure unknown frequency & capacitance using Wein's bridge.
5.	Measurement of the distance with the help of ultrasonic transmitter & receiver.
6.	Measurement of displacement with the help of LVDT.
7.	Draw the characteristics of the following temperature transducers (a) RTD (Pt-100) (b) Thermistors.
8.	Draw the characteristics between temperature & voltage of a K type thermocouple
9.	Calibrate an ammeter using D.C. slide wire potentiometer
10.	Measurement of strain/force with the help of strain gauge load cell.
11.	Study the working of Q-meter and measure Q of coils.
12.	Calibrate a single-phase energy meter (Analog and Digital) by phantom loading at different power factor by: (i) Phase shifting transformer (ii) Auto transformer.

Course Outcome:

Course Code	Course Name	Course Outcome	Details
4EC4-24	Electronic Measurement & Instrumentation Lab	**CO 1**	Understanding of the fundamentals of Electronic Instrumentation. Explain and identify measuring instruments.
		CO 2	Able to measure resistance, inductance and capacitance by various methods.
		CO 3	Design an instrumentation system that meets desired specifications and requirements.
		CO 4	Design and conduct experiments, interpret and analyze data, and report results.
		CO 5	Explain the principle of electrical transducers. Confidence to apply instrumentation solutions for given industrial applications.

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CO-PO Mapping:

Subject	Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
4EC4-24 Electronic Measurement & Instrumentation Lab	**CO 1**	3	2	1	2	2							
	CO 2	2	3	1	2	3							
	CO 3	1	3	2	3	2							
	CO 4	1	2	3	2	3							
	CO 5	1	2	3	3	3							

3: Strongly **2: Moderate** **1: Weak**

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Syllabus of

UNDERGRADUATE DEGREE COURSE

B.Tech. V Semester

Electronics & Communication Engineering

Rajasthan Technical University, Kota

Effective from session: 2019 – 2020

5EC3-01: Computer Architecture

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Basic Structure of Computers, Functional units, software, performance issues software, machineinstructions and programs, Types of instructions, Instruction sets: Instruction formats, Assembly language, Stacks, Ques, Subroutines.	6
3	Processor organization, Information representation, number formats. Multiplication & division, ALU design, Floating Point arithmetic, IEEE 754 floating pointformats	5
4	Control Design, Instruction sequencing, Interpretation, Hard wired controlDesignmethods, and CPU control unit. Microprogrammed Control - Basic concepts, minimizing microinstruction size, multiplier control unit. Microprogrammed computers - CPU control unit	6
5	Memory organizations, device characteristics, RAM, ROM, Memory management, Concept ofCache & associative memories, Virtual memory.	5
6	System organization, Input - Output systems, Interrupt, DMA, Standard I/O interfacesConcept of parallel processing, Pipelining, Forms of parallel processing, interconnect network	5
	Total	28

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5EC4-02: Electromagnetics Waves

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	01
2	Transmission Lines-Equations of Voltage and Current on TX line, Propagation constant and characteristic impedance, and reflection coefficient and VSWR, Impedance Transformation on Loss-less and Low loss Transmission line, Power transfer on TX line, Smith Chart, Admittance Smith Chart, Applications of transmission lines: Impedance Matching, use transmission line sections as circuit elements.	08
3	Maxwell's Equations-Basics of Vectors, Vector calculus, Basic laws of Electromagnetics,Maxwell's Equations, Boundary conditions at Media Interface.	03
4	Uniform Plane Wave-Uniform plane wave, Propagation of wave, Wave polarization, Poincare's Sphere, Wave propagation in conducting medium, phase and group velocity, Power flow and Poynting vector, Surface current and power loss in a conductor.	08
5	Plane Waves at a Media Interface-Plane wave in arbitrary direction, Reflection and refraction at dielectric interface, Total internal reflection, wave polarization at media interface, Reflection from a conducting boundary.	07
6	Waveguides- Wave propagation in parallel plate waveguide, Analysis of waveguide general approach, Rectangular waveguide, Modal propagation in rectangular waveguide, Surface currents on the waveguide walls, Field visualization, Attenuation in waveguide.	08
7	Radiation-Solution for potential function, Radiation from the Hertz dipole, Power radiated by hertz dipole, Radiation Parameters of antenna, receiving antenna, Monopole and Dipole antenna	07
	Total	42

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5EC4-03: Control system

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Introduction to control problem- Industrial Control examples. Transfer function. System with dead-time. System response. Control hardware and their models: potentiometers, synchros, LVDT, dc and ac servomotors, tacho-generators, electro hydraulic valves, hydraulicservomotors, electro pneumatic valves, pneumatic actuators. Closed-loop systems. Block diagram and signal flow graph analysis.	8
3	Feedback control systems- Stability, steady-state accuracy,transient accuracy, disturbance rejection, insensitivity and robustness. proportional, integral and derivative systems. Feedforward and multi-loop control configurations, stability concept, relative stability, Routhstability criterion.	7
4	Time response of second-order systems- steady-state errors and error constants. Performance specifications in time-domain. Root locus method of design. Lead and lag compensation.	6
5	Frequency-response analysis- Polar plots, Bode plot, stability in frequency domain, Nyquistplots. Nyquist stability criterion. Performance specifications in frequency-domain. Frequency domain methods of design, Compensation & their realization in time & frequency domain. Lead and Lag compensation. Op-amp based and digital implementation of compensators. Tuning of process controllers. State variable formulation and solution.	8
6	State variable Analysis- Concepts of state, state variable, state model, state modelsfor linearcontinuous time functions, diagonalization of transfer function, solution of state equations, concept of controllability &observability.	6
7	Introduction to Optimal control & Nonlinear control, Optimal Control problem, Regulator problem, Output regulator, treking problem. Nonlinear system – Basic concept & analysis.	6
	Total	42

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5EC4-04: Digital Signal Processing

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Discrete time signals: Sequences; representation of signals on orthogonal basis; Sampling and reconstruction of signals; Discrete systems attributes, Z-Transform, Analysis of LSI systems, frequency Analysis, Inverse Systems	10
3	Discrete Fourier Transform (DFT), Fast Fourier Transform Algorithm, Implementation of Discrete Time Systems	9
4	Design of FIR Digital filters: Window method, Park-McClellan's method. Design of IIR DigitalFilters: Butterworth, Chebyshev and Elliptic Approximations; Lowpass, Bandpass, Bandstop and High pass filters.	10
5	Effect of finite register length in FIR filter design. Parametric and non-parametric spectral estimation. Introduction to mult-irate signal processing. Application of DSP.	10
	Total	40

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5EC4-05: Microwave Theory & Techniques

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Introduction to Microwaves-History of Microwaves, Microwave Frequency bands; Applications of Microwaves: Civil and Military, Medical, EMI/ EMC.	4
3	Mathematical Model of Microwave Transmission-Concept of Mode, Features of TEM, TE and TM Modes, Losses associated with microwave transmission, Concept of Impedance in Microwave transmission.	5
4	Analysis of RF and Microwave Transmission Lines-Coaxial line, Rectangularwaveguide, Circular waveguide, Strip line, Micro strip line.	4
5	Microwave Network Analysis-Equivalent voltages and currents for non-TEMlines, Networkparameters for microwave circuits, Scattering Parameters.	4
6	Passive and Active Microwave Devices-Microwave passive components: Directional Coupler, Power Divider, Magic Tee, Attenuator, Resonator.Microwave active components: Diodes, Transistors, Oscillators, Mixers.Microwave Semiconductor Devices: Gunn Diodes, IMPATT diodes, Schottky Barrier diodes, PIN diodes.Microwave Tubes: Klystron, TWT, Magnetron.	6
7	Microwave Design Principles-Impedance transformation, Impedance Matching, Microwave Filter Design, RF and Microwave Amplifier Design, Microwave Power Amplifier Design, Low Noise Amplifier Design, Microwave Mixer Design, Microwave Oscillator Design. Microwave Antennas- Antenna parameters, Antenna for ground based systems, Antennas for airborne and satellite borne systems, Planar Antennas.	6
8	Microwave Measurements-Power, Frequency and impedance measurement at microwave frequency, Network Analyzer and measurement of scattering parameters, Spectrum Analyzerand measurement of spectrum of a microwave signal, Noise at microwave frequency and measurement of noise figure. Measurement of Microwave antenna parameters.	6
9	Microwave Systems-Radar, Terrestrial and Satellite Communication, Radio Aidsto Navigation, RFID, GPS. Modern Trends in Microwaves Engineering- Effect of Microwaves on human body, Medical and Civil applications of microwaves, Electromagnetic interference and Electromagnetic Compatibility (EMI & EMC), Monolithic Microwave ICs, RFMEMS for microwave components, Microwave Imaging.	6
	Total	**42**

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5EC5-11: Bio-Medical Electronics

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Brief introduction to human physiology. Biomedical transducers: displacement,velocity, force, acceleration, flow, temperature, potential, dissolved ions and gases.	9
3	Bio-electrodes and biopotential amplifiers for ECG, EMG, EEG, etc.	7
4	Measurement of blood temperature, pressure and flow. Impedance plethysmography. Ultrasonic, X-ray and nuclear imaging.Prostheses and aids: pacemakers, defibrillators, heart-lung machine, artificial kidney, aids for the handicapped. Safety aspects.	11
	Total	28

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5EC5-12: Embedded Systems

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	The concept of embedded systems design, Embedded microcontroller cores, embedded memories.	5
3	Examples of embedded systems, Technological aspects of embedded systems: interfacing between analog and digital blocks, signal conditioning, digital signal processing. Sub system interfacing, interfacing with external systems, user interfacing.	10
4	Design tradeoffs due to process compatibility, thermal considerations, etc., Software aspects of embedded systems: real time programming languages and operating systems for embedded systems.	12
	Total	28

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5EC5-13: Probability Theory & Stochastic Process

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Sets and set operations; Probability space; Conditional probability and Bayes theorem; Combinatorial probability and sampling models.	5
3	Discrete random variables, probability mass function, probability distribution function, example random variables and distributions; Continuous random variables, probability density function, probability distribution function, example distributions;	6
4	Joint distributions, functions of one and two random variables, moments of random variables; Conditional distribution, densities and moments; Characteristic functions of a random variable; Markov, Chebyshev and Chernoff bounds;	6
5	Random sequences and modes of convergence (everywhere, almost everywhere, probability, distribution and mean square); Limit theorems; Strong and weak laws of large numbers, central limit theorem	5
6	Random process. Stationary processes. Mean and covariance functions. Ergodicity. Transmission of random process through LTI. Power spectral density.	4
	Total	27

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5EC5-14: Satellite Communication

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Introduction to Satellite Communication: Principles and architecture of satellite Communication, Brief history of Satellite systems, advantages, disadvantages, applications and frequency bands used for satellite communication.	4
3	Orbital Mechanics: Orbital equations, Kepler's laws, Apogee and Perigee for an elliptical orbit, evaluation of velocity, orbital period, angular velocity etc. of a satellite, concepts of Solar day and Sidereal day.	4
4	Satellite sub-systems: Study of Architecture and Roles of various sub-systems of a satellite system such as Telemetry, tracking, command and monitoring (TTC & M), Attitude and orbit control system (AOCS), Communication sub-system, power sub-systems etc.	5
5	Typical Phenomena in Satellite Communication: Solar Eclipse on satellite, its effects, remedies for Eclipse, Sun Transit Outage phenomena, its effects and remedies, Doppler frequency shift phenomena and expression for Doppler shift. Satellite link budget	5
6	Flux density and received signal power equations, Calculation of System noise temperature for satellite receiver, noise power calculation, Drafting of satellite link budget and C/N ratio calculations in clear air and rainy conditions.	4
7	Modulation and Multiple Access Schemes: Various modulation schemes used in satellite communication, Meaning of Multiple Access, Multiple access schemes based on time, frequency, and code sharing namely TDMA, FDMA and CDMA.	4
	Total	**27**

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5EC4-21: RF Simulation Lab

Credit: 1.5 **Max. Marks: 75(IA:45, ETE:30)**
0L+0T+3P **End Term Exam: 2 Hours**

SN	Contents
1	Introduction: Objective, scope and outcome of the course.
2	Study of field pattern of various modes inside a rectangular and circular waveguide.
3	Find the change in characteristics impedance and reflection coefficients of the transmission line by changing the dielectric properties of materials embedded between two conductors.
4	Design and simulate the following Planar Transmission Lines: I. Strip and micro-strip lines II. Parallel coupled strip line III. Coplanar and Slot lines Determine their field patterns and characteristic impedance.
5	Design and simulate the following: I. 3-dB branch line coupler II. Wilkinson power divider III. Hybrid ring IV. Backward wave coupler V. Low pass filters VI. Band pass filters
6	Design RF amplifier using microwave BJT.
7	Design RF amplifier using microwave FET.

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5EC4-22: Digital Signal Processing Lab

Credit: 1.5 **Max. Marks: 75(IA:45, ETE:30)**
0L+0T+3P **End Term Exam: 2 Hours**

SN	Contents
1	Introduction: Objective, scope and outcome of the course.
2	Generation of continuous and discrete elementary signals (impulse,unit-step,ramp) using mathematical expression.
3	Perform basic operations on signals like adding, subtracting, shifting and scaling.
4	Perform continuous and discrete time Convolution (using basic definition).
5	Checking Linearity and Time variance property of a system using convolution, shifting.
6	To generate and verify random sequences with arbitrary distributions, means and variances for following: (a) Rayleigh distribution (b) Normal distributions: N(0,1). (c) Gaussion distributions: N (m, x) (d) Random binary wave.
7	To find DFT / IDFT of given DT signal.
8	N-point FFT algorithm.
9	To implement Circular convolution.
10	MATLAB code for implementing z-transform and inverse z-transform.
11	Perform inverse z-transform using residuez MATLAB function.
12	MATLAB program to find frequency response of analog LP/HP filters.
13	To design FIR filter (LP/HP) using windowing (rectangular, triangular, Kaiser) technique using simulink.

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5EC4-23: Microwave Lab

Credit: 1 **Max. Marks: 50(IA:30, ETE:20)**
0L+0T+2P **End Term Exam: 2 Hours**

SN	Contents
1	Introduction: Objective, scope and outcome of the course.
2	Study of various microwave components and instruments like frequency meter, attenuator, detector and VSWR meter. (a) Measurement of guide wavelength and frequency using a X-band slotted line setup. (b) Measurement of low and high VSWR using a X-band slotted line setup.
3	Introduction to Smith chart, measurement of SWR, shift in minimum standing wave with unknown load and calculation of unknown load impedance using Smith chart.
4	Study the behavior of terminated coaxial transmission lines in time and frequency domain.
5	(a) Draw the V-I characteristics of a Gunn diode and determine the output power and frequency as a function of voltage. (b) Study the square wave modulation of microwave signal using PIN diode.
6	Study the square wave modulation of microwave signal using PIN diode.Study and measure the power division and isolation characteristics of a microstrip 3dB power divider.
7	Study of rat race hybrid ring (equivalent of waveguide Magic-Tee) in micro-strip.
8	(a) To study the characteristics of micro-strip 3dB branch line coupler, strip line backward wave coupler as a function of frequency and compare their bandwidth. (b) (b)Measure the microwave input, direct, coupled and isolated powers of a backward wave strip line coupler at the centre frequency using a power meter. From the measurements calculate the coupling, isolation and directivity of the coupler.

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Syllabus of

UNDERGRADUATE DEGREE COURSE

B.Tech. VI Semester

Electronics & Communication Engineering



Rajasthan Technical University, Kota

Effective from session: 2019-20

6EC3-01: Power Electronics

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	SEMICONDUCTOR POWER DEVICES: Introduction. Basic characteristics &working of Power Diodes, Diac, Triac, MOSFETs, IGBT, GTO, Power Transistor and SCR- Principle of operation, V-I Characteristics, Turn-On mechanism and its applications	6
3	CONVERTERS: Basic concept, Working Principles of Single phase half Wave bridge converter, Single Phase Full Bridge Converter, 3 Phase Bridge Converter	5
4	INVERTERS: Voltage Source Inverter, Current Source Inverter, PWM Control of Voltage Source Converter and applications.	5
5	INDUSTRIAL POWER SUPPLIES: Principle of operation of choppers. Step up, Step down and reversible choppers. Chopper control techniques, High frequency electronic ballast, Switch Mode Power Supply: Fly back converter, forward/buck converter, Boost converter and buck-boost converter. Uninterruptible Power Supply.	6
6	MOTOR CONTROL: Introduction to speed control of DC motors using phase controlled converters and choppers, Basic idea of speed control of three phase induction motors using voltage and frequency control methods.	5
	Total	28

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6EC4-02: Computer Network

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Queuing Theory- Pure birth, Pure death & Birth-death processes, Mathematical models for M/M/1, M/M/ ∞ , M/M/m, M/M/1/K and M/M/m/m queues. Little's formula.	7
3	Introduction to computer networks and the Internet: Application layer: Principles of network applications, The Web and Hyper Text Transfer Protocol, File transfer, Electronic ail, Domain name system, Peer-to-Peer file sharing, Socket programming, Layering concepts. Packet switching, Blocking in packet switches, Three generations of packet switches, switch fabric, Buffering, Multicasting, Statistical Multiplexing.	9
4	Transport layer: Connectionless transport - User Datagram Protocol, Connection oriented transport – Transmission Control Protocol, Remote Procedure Call. Congestion Control and Resource Allocation: Issues in Resource Allocation, Queuing Disciplines, TCP congestion Control, Congestion Avoidance Mechanisms and Quality of Service.	9
5	Network layer: Virtual circuit and Datagram networks, Router, Internet Protocol, Routing algorithms, Broadcast and Multicast routing	7
6	Link layer: ALOHA, Multiple access protocols, IEEE 802 standards, Local Area Networks, addressing, Ethernet, Hubs, Switches.Fundamental of SDN, Open flow.	7
	Total	40

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6EC4-03: Fiber Optics Communications

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Introduction to vector nature of light, propagation of light, propagation of light in a cylindricaldielectric rod, Ray model, wave model.Different types of optical fibers, Modal analysis of a step index fiber.	8
3	Signal degradation on optical fiber due to dispersion and attenuation. Fabrication of fibers andmeasurement techniques like OTDR	7
4	Optical sources - LEDs and Lasers, Photo-detectors - pin-diodes, APDs, detectorresponsivity, noise, optical receivers. Optical link design - BER calculation, quantum limit, power penalties.	8
5	Optical switches - coupled mode analysis of directional couplers, electro-optic switches.Optical amplifiers - EDFA, Raman amplifier.	8
6	WDM and DWDM systems. Principles of WDM networks.Nonlinear effects in fiber optic links. Concept of self-phase modulation, groupvelocity dispersion and solition based communication.	8
	Total	40

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6EC4-04: Antennas and Propagation

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Fundamental Concepts-Physical concept of radiation, Radiation pattern, near andfar-field regions, reciprocity, directivity and gain, effective aperture, polarization, input impedance, efficiency, Friis transmission equation, radiation integrals and auxiliary potential functions.	7
3	Radiation from Wires and Loops-Infinitesimal dipole, finite-length dipole, linear elements near conductors, dipoles for mobile communication, small circular loop.	6
4	Aperture and Reflector Antennas-Huygens' principle, radiation from rectangular and circular apertures, design considerations, Babinet's principle, Radiation from sectoral and pyramidal horns, design concepts, prime-focus parabolic reflector and cassegrain antennas.	7
5	Broadband Antennas-Log-periodic and Yagi-Uda antennas, frequency independent antennas, broadcast antennas.	5
6	Micro strip Antennas-Basic characteristics of micro strip antennas, feeding methods, methods of analysis, design of rectangular and circular patch antennas.	6
7	Antenna Arrays-Analysis of uniformly spaced arrays with uniform and non-uniform excitation amplitudes, extension to planar arrays, synthesis of antenna arrays using Schelkun off polynomial method, Woodward-Lawson method.	5
8	Basic Concepts of Smart Antennas-Concept and benefits of smart antennas, fixed weight beamforming basics, Adaptive beam forming.	4
9	Different modes of Radio Wave propagation used in current practice.	1
	Total	42

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6EC4-05: Information Theory and Coding

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	01
2	Basics of information theory, entropy for discrete ensembles; Shannon's noiseless coding theorem; Encoding of discrete sources.	15
3	Markov sources; Shannon's noisy coding theorem and converse for discrete channels; Calculation of channel capacity and bounds for discrete channels; Application to continuous channels.	15
4	Techniques of coding and decoding; Huffman codes and uniquely detectable codes; Cyclic codes, convolutional arithmetic codes.	10
	Total	41

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6EC5-11: Introduction to MEMS

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Introduction and Historical Background.	1
3	Mechanics of solids in MEMS/NEMS: Stresses, Strain, Hookes's law, Poisson effect, Linear Thermal Expansion, Bending; Energy methods, Overview of Finite Element Method, Modeling of Coupled Electromechanical Systems.	14
4	Scaling Effects. Micro/Nano Sensors, Actuators and Systems overview: Case studies. Review of Basic MEMS fabrication modules: Oxidation, Deposition Techniques, Lithography (LIGA), and Etching.	14
5	Micromachining: Surface Micromachining, sacrificial layer processes, Stiction; Bulk Micromachining, Isotropic Etching and Anisotropic Etching, Wafer Bonding.	10
	Total	40

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6EC5-12: Nano Electronics

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	01
2	Introduction to nanotechnology, meso structures, Basics of Quantum Mechanics: Schrodinger equation, Density of States. Particle in a box Concepts, Degeneracy. Band Theory of Solids. Kronig-Penny Model. Brillouin Zones.	15
3	Shrink-down approaches: Introduction, CMOS Scaling, The nano scale MOSFET, Finfets, Vertical MOSFETs, limits to scaling, system integration limits (interconnect issues etc.).	10
4	Resonant Tunneling Diode, Coulomb dots, Quantum blockade, Single electron transistors,Carbon nanotube electronics, Bandstructure and transport, devices, applications, 2D semiconductors and electronic devices, Graphene, atomistic simulation	14
	Total	40

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6EC5-13: Neural Network And Fuzzy Logic Control

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	**NEUROPHYSIOLOGY:** Introduction: Elementary neurophysiology – From neurons to ANNs - Neuron model McCulloch-Pitts model, Hebbian Hypothesis; limitations of single-layered neural networks.Applications Of Neural Networks: Pattern classification, Associative memories, Optimization, Applications in Image Processing-Iris, finger print & face, Applications in decision making.	8
3	**THE PERCEPTRON:** The Perceptron and its learning law. Classification of linearly separable patterns. Linear Networks: Adaline - the adaptive linear element. Linear regression. The Wiener-Hopf equation. The Least-Mean-Square (Widrow-Hoff) learning algorithm. Method of steepest descent. Adaline as a linear adaptive filter. A sequential regression algorithm.Multi-Layer Feedforward Neural Networks: Multi-Layer Perceptrons. Supervised Learning. Approximation and interpolation of functions. Back-Propagation Learning law. Fast training algorithms. Applications of multilayer perceptrons: Image coding, Paint-quality inspection, Nettalk.	9
4	**FUZZY LOGIC:** Introduction -Uncertainty & precision, Statistics and random process, Uncertainty in information, Fuzzy sets and membership. Membership Functions: Features of membership function. Standard forms and boundaries, Fuzzification, Membership value assignment – Intuition, Inference, Neural networks. Fuzzy To Crisp Conversions: Maximum membership principle.	7
5	**DEFUZZIFICATION METHODS-** Centroid method, Weighted average method, Meanmax membership. Fuzzy Rule Based Systems: Natural language, linguistic hedges, Rule based system –Canonical rule forms, Decomposition of compound rules, Likelihood and truth qualification Aggregation of Fuzzy rules. Graphical techniques of reference.	8
6	**FUZZY CONTROL SYSTEM-** Simple Fuzzy Logic controller, General FLC, Control System Design Problem Control (Decision) Surface, Assumptions in a Fuzzy Control System Design, Special forms of FLC system models, Industrial application: Aircraft Landing Control Problem.Fuzzy Engineering Process Control: Classical Feedback Control, Classical PID Control, Multi-input, Multi-output (MIMO) Control Systems, Fuzzy Statistical Process Control	9
	Total	42

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6EC5-14: High Speed Electronics

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Transmission line theory (basics) crosstalk and nonideal effects; signal integrity: impact ofpackages, vias, traces, connectors; non-ideal return current paths, high frequency powerdelivery,methodologies for design of high speed buses; radiated emissions and minimizing system noise;Noise Analysis: Sources, Noise Figure, Gain compression, Harmonic distortion,Intermodulation,Cross-modulation, Dynamic range	10
3	Devices: Passive and active, Lumped passive devices (models), Active (models, low vs High frequency)	6
4	RF Amplifier Design, Stability, Low Noise Amplifiers, Broadband Amplifiers (and Distributed)Power Amplifiers, Class A, B, AB and C, D E Integrated circuit realizations, Cross-overdistortion Efficiency RF power output stages	8
5	Mixers –Up conversion Down conversion, Conversion gain and spurious response. OscillatorsPrinciples.PLL Transceiver architectures	8
6	Printed Circuit Board Anatomy, CAD tools for PCB design, Standard fabrication, Micro viaBoards. Board Assembly: Surface Mount Technology, Through Hole Technology, ProcessControl and Design challenges.	8
	Total	41

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6EC4-21: Computer Network Lab

Credit: 2 **Max. Marks: 100(IA:60, ETE:40)**
0L+0T+4P **End Term Exam: 2 Hours**

SN	Contents
1	Introduction: Objective, scope and outcome of the course.
2	PRELIMINARIES: Study and use of common TCP/IP protocols and term viz. telnet rlogin ftp, ping, finger, Socket, Port etc.
3	DATA STRUCTURES USED IN NETWORK PROGRAMMING: Representation of unidirectional, Directional weighted and unweighted graphs.
4	ALGORITHMS IN NETWORKS: computation of shortest path for one source-one destination and one source –all destination
5	SIMULATION OF NETWORK PROTOCOLS: i. Simulation of M/M/1 and M/M/1/N queues. ii. Simulation of pure and slotted ALOHA. iii. Simulation of link state routing algorithm.
6	Case study : on LAN Training kit i. Observe the behavior& measure the throughput of reliable data transfer protocols under various Bit error rates for following DLL layer protocols- a. Stop & Wait b. Sliding Window : Go-Back-N and Selective Repeat ii. Observe the behavior& measure the throughput under various network load conditions for following MAC layer Protocols a. Aloha b. CSMA, CSMA/CD & CSMA/CA c. Token Bus & Token Ring
7	Software and hardware realization of the following: i. Encoding schemes: Manchester, NRZ. ii. Error control schemes: CRC, Hamming code.

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6EC4-22: Antenna and Wave Propagation Lab

Credit: 1 **Max. Marks: 50(IA:30, ETE:20)**
0L+0T+2P **End Term Exam: 2 Hours**

SN	Contents
	PART-I (Antenna)
1	Study the gain pattern, HPBW, FNBW and Directivity of a dipole antenna.
2	Measurement of Radiation Pattern, Gain, HPBW of a folded dipole antenna.
3	Measurement of Radiation Pattern, Gain, HPBW of a loop antenna
4	Measurement of Radiation Pattern, Gain, VSWR, input impedance and reflection coefficient for given Monopole antenna
5	Measurement of Radiation Pattern, Gain, VSWR, input impedance and reflection coefficient for given Yagi antennas
6	Study of the Radiation Pattern, Gain, HPBW of a horn antenna
7	Study of the Radiation Pattern, Gain, HPBW of a reflector antennas
8	Study the radiation pattern, gain, VSWR, and input impedance of a rectangular microstrip patch antenna
9	Study the effect of inset feed on the input impedance of a rectangular patch antenna
10	Study the effect of ground plane on the radiation pattern of an antenna
11	Study antenna designing in CST Microwave Studio
12	Design a rectangular microstrip patch antenna using CST MWS
	PART-II (Optical Fiber) To perform following experiments based on Fiber Optic Trainer.
13	To set up Fiber Optic Analog link and Digital link.
14	Measurement of Propagation loss and numerical aperture.

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6EC4-23: Electronics Design Lab

Credit: 2 **Max. Marks: 100(IA:60, ETE:40)**
0L+0T+4P **End Term Exam: 2 Hours**

SN	Contents
	To design the following circuits, assemble these on bread board and test them and Simulation of these circuits with the help of appropriate software.
1	Op-Amp characteristics and get data for input bias current measure the output-offset voltage and reduce it to zero and calculate slew rate.
2	Op-Amp in inverting and non-inverting modes.
3	Op-Amp as scalar, summer and voltage follower.
4	Op-Amp as differentiator and integrator.
5	Design LPF and HPF using Op-Amp 741
6	Design Band Pass and Band reject Active filters using Op-Amp 741.
7	Design Oscillators using Op-Amp (i) RC phase shift (ii) Hartley (iii) Colpitts
8	Design (i) Astable (ii) Monostable multivibrators using IC-555 timer
9	Design Triangular & square wave generator using 555 timer.
10	Design Amplifier (for given gain) using Bipolar Junction Transistor.
11	Op-Amp characteristics and get data for input bias current measure the output-offsetvoltage and reduce it to zero and calculate slew rate.
12	Op-Amp in inverting and non-inverting modes.
13	Op-Amp as scalar, summer and voltage follower.

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6EC4-24: Power Electronics Lab

Credit: 1 **Max. Marks: 50(IA:30, ETE:20)**
0L+0T+2P **End Term Exam: 2 Hours**

SN	Contents
1	Study the characteristics of SCR and observe the terminal configuration, Measure the breakdown voltage, latching and holding current. Plot V-I characteristics.
2	Perform experiment on triggering circuits for SCR. i.e. R triggering, R-C triggering and UJT triggering circuit.
3	Study and test AC voltage regulators using triac, antiparallel thyristors and triac&diac.
4	Study and obtain the waveforms for single-phase bridge converter.
5	Perform experiment on single phase PWM inverter.
6	Perform experiment on buck, boost and buck-boost regulators.
7	Control speed of a dc motor using a chopper and plot armature voltage versus speed characteristic.
8	Control speed of a single-phase induction motor using single phase AC voltage regulator.
9	I. Study single-phase dual converter. II. Study speed control of dc motor using single-phase dual converter.
10	Study single-phase cyclo converter.
11	Perform experiment on Motor control – open loop & closed loop
12	Design, observe and perform experiment on various type of pulse generation from DSP/ FPGA Platform. Perform experiment for PWM inverters and choppers.

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7EC1A ANTENNAS & WAVE PROPAGATION

B.Tech. (EC) 7th sem. **Max. Marks: 100**

3L+0T **Exam Hours: 3**

UNIT	CONTENTS	CONTACT HOURS
I	**ANTENNA FUNDAMENTALS** – Review of Electromagnetic theory. Short elementary dipole and its fields. Basic antenna parameters - Radiation pattern, beamwidth, beam solid angle, directivity, efficiency, gain, radiation intensity, radiation resistance, input impedance and polarization. Receiving antenna- Reciprocity, effective length and aperture, antenna temperature.	8
II	**ANTENNA ARRAYS –** Point source, Array of two isotropic point sources. Uniform array of N point sources and array factor –Examples of 4 element broadside and endfire arrays. N-element linear array of elementary dipoles and principle of pattern multiplication. Two element array of elementary dipoles - Excitation with different relative phase shift and for different spacing.	7
III	**DIFFERENT TYPES OF ANTENNAS –** Thin linear antenna and thin half- wave dipole. V- and Rhombic antennas. Monopole antenna, Small loop antenna, Folded dipole and Yagi-Uda antenna. Broadband antennas – Broadband basics, log-periodic dipole array. Reflector antennas –Flat sheet, corner and parabolic reflector antennas. Slot, Horn and Lens antennas, Helical antennas. Microstrip patch antennas- Rectangular patch antenna, Two- element microstrip patch. *Antenna Measurements* - Antenna radiation pattern, gain, directivity and polarization. .	10
IV	**GROUND WAVE PROPAGATION** - Mechanism of radio wave propagation. Theory of ground reflection- Plane earth reflection, reflection factors for horizontal and vertical polarizations. Refraction and diffraction of radio waves. Space and surface waves. Tropospheric propagation, duct propagation and tropospheric scattering. .	7
V	**IONOSPHERIC PROPAGATION:** Various ionospheric layers, Electrical properties of the ionosphere and their effects on wave propagation. Critical frequency, virtual height, skip distance, maximum usable frequency. Multiple hop transmission. Effect of earth's magnetic field and Faraday rotation. Solar activity and meteorological conditions on wave propagation.	8
	TOTAL	**40**

TEXT BOOK

1. Sisir. Das and A. Das, Antenna and wave propagation, Tata McGraw-Hill Education Pvt. Ltd, (2013).
2. A.R. Harish and M. Sachidananda, Antennas and Wave Propagation, Oxford Univ. Press, Edition (2011).

REFERENCE BOOKS

SN	Name of Authors /Books /Publisher	Year of Publication
1.	J.D. Kraus, *Antennas*, Tata McGraw-Hill, 2nd Edition,	1999
2.	E.C. Jordan and K.G. Balmain, *Electromagnetic Waves and Radiating Systems*, Prentice-Hall of India, 2nd Edition,	1986
3.	T. Milligan, Microstrip Antenna Design, Wiley,	2005
4.	J.D. Kraus and R.J. Marhefka, Antennas for All Applications, Tata McGraw-Hill, Edition	2004
5.	R. Chatterjee, *Antenna Theory and Practice*,Wiley Eastern Ltd.,	1988
6.	Balanis Constantine A, Antenna theory, Analysis and design, 3rd edition, A John Wiley & Sons Inc. Publication	2005
7.	Collin R. E. And F. J. Zucker, Antenna Theory: Part I, McGraw-Hill, New York	1969
8.	Collin R. E. And F. J. Zucker, Antenna Theory: Part II, McGraw-Hill, New York	1969
9.	Ramesh Garg, P. Bhartia, Inder Bahl, and A Ittipiboon, Microstrip Antenna Design Hand, Artech House, Inc.	2001

7EC2A DIGITAL SIGNAL PROCESSING

B.Tech. (EC) 7th Sem. **Max. Marks: 100**

3L+1T **Exam Hours: 3**

UNIT	CONTENTS	Contact Hours
I	**SAMPLING** - Discrete time processing of Continuous-time signals, continuous time processing of discrete-time signals,	5
	Changing the sampling rate using discrete-time processing.	2
II	**TRANSFORM ANALYSIS OF LTI SYSTEMS** - Introduction, The frequency response of LTI systems, System functions for systems characterized by LCCD (Linear Constant Coefficient Difference) equations,	4
	All-pass system, Minimum-Phase systems, Linear systems with linear phase.	3
III	**STRUCTURES FOR DISCRETE-TIME SYSTEMS**- Block diagram and signal flow graph representation of LCCD equations,	2
	Basic structures for IIR and FIR systems, Transposed forms.	5
IV	**FILTER DESIGN TECHNIQUES -** Introduction, Analog filter Design: Butterworth & Chebyshev,	3
	IIR filter design by impulse invariance & Bilinear transformation,	2
	Design of FIR filters by Windowing: Rectangular, Hanning, Hamming & Kaiser.	5
V	**DFT, FFT**- The Discrete Fourier transform (DFT), Properties of the DFT, Linear Convolution using DFT,	5
	Efficient computation of the DFT: Decimation–in-Time and Decimation-in frequency FFT Algorithms.	4
	Total	**40**

TEXT BOOKs:

1. Proakis, Manolakis, "Digital Signal Processing: Principals, Algorithms And Applications", 4th ed., Pearson Education. (2006)
2. Oppenheim, Schafer, "Discrete Time Signal Processing", 3rd ed. , PHI (2010)

REFERENCE BOOKs:

S.No.	Name of Authors/Book/Publisher	Publication Year
1.	Digital Signal Processing: A Modern Introduction, Ambardar, cengage learning	2011
2.	Introduction to Digital Signal Processing using MATLAB, Schilling	2011
3	Sanjit K Mitra, "Digital Signal Processing", 4th ed., TMH	2013
4	Tan, Jiang, "Digital Signal Processing: Fundamentals and Applications",2nd ed., Elsevier	2008
5	Ifeachor, Jervis, "Digital Signal Processing", 2nd ed., Pearson Education	2009

7EC3A DIGITAL IMAGE PROCESSING

B.Tech. (EC) 7th Sem. **Max. Marks: 100**

3L+1T **Exam Hours: 3**

UNIT	CONTENTS	CONTACT HOURS
I	**DIGITAL IMAGE FUNDAMENTALS**: Image sensing and acquisition, Image sampling and quantization, Representing digital images, Spatial and gray-level resolution,	3
	Spatial operations, Vector & matrix operations, Zooming and Shrinking of digital images. RGB and HSI Color models	3
II	**BASIC IMAGE OPERATIONS:** Intensity transformation functions, Histogram equalization, Spatial filtering for image smoothing,	3
	Image sharpening by first and second order derivatives, Image smoothing and sharpening using frequency domain filters	5
III	**IMAGE RESTORATION:** Image restoration model, Noise Models, Spatial and frequency properties of noise, noise probability density functions,	3
	Noise only- spatial filter, Mean, order Statistic and adaptive filters, Concepts of inverse and Wiener filtering	5
IV	**MORPHOLOGICAL IMAGE PROCESSING:** Erosion and Dilation, Opening and closing,	3
	morphological algorithms for Boundary extraction, thinning, pruning, smoothing and thickening	5
V	**IMAGE SEGMENTATION AND COMPRESSION:** Edge based segmentation, Edge detection masks, Gradient operators,	3
	Thresholding, Region growing, Watershed transform,	3
	Fundamentals of image compression; Loss-less compression techniques; Lossy compression techniques, compression standards	4
	Total	**40**

TEXT BOOKs:

1. Gonzalez, Woods and Eddins, "Digital Image Processing", 3rd ed. , Pearson Education (2010)
2. Anil K Jain, "Fundamentals of Digital Image Processing", 4th ed., Prentice Hall (2010)

REFERENCE BOOKs:

SN	Name of Authors/Book/Publisher	Publication Year
1	Tamal Bose, "Digital Signal and Image Processing", ", 3rd ed. , John Wiley	2005
2	Sonaka,Hlavac and Boyle, "Image Processing, Analysis and Machine Vision", 3rd ed. , Cengage Learning	2013
3	Pratt, "Digital Image Processing", 4th ed. , John Wiley	2001
4.	Image Processing, Analysis, and Machine Vision, Sonka, cengage learning	2006

7EC4A WIRELESS COMMUNICATION

B.Tech. (EC) 7th sem. **Max. Marks: 100**
Exam Hours: 3

3L+0T

UNIT	CONTENTS	CONTACT HOURS
I	**Spread Spectrum Modulation Techniques –** Concept of spread spectrum, system processing gain, Spread Spectrum signals: Direct-sequence spread spectrum signals, Frequency-hopped spread spectrum signals, Code-division multiplexing, Spreading codes	8
II	**Wireless Microwave Communication**- Link Engineering, Frequency planning, Free space loss, Fresnel zone clearance, bending of radio beam, Effective earth radius, Fundamentals of fading, types and effects, Multipath channels; parameters, measurements, Building blocks of Transmitter & Receiver.	8
III	**Multiple Access Techniques and Networks** - FDMA, TDMA and CDMA with reference to mobile radio and satellite systems. TDMA based networks, OFDM and its characteristics, Packet radio multiple access techniques. CDMA based networks: Architecture, Air interface, Call processing, power control, Rake receiver concept and performance of CDMA system.	8
IV	**Cellular Wireless Networks**-, GSM: Introduction, overview of the GSM systems, GSM codec, channel coding and interleaving, radio like control. Cordless systems and WLL, Mobile IP, Wireless access protocol. Wireless LAN's: Technology, IEEE 1002.11 standards, Broadband Wireless 1002.16, Blue tooth, Wi-Fi, Wi-Max, Zigbee & RFID technology.	8
V	**Satellite Communication** - Elements of satellite communication: Frequency bands, Transmission and Multiple access. Satellite orbit and description- orbital period and velocity, effects of orbital inclination, Azimuth and elevation, Coverage angle and slant range, Satellite Link: basic link design and analysis, Geostationary orbit, Satellite subsystems. Earth Station antenna, high-power amplifier, low-noise amplifier, up converter, down converter, monitoring and control, reliability.	8
	TOTAL	**40**

TEXT Books:

1. William Stallings, Wireless Communication and Networks, Pearson Education (2013)
2. Rappaport, T.S., Wireless Communications, Pearson Education (2013)

REFERENCE Books:

SN	Name of Authors /Books /Publisher	Year of Publication
1	Gottapu Sasibhushana Rao, Mobile Cellular Communications, Pearson Education	2013
2	Singal, T.L, Wireless Communication, Tata McGraw Hill	2011
3	Vijay Kr. Garg, Wireless Communications and Networking, Morgan Kaufmann, Elsevier	2013
4	Blake, Wireless Communication Technology, Cengage Learning	2013
5	W.C.Y. Lee , Mobile Cellular Telecommunications , Tata McGraw Hill	2011
6	Wireless Communications and Networking, Price, TMH	2014
7	Pratt, Bostain, Satellite Communications, Wiley India	2011
8	Mark Zhuang, Wireless Communications and Networking, Prentice Hall of India	2003
9	Simon Haykin, Modern Wireless Communications, Pearson Education	2005
10	Price, Fundamentals of Wireless Networking, Tata McGraw Hill	2012

7EC5A VLSI DESIGN

B.Tech. (EC) 7th Sem. **Max. Marks: 100**

3L+0T **Exam: 3 H**

Unit	Contents	Contact hours
I	**INTRODUCTION TO MOSFET: -** Basic MOS transistors, Enhancement Mode transistor action, Depletion Mode transistor action, NMOS and CMOS fabrication. Aspects of threshold voltage, threshold voltage with body effect. Ids versus Vds relationship, channel length modulation. Transistor Trans-conductance gm. MOS transistor circuit Model, Model parameter (oxide and junction capacitor, channel resistance) variation with scaling and biasing. High order effects (i.e. subthreshold conduction, hot electron effect, narrow channel effect and punch through effect.	10
II	**CMOS LOGIC CIRCUITS-** nMOS inverter (resistive and active load), Pull up to Pull-down ratio for a NMOS Inverter and CMOS Inverter (Bn/Bp), , determination of inverter parameter ($V_{IL,}$ V_{IH} V_{OL} V_{OH}) and Noise Margin. **Speed and power dissipation analysis of CMOS inverter.** Combinational Logic, NAND Gate, NOR gate, XOR gate, Compound Gates, 2 input CMOS Multiplexer, Memory latches and registers, Transmission Gate, estimation of Gate delays, Power dissipation and Transistor sizing.	8
III	Basic physical design of simple Gates and Layout issues. Layout issues for CMOS inverter, Layout for NAND, NOR and Complex Logic gates, Layout of TG, Layout optimization using Eular path. DRC rules for layout and issues of interconnects, Latch up problem.	8
IV	**Dynamic CMOS circuits**: Clocked CMOS (C^2MOS) logic, DOMINO logic, NORA logic, NP(ZIPPER) logic, PE(pre-charge and Evaluation) Logic. Basic Memory circuits, SRAM and DRAM.	8
V	**Physical Design**: Introduction to ECAD tools for first and back end design of VLSI circuits. Custom /ASIC design, Design using FPGA and VHDL. VHDL Code for simple Logic gates, flip-flops, shift registers	6
	Total	**40**

Text Books:

1. **CMO S DIGITAL INTEGRATE**D **CIRCUITS Analysis and Design.** SUNG-MO (STEVE) ANG, YUSUF LEBLEBIGI, McGraw Hill (2008)

Reference Books:

SN	Name of Authors/Book/Publisher	Publication Year
1	N.Weste and K. Eshraghian, Principles of CMOS VLSI, 2e, Pearson Education.	2011
2	VLSI Design , P P Sahu , , McGraw.	2013
3	VLSI Design, D.P. Das, Oxford.	2011
4	Chip Design for Submicron VLSI: CMOS Layout & Simulation, Uyemura, cengage learning	2009

7EC6.1A ADVANCED MICROPROCESSORS

B.Tech. (EC) 7th sem. **Max. Marks: 100**
3L+0T **Exam Hours: 3**

UNIT	CONTENTS	CONTACT HOURS
I	**The 8086 Microprocessor Family:** 8086 ARCHITECTURE- Hardware specifications, Pins and signals, Internal data operations and Registers, Minimum and maximum mode, System Bus Timing, Linking and execution of Programs,	8
II	**Software & Instruction Set:** Assembly language programming: addressing mode and instructions of 8086, Strings, Procedures and Macros, 8086 interrupts. Assembler Directives and operators.	8
III	**Analog Interfacing:** A/D and D/A converter interfacing, keyboard and display interfacing, RS 232 & IEEE 488 communication standards. An 8086 based Process Control Systems	8
IV	**Digital Interfacing:** Programmable parallel ports, Interfacing microprocessor to keyboard and alphanumeric displays, Memory interfacing and Decoding , DMA controller.	8
V	**Multiprocessor Configurations:** - Multiuser / Multi tasking operating system concepts, 8086 based Multiprocessor systems. Introduction and basic features of 286, 386, 486 & Pentium processors.	8
	TOTAL	**40**

TEXT BOOK

1. A Nagoor Kani “Microprocessors and Microcontrollers” Mc Graw Hill Education 2ed. (2012)
2. Douglas V. Hall “Microprocessors and Interfacing Programming and Hardware” Tata Mc Graw Hill.(2000)

REFERENCE BOOKS

SN	Name of Authors /Books /Publisher	Year of Publication
1	A. Ray & K. Bhurchandi. “Advanced Microprocessors and Peripherals. Tata Mc Graw Hill,	2012
2	A Nagoor Kani “Microprocessors and Microcontrollers” Mc Graw Hill Education 2ed.	2012
3	Introduction to Microprocessors, A. P. Mathur Mc Graw Hill	2011
4	The Intel Family of Microprocessors: Hardware and Software Principles and Applications, Antonakos, cengage learning	2012
	The 8086 Microprocessor: Programming & Interfacing the PC, Ayala, cengage learning	2007

7EC6.2A ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS

B.Tech. (EC) 7th Sem. **Max. Marks: 100**

3L+0T **Exam: 3 Hours**

Unit	Contents	Contact Hours
I	**Introduction to Artificial Intelligence:** Intelligent Agents, State Space Search, Uninformed Search, Informed Search, Two Players Games, Constraint Satisfaction Problems.	09
II	**Knowledge Representation:** Knowledge Representation And Logic, Interface in Propositional Logic, First Order Logic, Reasoning Using First Order Logic, Resolution in FOPL	05
III	**KNOWLEDGE ORGANIZATION:** Rule based System, Semantic Net, Reasoning in Semantic Net Frames, Planning	10
IV	**KNOWLEDGE SYSTEMS:** Rule Based Expert System, Reasoning with Uncertainty, Fuzzy Reasoning	07
V	**KNOWLEDGE ACQUISITION:** Introduction to Learning, Rule Induction and Decision Trees, Learning Using neural Networks, Probabilistic Learning Natural Language Processing	09
	TOTAL	**40**

TEXT BOOK:

1. Elaine Rich and Kevin Knight, Artificial Intelligence 3/e, TMH (1991)
2. PADHY: ARTIFICIAL INTELLIGENCE & INTELLIGENT SYSTEMS, Oxford(2005)

REFERENCE BOOKS:

SN	Name of Authors /Books /Publisher	Year of Publication
1	James A Anderson, An introduction to Neural Networks. Bradford Books	1995
2	Dan. W Patterson, Artificial Intelligence and Expert Systems,PHI	1990
3	Kumar Satish, "Neural Networks" Tata Mc Graw Hill	2004
4	S. Rajsekaran & G.A. Vijayalakshmi Pai, "Neural Networks,Fuzzy Logic and Genetic Algorithm:Synthesis and Applications" Prentice Hall of India.	2006
6	Siman Haykin,"Neural Netowrks"Prentice Hall of India	1990
7	Artificial Intelligence, Kaushik, cengage learning	1997

7EC4.3A VHDL

B.Tech. (EC) 7th Sem. **Max. Marks: 100**

3L+0T **Exam: 3 Hours**

Unit	Contents	Contact Hours
I	**INTRODUCTION:**VHDL/PLD Design Methodology, Advantages, Requirement Analysis and specification, VHDL description, Verification Using simulations, Functional Simulation, Logic Synthesis, Place and route and timing Simulation Fundamental & history of various hardware description language, VHDL for Synthesis V/s Simulation, Design flow of ASICs and standard logic circuits. Implementation Details for SPLDs, CPLDs and FPGAs	06
II	**LANGUAGE FUNDAMENTALS:** Entities, Architectures and coding Styles, Signals and Data types, Packages, Dataflow, Structural, Behavioral and RTL Style of Combinational design, Event- Driven Simulation: Simulation Approaches, Elaboration Signal Drivers Simulator Kernel process, Signals verses Variables.	07
III	**COMBINATIONAL and SEQUENCIAL CIRCUITS BUILDING BLOCKS:** Multiplexer, Synthesis using Shannon's expansions, Decoders, encoders, Code Converters, VHDL Code for Combinational Circuits. VHDL code for Flip-Flops, shift registers, Counters.	09
IV	**SYNCHRONOUS/ ASYNCHRONOUS SEQUENCIAL CIRCUITS:** Mealy & Moore type FSMs, VHDL Code for Mealy & Moore Machines, VHDL Codes for Serial Adder, Vending Machine.	09
V	**DIGITAL SYSTEM DESIGN:** Building Block circuits, Memory organization, SRAM, Design examples of divider, Multiplier, Shifting & Sorting Operations, Clock Synchronization, CPU organization and design concepts.	09
	TOTAL	**40**

TEXT BOOK:

1. Digital Logic with VHDL Design, Brown, TMH.(2007)
2. VHDL for Engineers, Short, Pearson. (2011)

REFERENCE BOOKS:

SN	Name of Authors /Books /Publisher	Year of Publication
1	VHDL (Text BOOK Binding), Douglas L. Perry, TMH	2002
2	VHDL , A design oriented Approach, S S Limaye, TMH	2008
3	VHDL: Programming By Example, Douglas Perry, Oxford	2002
4	The Designer's Guide To VHDL, Peter J. Ashenden, Oxford	2010
5	Circuit Design With VHDL , By Volnei A Pedroni, PHI	2004
6	VHDL Bascis to programming, Gaganpreet Kaurt, Pearson	2013
7	Digital System Design Using VHDL, cengage learning	2008
8	HDL Programming Fundamentals VHDL & VERILOG. Botros. cengage learning	2002

7EC7A SIGNAL AND IMAGE PROCESSING LAB

B.Tech. (EC) 7th sem. **Max. Marks: 100**
2P **Exam Hours: 3**

S.No.	Contents
1	To simulate the transmitter and receiver for BPSK
2	To design and simulate FIR digital filter (LP/HP).
3	To design and simulate IIR digital filter (LP/HP).
4	Reading and displaying Gray/ Colour images of different formats
5	RGB/HSI conversions in an image, Image arithmetic operations.
6	Image Histogram and histogram equalization
7	Image filtering in Spatial and frequency domain
8	Morphological operations in analyzing image structures
9	Thresholding-based image segmentation
10	Study of image compression

7EC8A WIRELESS COMMUNICATION LAB

B.Tech. (EC) 7th Sem. **Max. Marks: 100**

3P **Exam: 3 Hours**

S.No.	Contents
1	Measurement of antenna input characteristics: Measure the input return loss versus frequency in the operating band for (i) Half wave dipole (printed dipole/strip dipole), (ii) Folded dipole and (ii) Log-periodic antenna.
2	Measurement of radiation characteristics of a (i) Half wave dipole (printed dipole/strip dipole), and (ii) Printed Yagi antenna -. Measure radiation patterns in the two principal planes and plot on polar chart. Determine beam width, directivity and antenna efficiency.
3	Measurement of antenna gain using absolute gain and relative gain measurements: • Measure gain of Bi-quad antenna using absolute gain measurements. • Measure gain of log-periodic antenna and printed slot antenna using relative gain measurements.
4	Circular polarization measurements on helical antenna.
5	Antenna array theory demonstration using single EM coupled rectangular patch, 2x1 EM coupled and 2x2 EM coupled rectangular patch antennas.
6	Communication link budget calculations- Friis formula and demonstration with transmit and receive antenna setup.
7	Radar Trainer: Working of Doppler radar, velocity of moving object, time and frequency measurement and other applications.
8	To perform Modulation, Demodulation and BER measurement using CDMA – DSSS Trainer.
9	To establish analog/digital communication link and transmit & receive three signals (audio, video, tone) simultaneously using Satellite Communication Trainer.
10	To study GPS Receiver, establishing link between GPS satellite & GPS trainer and measure of latitude & longitude

8EC1A IC TECHNOLOGY

B.Tech. (EC) 8th Sem. **Max. Marks: 100**

3L+0T **Exam: 3 H**

Unit	Contents	Contact hours
I	**INTRODUCTION TO IC TECHNOLOGY-** Semiconductor Substrate-Crystal defects, Electronic Grade Silicon, Czochralski Growth, Float Zone Growth, Characterization & evaluation of Crystals; Wafer Preparation- Silicon Shaping, Etching and Polishing, Chemical cleaning.	8
II	**DIFFUSION & OXIDATION -** Ficks diffusion Equation in One Dimension, Atomic model, Analytic Solution of Ficks Law, correction to simple theory, Diffusion in SiO_2. Ion Implantation and Ion Implantation Systems. Oxidation Growth mechanism and Deal-Grove Model of oxidation, Linear and Parabolic Rate co-efficient, Structure of SiO_2, Oxidation techniques and system, Oxide properties.	9
III	**CHEMICAL VAPOUR DEPOSITION AND EPITAXIAL LAYER GROWTH-** CVD for deposition of dielectric and polysilicon thick Layer – a simple CVD system, Chemical equilibrium and the law of mass action, Introduction to atmospheric CVD of dielectric, low pressure CVD of dielectric and semiconductor. Epitaxy-Vapour Phase Expitaxy, Defects in Epitaxial growth, Metal Organic Chemical Vapor Deposition, Molecular beam epitaxy.	9
IV	**PATTERN TRANSFER & ETCHING -** Introduction to photo/optical lithography, Contact/ proximity printers Projection printers, Mask generation, photo resists. Dry & Wet etching, methods for anisotropic etching, Plasma etching, Reaction ion etching (RIE).	8
V	**VLSI PROCESS INTEGRATION-** Junction and Oxide Isolation, LOCOS methods, Trench Isolation, SOI; Metallization, Planarization. Fundamental consideration for IC Processing, NMOS IC Technology, CMOS IC Technology, Bipolar IC Technology. Fault diagnosis and characterization techniques.	6
	Total	**40**

Text Books:

1. S.M. Sze (Ed), VLSI Technology, 2nd Edition, McGraw Hill (1988).

Reference Books:

S.No.	Name of Book/publication/Authors	Publication Year
1	S.K. Ghandhi, VLSI Fabrication Principles, John Wiley Inc., New York,	1983
2	IC Technology, Gouranga Bose, McGraw Hill	2013
3	C.Y. Chang and S.M.Sze (Ed),ULSI Technology, McGraw Hill Companies Inc	1996

8EC2A RADAR & TV ENGINEERING

B.Tech. (EC) 8th Sem. **Max. Marks: 100**
3L+1T **Exam Hours: 3**

Unit	Contents	Contact hours
I	**RADAR -** Radar Block diagram, frequencies and applications. Radar range equation. Continuous wave (CW) & FM radar; Moving target indicator (MTI): Delay line cancellers, blind velocity Pulse Doppler Radar. Tracking radar sequential lobbing, Conical scan and monopulse radar, Types of display, Radar receivers, Noise figure. NAVIGATIONAL AIDS - Principle of operation of Radar direction finder & range system. LORAN system, DME, TACAN, Aircraft landing systems.	10
II	T.V. systems. Block diagram of T.V. transmitters. Principles of Monochrome and colour T.V.system (PAL, SECAM, NTSC). Theory of scanning standards, Composite video signal analysis. T.V Cameras : Image orthicon, plumbicon, vidicon and CCD camera tubes. Types of Analog Monochrome and colour picture tubes,	8
III	**Processing and transmission of TV signals:** Modulation of video and sound signals, Vestigial side band transmission, Compatibility of colour and monochrome frequency interleaving & transmission of colour signals, Picture, sound and colour sub carriers. Encoding picture information. Generation of colour, colour difference and Chrominance signal modulation.TV transmission & reception antennas.	8
IV	**Basic circuits of TV RECEIVER:** Functional block diagram of T.V. receiver, R.F. Tuner, I.F. amplifier, Video detector, video amplifier, AGC, Synch. Separation, Sync. Processing and AFC. Deflection oscillators, vertical & horizontal deflection and sound system circuits. EHT generation. Common faults and their diagnosis. Basic idea of HDTV, DBS-TV and 3D-TV.	8
V	**MODERN TV SYSTEM:** Digital transmission and reception of TV signals, DISHTV, DTH and cable TV, transmission of TV signals through Satellite and Transponders, working principles of HDTV, DBS-TV, IPTV and 3D-TV. Modern TV receiver with LCD, LED and Plasma displays.	6
	Total	**40**

Text Books:

1. Monochrome and colour Television , R R Gulathi, Wiley Eastern Ltd. (2007).
2. Introduction to Radar System, 3rd, M I Skolink, MGH. (2003).

Reference Book:

S.No.	Name of Book/Publication/writer	Publication Year
1.	Television Engineering and Video System, R G Gupta, MGH	2005
2.	Television and Video Engineering , A M Dhake, MGH	1995
3.	Nathanson, F.E., "*Radar Design Principles*", McGraw-Hill Inc.,	1991
4.	Principles, Technology, Applications, Prentice Hall	1993
5.	D.K.Barton, Modern radar systems analysis, Artech House,	1988
6.	Microwave and radar engineering, G.S.B. Rao, Pearson P.	2013

8EC3A MEMS AND NANOTECHNOLOGY

B.Tech. (EC) 8th sem. **Max. Marks: 100**
3L+1T **Exam Hours: 3**

UNIT	CONTENTS	CONTACT HOURS
I	**Introduction to Nanoelectronics:** Top Down and Bottom UP Approach, Nanotechnology Potentials, Idea of band structure – Metals, Insulators and Semiconductors. Effect of crystal size on density of states and band gap, Electronic structure of nanoparticles. Nanostructured crystals, Size and dimensionality effects – Single electron tunneling – Applications – Superconductivity, Graphenes and CNT.	08
II	**Nano Fabrication and Patterning Techniques:** Si processing methods, Cleaning/etching, Oxidation, Gettering, doping, Epitaxy. CVD & MOCVD, Physical Vapor Deposition (PVD), Liquid Phase Techniques, Self assembly and catalysis. Etching: Wet and Dry, Nanolithography, Nanoimprinting, X-Ray Lithography(XRL), Particle beam lithography(e-beam, FIB, shadow mask evaporation),	09
III	**General Characterization Techniques:** X- Ray Diffraction studies – Bragg's law – particle size – Scherrer's equation, Infrared Spectroscopy of Semiconductors, Raman Spectroscopy, Dynamic Light Scattering (DLS), NMR Spectroscopy, ESR Spectroscopy. photo electron spectroscopy(XPS)-SEM,TEM,STM, Atomic force microscopy(AFM).	09
IV	**Electrical, Magnetic, Mechanical and Optical Properties and Applications :** Electronic and electrical properties -One dimensional systems-Metallic nanowires, Quantum dots -Two dimensional systems - Quantum wells. Magnetic properties -Transport in a magnetic field. Mechanical properties, Optical properties, Evolving interfaces of Nano in NanoBiology, Nano Sensors and Nanomedicines	07
V	**MEMS and Microsystems:** Evolution of Micro Fabrication – Micro Systems and Microelectronics. Application of MEMS in Various Fields. Introduction – Substrate and Wafer, Active Substrate Material. Silicon as a substrate material, MEMS packaging. Case study on pressure sensor with packaging.	07
	TOTAL	**40**

TEXT BOOKs

1. Nano Essentials, T Pradeep, Mc Graw Hill, (2008).
2. Nanotechnology-Enabled Sensors, Kourosh Kalantar-zadehand Benjamin Fry, Springer, (2007).

REFERENCE BOOKs

SN	Name of Authors /Books /Publisher	Year of Publication
1	Fundamental of Nanoelectronics, George W. Hanson, Pearson	2009
2	Principal of Nanotechnology, G. A. Mansoori, Wiley	2005
3	Mems and Micro Systems, Mahalik, TMH	2007
4	MEMS, Gabriel, Wiley	2006
5	MEMS, A.R. Jha, CRC	2008
6	Nano Fabrication, CRC	2012
7	MEMS & Microsystems, Design and Manufacture, Tai-Ran HSU, TMH	2013

8EC4.1A COMPUTER NETWORKS

B.Tech. (EC) 8th Sem. **Max. Marks: 100**
3L+0T **Exam Hours: 3**

UNIT	CONTENTS	CONTACT HOURS
I	**Queuing Theory**- Pure birth, Pure death & Birth-death processes,	2
	Mathematical models for M/M/1, M/M/∞, M/M/m, M/M/1/K and M/M/m/m queues. Little's formula.	5
II	**Physical and Data link layer** – OSI model & TCP/IP reference models, Line coding schemes, Packet & Circuit switching, Virtual circuit network,	3
	Framing, Simplex protocol, Simplex stop & wait protocol, Sliding window protocol, Go back N protocol, selective repeat,	3
	HDLC, PPP	2
III	**MAC Sublayer-** Static & dynamic channel allocation, Multiple Access Protocols: ALOHA, slotted ALOHA, CSMA, Token Bus, Token Ring, FDDI	4
	IEEE standards 1002.3 & 1002.5, Virtual circuit network: frame relay & ATM frame and protocol architecture,	3
	Network connection devices: Hubs, Bridges, switches, Routers and Gateways	2
IV	**Network Layer-** IPv4 & IPv6 addressing and datagram, Internetworking, Non-adaptive & Adaptive routing algorithms,	4
	Distance vector routing and Link state routing algorithms, OSPF and BGP	4
V	**Transport and Application Layer**- Client server paradigm, TCP frame format, Data traffic descriptors, QoS, Congestion and its control algorithms,	4
	Improving QoS by different queuing schemes, leaky bucket and token bucket implementation, Domain name, DNS in the internet, SMTP, FTP, WWW, HTTP	4
	Total	**40**

Text Book:

1. Forouzan, "Data Communications and Networks", 5th ed., Mcgraw-Hill, (2006).

REFERENCE BOOKS:

SN	Name of Authors/Book/Publisher	Publication Year
1	Tanenbaum, "Computer Network", 5th ed., Pearson Education	2012
2	Leon Garcia, Widjaja, "Communication Networks', 2nd ed., Mcgraw-Hill	2003
3	Stallings, "Data and Computer Communications", 10th ed., Pearson Education	2013
4	Bertsekas, Gallager, "Data Networks", 2nd ed., PHI	1992
5	Computer Networks, Dave, cengage learning	2003
6	Fundamentals of Networking and Data Communications, White, cengage learning	2013

8EC4.2A OPERATING SYSTEMS

B.Tech. (EC) 8th Sem. **Max. Marks: 100**

Exam Hours: 3

3L+0T

UNIT	CONTENTS	CONTACT HOURS
I	**INTRODUCTION** – History, Operating system services, types, responsibilities, generations, LINUX, WINDOWS.	6
II	**PROCESS MANAGEMENT**- Operations on process, Process state, Scheduling, Criteria, scheduling algorithms, Evaluation, Synchronization, Semaphores, Monitors.	8
III	**MEMORY MANAGEMENT**- Swapping, Continuous memory allocation, Paging, Pure paging, Demand paging, Page-replacement algorithms, thrashing, Example-Pentium, Disk Scheduling.	10
IV	**INFORMATION MANAGEMENT**- File and directory concept, Access methods, Protection, Free space management, Efficiency and performance, Access matrix, Capability-based systems, Program-threats, User authentication, Firewall.	10
V	**DEAD LOCKS**- System model, Dead lock characterization, Deadlock prevention, Avoidance, Detection, Recovery, Classic problems of synchronization.	6
	TOTAL	**40**

TEXT BOOKs:

1. Operating Systems, Dhamdhere, TMH, (2006).
2. Operating System:, Crowley, TMH, (1996).

REFERENCE BOOKS:

SN	Name of Authors /Books /Publisher	Year of Publication
1	Modern Operating Systems, Andrew S Tanenbaum, PHI	2008
2	Operating Systems:, Pal Chaudhury, PHI	2009
3	Operating System Principles, Peter B. Galvin, Greg Gagne, John Wiley & Sons	2002
4	Operating Systems, Gary Nutt, Pearson	2003
5	Operating Systems: Internals And Design Principles, William Stallings, Pearson	2012
6	Understanding Operating System , Flynn, cengage learning	2009
7	Operating Systems: Principles, Design and Applications , cengage learning	2002

8EC4.3A MICROCONTROLLERS & EMBEDDED SYSTEMS

B.Tech. (EC) 8th sem. **Max. Marks: 100**
3L+0T **Exam Hours: 3**

UNIT	CONTENTS	CONTACT HOURS
I	**THE 8051 MICROCONTROLLER:** Introduction, The 8051 microcontroller hardware, I/O pins, Ports, External memory, Counters and Timers, Serial data.	8
II	**8051 ASSEMBLY LANGUAGE PROGRAMMING:** Addressing modes, External data moves, Stack,Push and Pop opcodes, Logical operations, Byte level and bit level logical operations. Arithmetic operations, Jump and call instructions, Interrupts & returns.	8
III	**REAL TIME CONTROL:** Interrupts, Multiple sources of interrupts, Non maskable sources of interrupts, Interrupt structure in 8051,Timers,Free running counter & Real Time control .	8
IV	**SYSTEM DESIGN**: Serial I/O interface, Parallel I/O ports interface, Digital and Analog interfacing methods, LED array, keyboard, Printer, Flash memory interfacing.	8
V	**INTRODUCTION TO EMBEDED SYSTEM**: Application of Microcontrollers in interfacing, MCU based measuring instruments. Real Time Operating System for System Design,Multitasking System, Task Definition in a Multitasking System, Round Robin Scheduling, Full PreemptiveScheduling, Basic study and Features of Commercial RTOS : WINCE and Embedded Linux.	8
	TOTAL	**40**

TEXT BOOKs:

1. Kenneth J.Ayala, "The 8051 Micro controller", Penram Interfacing Publishing, 1996.
2. Rajkamal, "Embedded Systems" TMH

REFERENCE BOOKS:

SN	Name of Authors /Books /Publisher	Year of Publication
1	A Textbook of Microprocessors and Microcontrollers, R. Thegarajan, Scitech Publishers	2002
2	The 8051 Microcontroller and Embedded Systems, Using Assembly and C, K Ayala & D. Gadre, Cengage Learning	2004
3	The 8051 Microcontrollers & Embedded Systems,Mazidi, ,PHI	2004
4	The 8051 Microcontroller, Ayala, cengage learning	2009
5	The 8051 Microcontroller & Embedded Systems using Assembly and C, Ayala /Gadre cengage learning	2005
6	A Textbook of Microprocessors and Microcontrollers, R.S. Kaler I. K. International Publishing House Pvt. Ltd.	2009
7	Embedded Systems & Robots: Projects Using the 8051 Microcontroller , cengage learning	
8	Embedded System Design Using C8051 , Huang , cengage learning	
9	Embedded Microcomputer System Real Time Interfacing, Valvano , cengage learning	

8EC5A RF FABRICATION LAB

B.Tech. (EC) 8th sem. **Max. Marks: 100**
3P **Exam Hours: 3**

S.No.	Contents
1.	Design and fabricate the following *Planar Transmission Lines:* • Stripline and microstrip lines • Parallel coupled striplines and microstrip lines • Slot lines and Coplanar lines Measure their S-parameters and Characteristic impedance.
2	Design and Fabricate the following; • 3-dB branchline coupler, • backward wave coupler, • Wilkinson power dividers • Low pass filters • band pass filters. Measure their S-parameters & frequency responses.
3	Design, fabrication, and measurement of RF amplifier using microwave BJT.

8EC6 INDUSTRIAL ECONOMICS & MANAGEMENT

B.Tech. (EC) 8th sem. **Max. Marks:50**
Exam Hours:3
2P

S.No.	CONTENTS
1.	Framework of industrial economics – organizational forms and alternative motives of the firm, industrial efficiency, theory of profitability, market structure, principles of costing.
2.	Approaches to industrial location analysis, Productivity analysis, Input-Output analysis, Concentration of economic power. New Industrial Policy – Critical analysis, Role of technology and entrepreneurship in industrial development.
3.	Industrial project appraisal- classification of industries, industrial legislations in India, recent trends in MNCs, LPG, FDI &joint ventures, methods of project evaluation-NPV,CBA,IRR, break-even analysis.
4.	Management – Principles of management, functions of management-planning,organizing,staffing,directing,controlling,co-ordinating,decision making
5.	Emerging issues – Total quality management, JIT , quality circle, KANBAN, benchmarking, six sigma, quality management, ,ISO 9000, ISO 14000 , Customer relationship management (CRM) .

TEXT BOOKs:

1. Subburay, Total quality management, TMH. (2011)
2. Barthwal R.R- industrial economics . wiley eastern limited

Reference Books:

1. Tirole jean – the theory of industrial organization . MIT PRESS
2. Ahluwalia I.J – industrial growth in india . Oxford university press
3. Divine P.J and R.M jones et Al- an introduction In industrial economics .George allen &Unwin limited London.
4. Peter F. drucker – principles and practice of management . Prentice hall ltd .

8EC7A VLSI DESIGN & OPTICAL FIBER LAB

B.Tech. (EC) 8th sem. **Max. Marks: 100**

3P **Exam Hours: 3**

S.No.	Contents
PART-I: Design and simulation of following VLSI circuits using EDA Tools (Software) Schematic design and make Device Level Layout of following circuits.	
1.	Design 2-input NAND, NOR and XOR using CMOS logic. Obtain its static and dynamic analysis for speed and power dissipation.
2.	Design 2X1 and 4X1 Multiplexer using Transmission Gate (TG. Obtain its static and dynamic analysis for speed and power dissipation.
3.	Design a SR-latch and D-latch using CMOS. Obtain its static and dynamic analysis for speed and power dissipation.
4.	Design a SRAM and DRAM Memory Cell. Obtain its static and dynamic analysis for speed and power dissipation.
PART-II Design and simulation of following VLSI circuits using VHDL and then burn/implement the circuits on FPGA kit for real input.	
5.	Design a 4- bit parallel Adder. Obtain its number of gates, area, and speed and power dissipation.
6.	Design a 4- bit Serial in-serial out shift register. Obtain its number of gates, area, and speed and power dissipation.
7.	Design a 4 bit binary synchronous counter. Obtain its number of gates, area, and speed and power dissipation.
PART-III. To perform following experiments based on Fiber Optic Trainer.	
8.	To set up Fiber Optic Analog link.
9.	To set up fiber Optic Digital link.
10.	Measurement of Propagation loss and numerical aperture.
11.	Characterization (VI Characteristics) of laser diode and light emitting diode.

Scheme and Syllabus
Rajasthan Technical University, Kota
B. Tech. in Civil Engineering
(Session 2019-20)

Scheme of

UNDERGRADUATE DEGREE COURSE

Civil Engineering

Rajasthan Technical University, Kota

Effective from session: 2018 – 2019

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Teaching & Examination Scheme
B.Tech. : Civil Engineering
2nd Year - III Semester

SN	Category	Course		Contact hrs/week			Marks				Cr
		Code	Title	L	T	P	Exm Hrs	IA	ETE	Total	
THEORY											
1	BSC	3CE2-01	Advance Engineering Mathematics -I	3	0	0	3	30	120	**150**	**3**
2	HSMC	3CE1-02/ 3CE1-03	Technical Communication /Managerial Economics & Financial Accounting	2	0	0	2	20	80	**100**	**2**
3	ESC	3CE3-04	Engineering Mechanics	2	0	0	2	20	80	**100**	**2**
4	PCC	3CE4-05	Surveying	3	0	0	3	30	120	**150**	**3**
5		3CE4-06	Fluid Mechanics	2	0	0	2	20	80	**100**	**2**
6		3CE4-07	Building Materials and Construction	3	0	0	3	30	120	**150**	**3**
7		3CE4-08	Engineering Geology	2	0	0	2	20	80	**100**	**2**
			Sub Total	17	0	0		170	680	**850**	**17**
PRACTICAL & SESSIONAL											
8	PCC	3CE4-21	Surveying Lab	0	0	3		45	30	**75**	**1.5**
9		3CE4-22	Fluid Mechanics Lab	0	0	2		30	20	**50**	**1**
10		3CE4-23	Computer Aided Civil Engineering Drawing	0	0	3		45	30	**75**	**1.5**
11		3CE4-24	Civil Engineering Maretials Lab	0	0	2		30	20	**50**	**1**
12		3CE4-25	Geolgy Lab	0	0	2		30	20	**50**	**1**
13	PSIT	3CE7-30	Industrial Training	0	0	1		30	20	**50**	**1**
14	SODECA	3CE8-00	Social Outreach, Discipline & Extra Curricular Activities	0	0	0		0	25	**25**	**0.5**
			Sub- Total	0	0	13		210	165	**375**	**7.5**
			TOTAL OF III SEMESTER	17	0	13		380	845	**1225**	**24.5**

L: *Lecture,* ***T:*** *Tutorial,* ***P:*** *Practical,* ***Cr:*** *Credits*

ETE: *End Term Exam,* ***IA:*** *Internal Assessment*

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

Scheme of

UNDERGRADUATE DEGREE COURSE

Civil Engineering

Rajasthan Technical University, Kota

Effective from session: 2018 – 2019

Teaching & Examination Scheme
B.Tech. : Civil Engineering
2nd Year - IV Semester

THEORY												
SN	**Category**	**Course**		**Contact hrs/week**			**Marks**					**Cr**
		Code	**Title**	**L**	**T**	**P**	**Exm Hrs**	**IA**	**ETE**	**Total**		
1	BSC	4CE2-01	Advance Engineering Mathematics -II	2	0	0	2	20	80	**100**		**2**
2	HSMC	4CE1-03/ 4CE1-02	Managerial Economics & Financial Accounting/ Technical Communication	2	0	0	2	20	80	**100**		**2**
3	ESC	4CE3-04	Basic Electronics for Civil Engineering Applications	2	0	0	2	20	80	**100**		**2**
4	PCC	4CE4-05	Strength of Materials	3	0	0	3	30	120	**150**		**3**
5		4CE4-06	Hydraulics Engineering	3	0	0	3	30	120	**150**		**3**
6		4CE4-07	Building Planning	2	0	0	2	20	80	**100**		**2**
7		4CE4-08	Concrete Technology	3	0	0	3	30	120	**150**		**3**
			Sub Total	17	0	0		170	680	**850**		**17**
PRACTICAL & SESSIONAL												
8	PCC	4CE4-21	Material Testing Lab	0	0	2		30	20	**50**		**1**
9		4CE4-22	Hydraulics Engineering Lab	0	0	2		30	20	**50**		**1**
10		4CE4-23	Building Drawing	0	0	3		45	30	**75**		**1.5**
11		4CE4-24	Advanced Surveying Lab	0	0	2		30	20	**50**		**1**
12		4CE4-25	Concrete Lab	0	0	3		45	30	**75**		**1.5**
13	SODECA	4CE8-60	Social Outreach, Discipline & Extra Curricular Activities	0	0	0		0	25	**25**		**0.5**
			Sub- Total	0	0	12		180	145	**325**		**6.5**
			TOTAL OF IV SEMEESTER	17	0	12		350	825	**1175**		**23.5**

L: *Lecture,* ***T:*** *Tutorial,* ***P:*** *Practical,* ***Cr:*** *Credits*

ETE: *End Term Exam,* ***IA:*** *Internal Assessment*

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

Scheme of

UNDERGRADUATE DEGREE COURSE

B.Tech. V & VI Semester

Civil Engineering

Rajasthan Technical University, Kota

Effective from session: 2019-20

Teaching & Examination Scheme
B.Tech. : Civil Engineering
3rd Year –V Semester

SN	Category	Course Code	Course Title	Contact hrs/week L	T	P	Marks Exm Hrs	IA	ETE	Total	Cr
THEORY											
1	ESC	5CE3-01	Construction Technology & Equipments	2	0	0	2	20	80	**100**	**2**
2	PCC/ PEC	5CE4-02	Structural Analysis-I	2	0	0	2	20	80	**100**	**2**
3		5CE4-03	Design of Concrete Structures	3	0	0	3	30	120	**150**	**3**
4		5CE4-04	Geotechnical Engineering	3	0	0	3	30	120	**150**	**3**
5		5CE4-05	Water Resource Engineering	2	0	0	2	20	80	**100**	**2**
6		Departmental Elective-I:		2	0	0	2	20	80	**100**	**2**
		5CE5-11	Air & Noise Pollution and Control								
		5CE5-12	Disaster Management								
		5CE5-13	Town Planning								
7		Departmental Elective-II:		2	0	0	2	20	80	**100**	**2**
		5CE5-14	Repair and Rehabilitation of Structures								
		5CE5-15	Ground Improvement Techniques								
		5CE5-16	Energy Science & Engineering								
		Sub Total		**16**	**0**	**0**		**160**	**640**	**800**	**16**
PRACTICAL & SESSIONAL											
8	PCC	5CE4-21	Concrete Structures Design	0	0	3	3	45	30	**75**	**1.5**
9		5CE4-22	Geotechnical Engineering Lab	0	0	3	3	45	30	**75**	**1.5**
10		5CE4-23	Water Resource Engineering Design	0	0	2	2	30	20	**50**	**1**
11	PSIT	5CE7-30	Industrial Training	0	0	1		75	50	**125**	**2.5**
12	SODECA	5CE8-00	Social Outreach, Discipline & Extra Curricular Activities	0	0	0		0	25	**25**	**0.5**
		Sub- Total		**0**	**0**	**9**		**195**	**155**	**350**	**7**
		TOTAL OF V SEMESTER		**16**	**0**	**9**		**355**	**795**	**1150**	**23**

L: *Lecture,* ***T:*** *Tutorial,* ***P:*** *Practical,* ***Cr:*** *Credits*
ETE: *End Term Exam,* ***IA:*** *Internal Assessment*

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

Teaching & Examination Scheme
B. Tech.: Civil Engineering
3rd Year – VI Semester

SN	Category	Course Code	Course Title	Contact hrs/week L	T	P	Marks Exm Hrs	IA	ETE	Total	Cr
THEORY											
1	ESC	6CE3-01	Wind & Seismic Analysis	2	0	0	2	20	80	**100**	**2**
2	PCC/ PEC	6CE4-02	Structural Analysis-II	3	0	0	3	30	120	**150**	**3**
3		6CE4-03	Environmental Engineering	3	0	0	3	30	120	**150**	**3**
4		6CE4-04	Design of Steel Structures	3	0	0	3	30	120	**150**	**3**
5		6CE4-05	Estimating & Costing	2	0	0	2	20	80	**100**	**2**
6		Departmental Elective-III:		2	0	0	2	20	80	**100**	**2**
		6CE5-11	Pre-stressed Concrete								
		6CE5-12	Solid and Hazardous Waste Management								
		6CE5-13	Traffic Engineering and Management								
7		Departmental Elective-IV:		2	0	0	2	20	80	**100**	**2**
		6CE5-14	1. Bridge Engineering								
		6CE5-15	2. Rock Engineering								
		6CE5-16	3. Geographic Information System & Remote Sensing								
		Sub Total		**17**	**0**	**0**		**170**	**680**	**850**	**17**
PRACTICAL & SESSIONAL											
8	PCC	6CE4-21	Environmental Engineering Design and Lab	0	0	3	3	45	30	**75**	**1.5**
9		6CE4-22	Steel Structure Design	0	0	3	3	45	30	**75**	**1.5**
10		6CE4-23	Quantity Surveying and Valuation	0	0	2	2	30	20	**50**	**1**
11		6CE4-24	Water and Earth Retaining Structures Design	0	0	2	2	30	20	**50**	**1**
12		6CE4-25	Foundation Design	0	0	2	2	30	20	**50**	**1**
13	SODECA	6CE8-00	Social Outreach, Discipline & Extra Curricular Activities						25	**25**	**0.5**
		Sub- Total		**0**	**0**	**12**		**180**	**145**	**325**	**6.5**
		TOTAL OF VI SEMESTER		**17**	**0**	**12**		**350**	**825**	**1175**	**23.5**

L: *Lecture,* ***T:*** *Tutorial,* ***P:*** *Practical,* ***Cr:*** *Credits*
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Office of Dean Academic Affairs
Rajasthan Technical University, Kota

BRANCH CODE	Civil Engineering	CE					
			Hrs. / Week				
SEMESTER - VII	Title	L	T	P	IA	Exam	Total
7CE1A	Water Resource Engineering-I	3		0	20	80	100
7CE2A	Design of Steel Structures-I	3		0	20	80	100
7CE3A	Design of Concrete Structures-II	3		0	20	80	100
7CE4A	Transportation Engineering-II	3		0	20	80	100
7CE5A	Application of Numerical Methods in Civil Engineerinng	3		0	20	80	100
7CE6.1A	Advance Transportation Engineering	3		0	20	80	100
7CE6.2A	Design of Prestress Concrete Structures						
7CE6.3A	Rural Water Supply & Sanitation						
	Total	18					600
7CE7A	Design of Water Resource Structures-I			2	30	20	50
7CE8A	Steel Structures Design-I	0	0	3	30	20	50
7CE9A	Concrete Structures Design-II			3	30	20	50
7CE10A	Application of Numerical Methods in Civil Engineerinng Lab	0	0	3	30	20	50
7CETR	Practical Training & Industrial Visit			2		100	100
7CEPR	Project-I			2	50		50
7CEDC	Discipline & Extra Curricular Activity						50
	Total						400
	Grand Total	18	0	15			1000

BRANCH CODE	Civil Engineering	CE					
			Hrs. / Week				
SEMESTER - VIII	1	L	T	P	IA	Exam	Total
8CE1A	Water Resource Engineering-II	3		0	20	80	100
8CE2A	Design of Steel Structures-II	3		0	20	80	100
8CE3A	Project Planning & Construction Management	3		0	20	80	100
8CE4.1A	Bridge Engineering	3		0	20	80	100
8CE4.2A	Advance Foundation Engineering						
8CE4.3A	Earthquake Resistant Construction & Design						
	Total	12					400
8CE5A	Design of Water Resource Structures-II	0	0	3	30	20	50
8CE6A	Professional Practice & Estimating	0	0	3	30	20	50
8CE7A	Steel Structures Design-II			3	30	20	50
8CE8A	Design of Foundations			2	30	20	50
8CE9A	Structural Analysis by Matrix Methods	0	0	2	30	20	50
8CESM	Seminar	0	0	2	60	40	100
8CEPR	Project-II	0	0	2	120	80	200
8CEDC	Discipline & Extra Curricular Activity						50
	Total						600
	Grand Total	12	0	17			1000

Syllabus of

UNDERGRADUATE DEGREE COURSE

Civil Engineering

Rajasthan Technical University, Kota

Effective from session: 2018 – 2019

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

II Year - III Semester: B.Tech. (Civil Engineering)

3CE2-01: ADVANCE ENGINEERING MATHEMATICS-I

Credit: 3 **Max. Marks: 150 (IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hrs.
1	**Numerical Methods – 1:** Finite differences, Relation between operators, Interpolation using Newton's forward and backward difference formulae. Gauss's forward and backward interpolation formulae. Stirling's Formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange'sformulae. Numerical Differentiation, Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules.	10
2	**Numerical Methods – 2:** Numerical solution of ordinary differential equations: Taylor's series, Euler and modified Euler's methods. Runge-Kutta method of fourth order for solving first and second order equations. Milne's and Adam's predicator-corrector methods. Solution of polynomial and transcendental equations-Bisection method, Newton-Raphson method and Regula-Falsi method.	8
3	**Laplace Transform:** Definition and existence of Laplace transform, Properties of Laplace Transform and formulae, Unit Step function, Dirac Delta function, Heaviside function, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem. Evaluation of integrals by Laplace transform, solving ODEs by Laplace transforms method.	10
4	**Fourier Transform:** Fourier Complex, Sine and Cosine transform, properties and formulae, inverse Fourier transforms, Convolution theorem, application of Fourier transforms to partial ordinary differential equation (One dimensional heat and wave equations only).	7
5	**Z-Transform:** Definition, properties and formulae, Convolution theorem, inverse Z-transform, application of Z-transform to difference equation.	5
	Total	40

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

3CE1-02/4CE1-02: TECHNICAL COMMUNICATION

Credit: 2 **Max. Marks: 100 (IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hrs.
1	**Introduction to Technical Communication-** Definition of technical communication, Aspects of technical communication, forms of technical communication, importance of technical communication, technical communication skills (Listening, speaking, writing, reading writing), linguistic ability, style in technical communication.	4
2	**Comprehension of Technical Materials/Texts and Information Design & development-** Reading of technical texts, Readingand comprehending instructions and technical manuals, Interpreting and summarizing technical texts, Note-making. Introduction of different kinds of technical documents, Information collection, factors affecting information and document design, Strategies for organization, Information design and writing for print and online media.	6
3	**Technical Writing, Grammar and Editing**- Technical writing process, forms of technical discourse, Writing, drafts and revising, Basics of grammar, common error in writing and speaking, Study of advanced grammar, Editing strategies to achieve appropriate technical style, Introduction to advanced technical communication. Planning, drafting and writing Official Notes, Letters, E-mail, Resume, Job Application, Minutes of Meetings.	8
4	**Advanced Technical Writing**- Technical Reports, types of technical reports, Characteristics and formats and structure of technical reports. Technical Project Proposals, types of technical proposals, Characteristics and formats and structure of technical proposals. Technical Articles, types of technical articles, Writing strategies, structure and formats of technical articles.	8
	TOTAL	**26**

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

3CE1-03/4CE1-03: MANAGERIAL ECONOMICS AND FINANCIAL ACCOUNTING

Credit: 2
2L+0T+0P

Max. Marks: 100 (IA:20, ETE:80)
End Term Exam: 2 Hours

SN	Contents	Hrs.
1	**Basic economic concepts-**Meaning, nature and scope of economics, deductive vs inductive methods, static and dynamics, Economic problems: scarcity and choice, circular flow of economic activity, national income-concepts and measurement.	4
2	**Demand and Supply analysis**-Demand-types of demand, determinants of demand, demand function, elasticity of demand, demand forecasting – purpose, determinants and methods, Supply-determinants of supply, supply function, elasticity of supply.	5
3	**Production and Cost analysis**-Theory of production- production function, law of variable proportions, laws of returns to scale, production optimization, least cost combination of inputs, isoquants. Cost concepts-explicit and implicit cost, fixed and variable cost, opportunity cost, sunk costs, cost function, cost curves, cost and output decisions, cost estimation	5
4	**Market structure and pricing theory**-Perfect competition, Monopoly, Monopolistic competition, Oligopoly.	4
5	**Financial statement analysis**-Balance sheet and related concepts, profit and loss statement and related concepts, financial ratio analysis, cash-flow analysis, funds-flow analysis, comparative financial statement, analysis and interpretation of financial statements, capital budgeting techniques.	8
	Total	**26**

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

II Year - III Semester: B.Tech. (Civil Engineering)

3CE3-04: ENGINEERING MECHANICS

Credit: 2
2L+0T+0P

Max. Marks: 100 (IA:20, ETE:80)
End Term Exam: 2 Hours

SN	CONTENT	Hrs.
1	**Introduction: objective, scope and outcome of the course.**	1
2	**Statics of particles and rigid bodies:** Fundamental laws of mechanics, Principle of transmissibility, System of forces (conservative and non-conservative), Resultant force, Resolution of force, Moment and Couples, Resolution of a force into a force and a couple, Free body diagram, Equilibrium, Conditions for equilibrium, Lami's theorem.	4
3	**Plane trusses:** Types of structures, Trusses, Support Conditions, Types of Loadings, Classification of trusses, Determinacy of trusses, Basic assumptions of truss analysis (zero force member, tension or compression member), Method of joints, Method of sections.	4
4	**Centroid & Moment of inertia (M.I.):** Location of centroid, Moment of inertia (mass and area), Parallel axis and perpendicular axis theorems, M.I of composite section, M.I. of solid bodies, Polar moment of inertia, principle axis and principle moment of inertia.	4
5	**Virtual work:** Principle of Virtual Work, Active forces and active force diagram, Stability of equilibrium. **Work, Energy and Power:** Work of a force, weight and couple, Power, Efficiency, Energy, Kinetic energy of rigid body, Principle of work and energy, Conservation of energy.	4
6	**Friction:** Types of Friction, Laws of friction, Angle of friction, Angle of repose, Ladder, Wedge, Belt Friction.	2
7	**Springs**: Stiffness of springs, springs in series and parallel, Introduction to laminated plate springs, leaf spring, close coiled helical springs, open coiled springs.	2
8	**Simple Stresses and Strains:** Concept of stress and strain in three dimensions and generalized Hooke's law; Young's modulus, Shear stress, Shear strain, Modulus of rigidity, Complementary shear stress; Poisson's ratio, Volumetric strain, Bulk modulus, relation between elastic constants, Stress and strain thin cylinder and spherical cell under internal pressure.	7
	TOTAL	**28**

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

II Year - III Semester: B.Tech. (Civil Engineering)

3CE4-05: SURVEYING

Credit: 3
3L+0T+0P

Max. Marks: 150 (IA:30, ETE:120)
End Term Exam: 3 Hours

SN	Contents	Hrs.
1	**Introduction: objective, scope and outcome of the course.**	1
2	**LINEAR AND ANGULAR MEASUREMENTS** Method of linear measurements, Correction to length measured with a chain/tape, Ranging a survey line; direct and indirect Angular measurement by compass, Designation of bearing, Traversing with tape and compass, Correction to measured bearing, Angular measurement by theodolite; Temporary adjustments, Method of horizontal angle measurement and vertical angle, Traverse computation, plotting of traverse and determining the closing error, Balancing traverse.	14
3	**LEVELLING** Measurements of elevations methods of levelling; direct/differential, Indirect/Trigonometrical, and Profile/Cross sectional levelling. Digital and Auto level, Errors in levelling, contours and contour lines; methods of contouring; direct and indirect, characteristics, uses, area and vol. measurements.	8
4	**CURVE SURVEYING** Elements of simple and compound curves, Types of curves, Elements of circular, reverse, and transition curves. Method of setting out simple, circular, transition and reverse curves, Types of vertical curves, length of vertical curves, setting out vertical curves. Tangent corrections.	5
5	**TACHEOMETRY AND PHOTOGRAMMETRY SURVEYING** Advantages of tacheometric surveying, different systems of tacheometric measurements, Stadia system of tacheometry, distance elevation formulae for horizontal sights. Determination of tacheometric constants, distance and elevation formulae for inclined sights with staff vertical. Introduction to basic concepts perspective geometry of aerial photographs, relief and tilt displacements, Terrestrial Photogrammetry, flight planning	8
6	**SETTING OUT WORKS & MODERN FIELD SURVEY SYSTEMS** Instruments and methods for laying out buildings, setting out culverts, setting out sewer lines. Principle of E.D.M. (Electronic Distance Measurements), Modulation, Types of E.D.M., Distomat, Total station, parts of total station, advantages and application.	6
	TOTAL	42

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RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

II Year - III Semester: B.Tech. (Civil Engineering)

3CE4-06: FLUID MECHANICS

Credit: 2
2L+0T+0P

Max. Marks: 100 (IA:20, ETE:80)
End Term Exam: 2 Hours

SN	Contents	Hrs.
1	**Introduction to objective, scope and outcome of the course.**	1
2	**Fluids**: Definition, Type of fluids, Ideal fluids, real fluids, Newtonian and non-Newtonian fluids.	1
3	**Properties of Fluids:** Units of measurement, Mass density, Specific weight, Specific volume, Specific Gravity, Viscosity, Surface tension and Capillarity, Compressibility and Elasticity.	2
4	**Principles of Fluid Statics**: Basic equations, Pascal Law, Type of pressure:-atmospheric pressure, Gauge pressure, vacuum pressure, absolute pressure, manometers, Bourdon pressure gauge	3
5	**Buoyancy**; Forces acting on immersed plane surface. Centre of pressure, forces on curved surfaces. Conditions of equilibrium for floating bodies, meta-centre and analytical determination of meta centric height.	3
6	**Kinematics of Flow**: Visualisation of flow, Types of flow: Steady and unsteady, uniform and non-uniform, rotational and irrotaional flow, Laminar and turbulent flow, streamline, path line, streak line, principle of conservation of mass, equation of continuity, acceleration of fluid particles local and convective, velocity, acceleration, velocity potential and stream function, elementary treatment of flow net, vorticity, circulation, free and forced vortex. Fluid mass subject to horizontal and vertical acceleration and uniform rotation	6
7	**Fluid Dynamics**: Control volume approach, Euler's equation, Bernoulli's equation and its applications, venture-meter, orificemeter, orifices & mouthpieces, time of emptying of tanks by orifices, momentum and angular momentum equations and their applications, pressure on flat plates and nozzles.	6
8	**Laminar Flow through Pipes**: Laminar flow through pipes, Relation between shear & pressure gradient. Flow between plates & pipes. Hagen-Poiseuille equation, Equations for velocity distribution, pressure difference velocity distribution over a flat plate and in a pipe section, Darcy-Weisbach equation, friction factor , minor losses, pipe networks	6
	TOTAL	28

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RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

II Year - III Semester: B.Tech. (Civil Engineering)

3CE4-07: BUILDING MATERIALS AND CONSTRUCTION

Credit: 3 **Max. Marks: 150 (IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hrs.
1	**Introduction to objective, scope and outcome of the course.**	1
2	**Basic Civil Engineering Materials (Properties, Types and Uses):** Stone: Compressive strength, Water absorption, Durability, Impact value, Tensile strength; Bricks: Water absorption, Compressive strength, Effloresces, Dimension and Tolerance; Tiles: Water absorption, Tolerance, Impact value and Glazing; Light weight concrete blocks. **Lime**: classification as per IS, properties, standard tests and uses in construction. **Fly-ash:** Properties and Use in manufacturing of bricks & cement; **Miscellaneous**: Gypsum, Plaster of Paris, PVC materials, Paints, Varnish and Distemper.	8
3	**Timber & Steel:** Timber: Definitions of related terms, Classifications and Properties, Defects in Conversion of wood, Seasoning wood, Preservation, Fire proofing, Ply woods, Fibre boards; Steel: Mild steel and HYSD steel, Properties and their use, common tests on steel.	3
4	**Mortarand Plaster:** Mortar preparation methods**:** Functions and tests & their uses in various types of pointing & plastering	2
5	**Brick and Stone Masonry**: Basic principle of masonry work, different types of bonds, relative merits and demerits of English, Single Flemish and Double Flemish bond. Comparison between stone and brick masonry. General principles, classification of stone masonry and their relative merits and demerits.	4
6	**Building Requirements & Construction System:** Building components, their functions and requirements. Types of construction: load bearing and framed structure construction, RCC beam, column and slab construction, Precast and In-situ construction, Relative merits and demerits. Fire resistance construction, FRC. **Ground & Upper floors:** Floor components and their functions, Floor types and Selection of flooring, construction details of ground and upper floors, merits and demerits.	7
7	**Foundation & Site Preparation:** Purpose, types of foundation: like shallow, deep, pile, raft, grillage foundation and their suitability. Depth of foundation, Sequence of construction activity and co-ordination, site clearance, layout of foundation plan.	5

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	Temporary structures: Types & methods of shoring, underpinning and scaffolding.	
8	**Damp Proofing:** Causes and Effects of dampness, Methods and materials for damp proofing, Methods and materials for anti-termite treatment. **Construction and Expansion Joints:** Requirements, Types material used, Construction details.	**3**
9	**Arches and Lintels:** Terms used, types of arches and their construction detail, types of lintels and constructions. **Partition Wall:** Types, purpose and use of partition wall.	**3**
10	**Stairs:** Terms used, requirements of good staircase, classification, construction details and suitability of different types of stairs, Lifts and Ramps.	**2**
11	**Roof and Roof Covering:** Purposes, classification of roofs, terms used. Introduction to Solid slab, Flat slab, Shell Roofs and Pitched roofs, and their constructional features. Types of pitched roofs and Trusses, typical constructional details; Roof covering materials, types and typical constructional details.	**4**
	Total	**42**

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3CE4-08: ENGINEERING GEOLOGY

Credit: 2 **Max. Marks: 100 (IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hrs.
1	**Introduction to objective, scope and outcome of the course.**	1
2	**General Geology**: Branches and Scope of Geology, Types of Weathering & Geological work of natural agencies like River & Wind. Geological Time Scale. Physical Properties of Minerals.	6
3	**Petrology:** Formation, Texture, Structure and Classification of Igneous, Sedimentary and Metamorphic Rocks. Engineering Properties of Rocks for Building & Road Material. Laboratory and Field & in-situ Test for Site Construction.	6
4	**Structural Geology:** Causes, Terminology, Classification, Recognition, Effects and Engineering consideration of Fold, Fault, Joints and Unconformities.	5
5	**Engineering Geology:** Geophysical methods as applied to Civil Engineering for Subsurface Analysis (Electrical and Seismic methods). Terminology, Types and Geological consideration for site selection of Dam & Tunnel.	6
6	**Remote Sensing & GIS:** Application of Remote Sensing and GIS in Various fields of Civil Engineering.	4
	TOTAL	28

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3CE4-21: SURVEYING LAB

Credit: 1.5 **Max. Marks: 75 (IA:45, ETE:30)**
0L+0T+3P

List of Experiments

1. Linear Measurement by Tape:
   a. Ranging and Fixing of Survey Station.
   b. Plotting Building Block by offset with the help of cross staff.
2. Compass Survey: Using Surveyor's and Prismatic compass
   a. Measurement of bearing of lines
   b. Adjustment of included angles of compass traverse.
3. Levelling: Using Tilting/ Dumpy/ Automatic Level
   a. To determine the reduced levels in closed circuit.
   b. To carry out profile levelling and plot longitudinal and cross sections for road.
4. Theodolite Survey: Using Vernier Theodolite
   a. To carryout temporary adjustment of Theodolite & Measurement of horizontal and vertical angle: by method of repetition and method of Reiteration.
   b. To measure and adjust the angles of a braced quadrilateral.
5. Trigonometric Levelling: To determine the Height of an object by trigonometriclevelling:
   a. By using Instruments in same vertical plane.
   b. By using Instruments in different vertical planes.
6. Tacheometry Survey:
   a. To determine the tachometric constant.
   b. To determine the horizontal and vertical distance by tachometric survey.
7. To study the various electronic surveying instruments like EDM, Total Station etc.

One-week Survey Camp for topographic/ project survey/Contouring be arranged before or after Term End Exam.

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3CE4-22: FLUID MECHANICS LAB

Credit: 01 **Max. Marks: 50 (IA:30, ETE:20)**

0L+0T+2P

List of Experiments

1. To study the various pressure measuring devices
2. To verify the Bernoulli's theorem.
3. To calibrate the Venturi-meter.
4. To calibrate the Orifice-meter.
5. To determine Metacentric Height.
6. To determine C_c, C_v, C_d of an orifice.
7. To determine C_d of a mouthpiece.
8. To determine C_d of a V-notch.
9. To determine viscosity of a given fluid.
10. To study the velocity distribution in pipes.

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3CE4-23: COMPUTER AIDED CIVIL ENGINEERING DRAWING

Credit: 1.5 **Max. Marks: 75 (IA:45, ETE:30)**
0L+0T+3P

List of Assignments

To study and draw the labelled sketch of different Building Components on sheets with exposure to CAD:

1. Drawing of walls
    a. Brick and Stone masonry
    b. Cross section of external wall from foundation to parapet
    c. Partition wall, cavity wall and
2. Pointing, Arches, Lintels and Floors
3. Doors and Windows
4. Stairs, Cross section of Dog legged stairs
5. Roofs: Flat and Pitched roof (Steel truss)
6. Development of Front Elevation and Sectional Elevation from a given plan
7. Development of Plan, Front Elevation and Sectional Elevation from line diagram

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3CE4-24: CIVIL ENGINEERING MATERIALS LAB

Credit: 01 **Max. Marks: 50 (IA:30, ETE:20)**
0L+0T+2P

List of Experiments

1. To determine properties of following materials:
   - A. STONE:
     - a. Compressive strength,
     - b. Water absorption,
     - c. Impact value,
     - d. Tensile strength;
   - B. Bricks:
     - a. Water absorption,
     - b. Compressive strength,
     - c. Dimension and Tolerance;
   - C. Tiles:
     - a. Water absorption,
     - b. Tolerance,
     - c. Impact value
   - D. Timber: Compressive and Tensile Strength of Timber across and along the Grain
2. To Study the Properties & Utilization of Fly Ash in Construction
3. To Study the Different Aluminum and Steel Sections
4. To Study the Manufacturing and Use of Concrete Hollow Blocks
5. To Study the Properties and Uses of Kota Stone and its Slurry

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3CE4-25: GEOLOGY LAB

Credit: 01 **Max. Marks: 50 (IA:30, ETE:20)**
0L+0T+2P

List of Experiments

1. Physical Properties of Minerals
2. Physical Properties of Rocks
3. Identification of Minerals in Hand Specimen
4. Identification of Rocks in Hand Specimen
5. Identification of Geological features through wooden Models
    a. Structural Geological Diagrams
    b. Petrological Diagrams
    c. Engineering Geological Diagrams
6. Interpretation of Geological Map (10 Nos.)
7. Dip & Strike Problems (8 Nos.)

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Syllabus of

UNDERGRADUATE DEGREE COURSE

Civil Engineering

Rajasthan Technical University, Kota

Effective from session: 2018 – 2019

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

II Year-IV Semester: B.Tech. (Civil Engineering)

4CE2-01: ADVANCE ENGINEERING MATHEMATICS-II

Credit: 2 **Max. Marks: 100 (IA:20, ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hrs.
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Probability:** Basic concepts of probability, conditional probability, Baye's theorem.Random variable: Discrete and Continuous random variables, Joint distribution, Marginal distribution, Probability distribution function, Conditional distribution.Mathematical Expectations: Moments, Moment Generating Functions, variance and correlation coefficients, Chebyshev's Inequality, Skewness and Kurtosis. Binomial, Poisson and Normal distribution and their properties.	13
3	**Applied Statistics:** Basic concept of variance, Correlation and regression – Rank correlation. Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.	12
	Total	26

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RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

II Year-IV Semester: B.Tech. (Civil Engineering)

4CS1-03/3CS1-03: MANAGERIAL ECONOMICS AND FINANCIAL ACCOUNTING

Credit-2 **Max. Marks : 100 (IA:20,ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Basic economic concepts-** Meaning, nature and scope of economics, deductive vs inductive methods, static and dynamics, Economic problems: scarcity and choice, circular flow of economic activity, national income-concepts and measurement.	3
3	**Demand and Supply analysis-** Demand-types of demand, determinants of demand, demand function, elasticity of demand, demand forecasting –purpose, determinants and methods, Supply-determinants of supply, supply function, elasticity of supply.	5
4	**Production and Cost analysis-** Theory of production- production function, law of variable proportions, laws of returns to scale, production optimization, least cost combination of inputs, isoquants. Cost concepts-explicit and implicit cost, fixed and variable cost, opportunity cost, sunk costs, cost function, cost curves, cost and output decisions, cost estimation.	5
5	**Market structure and pricing theory-** Perfect competition, Monopoly, Monopolistic competition, Oligopoly.	4
6	**Financial statement analysis-** Balance sheet and related concepts, profit and loss statement and related concepts, financial ratio analysis, cash-flow analysis, funds-flow analysis, comparative financial statement, analysis and interpretation of financial statements, capital budgeting techniques.	8
	TOTAL	26

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RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

II Year-IV Semester: B.Tech. (Civil Engineering)

4CS1-02/3CS1-02: TECHNICAL COMMUNICATION

Credit-2 **Max. Marks : 100 (IA:20,ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hours
	Introduction: Objective, scope and outcome of the course.	**1**
1	**Introduction to Technical Communication-** Definition of technical communication, Aspects of technical communication, forms of technical communication, importance of technical communication, technical communication skills (Listening, speaking, writing, reading writing), linguistic ability, style in technical communication.	**3**
2	**Comprehension of Technical Materials/Texts and Information Design & development-** Reading of technical texts, Reading and comprehending instructions and technical manuals, Interpreting and summarizing technical texts, Note-making. Introduction of different kinds of technical documents, Information collection, factors affecting information and document design, Strategies for organization, Information design and writing for print and online media.	**6**
3	**Technical Writing, Grammar and Editing**- Technical writing process, forms of technical discourse, Writing, drafts and revising, Basics of grammar, common error in writing and speaking, Study of advanced grammar, Editing strategies to achieve appropriate technical style, Introduction to advanced technical communication. Planning, drafting and writing Official Notes, Letters, E-mail, Resume, Job Application, Minutes of Meetings.	**8**
4	**Advanced Technical Writing**- Technical Reports, types of technical reports, Characteristics and formats and structure of technical reports. Technical Project Proposals, types of technical proposals, Characteristics and formats and structure of technical proposals. Technical Articles, types of technical articles, Writing strategies, structure and formats of technical articles.	**8**
	TOTAL	**26**

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SYLLABUS

II Year-IV Semester: B.Tech. (Civil Engineering)

4CE3-04: BASIC ELECTRONICS FOR CIVIL ENGINEERING APPLICATIONS

Credit: 2 **Max. Marks: 100 (IA:20, ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hrs.
1	**Introduction:** to objective, scope and outcome of the subject.	1
2	**Basic Electronics**: Number systems & Their conversion used in digital electronics, Demorgan's theorem, Logic Gates, half and full adder circuits, R-S flip flop, J-K flip flop.	2
3	Introduction to Semiconductors, Diodes, V-I characteristics, Bipolar junction transistors (BJT) and their working, introduction to CC, CB & CE transistor configurations.	3
4	**Instrumentation**: mechanical, electrical, electronic system and their calibration, Use of automatic and digital levels, electronic theodolites, total stations; Control surveys using GNSS, Total station and traversing methods (adjustment and computations of coordinates).	4
5	**Measurement errors**: Gross error and systematic errors, absolute and relative errors, accuracy, precision, resolution and significant figures. Full-field measurements;	2
6	**Data acquisition system and data processing**: analog systems, digital systems using personal computers, dynamic measurement, numerical and graphical data processing and archiving.	3
7	**Sensors & Transducers**: various types of sensors for displacement, velocity, acceleration, pressure, loads, strains, Displacement sensors, Mass &Piezoeletric, strain gauges, Temperature sensors thermocouple, flow sensors : Ultrasonic, electromagnetic, laser and thermal	5
8	**Sensor types characteristics**: types of resolution, FOV, IFOV, PSF; Geometric and radiometric distortions, Geo-referencing, re-sampling methods; Atmospheric errors and removal; Satellite orbits and characteristics; Applications of optical and microwave remote sensing techniques in Civil Engineering.	5
9	**Digital Image Processing**: Digital image, introduction to digital image processing, pre-processing, enhancement, classification, accuracy assessment.	3
	TOTAL	28

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RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

II Year-IV Semester: B.Tech. (Civil Engineering)

4CE4-05: STRENGTH OF MATERIALS

Credit: 3 **Max. Marks: 150 (IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	Hrs.
1	**Introduction:** to objective, scope and outcome of the subject	1
2	**Simple Stresses and Strains in different members:** Stresses in prismatic & non prismatic members and in composite members; Thermal stresses; Stresses in composite members, Compatibility condition.	5
3	**Compound Stress:** Two dimensional stress system: stress resultant, principal planes and principal stresses, state of pure shear maximum shear stress, Mohr's circle &its application. Introduction to theories of failures.	6
4	**Bending of Beams:** Bending moment, Shear force and Axial thrust diagrams for statically determinate beams subjected to various types of loads and moments, Point of Contra-flexure, relation between load, SF and BM.	8
5	**Theory of simple bending**: Distribution of bending and shear stresses for simple and composite sections, Combined direct and bending stress,	6
6	**Torsion:** Elementary concepts of torsion, shear stress in solid and hollow circular shafts, angle of twist, power transmitted by a shaft, combined bending and torsion;	4
7	**Columns:**Short and long columns, slenderness ratio, crushing and buckling of column, short column subjected to axial and eccentric loads; Euler's theory and its limitation, concept of effective length of columns; Rankine & Secant formulae, middle third rule, core of a section.	5
8	**Deflection of Beams:** Differential relation between load, shear force, bending moment, slope deflection. Slope & deflection in determinate beams using double integration method, Macaulay's method, area moment method and conjugate beam method and their application to statically determinate prismatic beams.	7
	TOTAL	42

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SYLLABUS

II Year-IV Semester: B.Tech. (Civil Engineering)

4CE4-06: HYDRAULICS ENGINEERING

Credit: 3 **Max. Marks: 150 (IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	Hrs.
1	**Introduction:** to scope, objective and outcome of subject	1
2	**Dimensional Analysis & Models:** Dynamical Similarity and Dimensional Homogeneity Model experiment, geometric, Kinematic and Dynamic similarity. Reynold's, froudes, Weber's, Euler and Mach numbers. Distorted river models and undistorted models, proper choice of scale ratios. Scale effect. Principle of dimensional analysis Rayleigh method, Buckingham theorem.	4
3	**Turbulent flow**, Reynolds equations, Prandtl's mixing length theory, Equations of velocity distribution and friction coefficient **Boundary Layer Theory**: Concept of boundary layer, laminar and turbulent boundary layers, boundary layer thickness, von Karman integral equation, laminar sub-layer, hydro-dynamically smooth and rough boundaries, separation of flow and its control, cavitation.	6
4	**Open channel Flow** Uniform, Non-Uniform and variable flow. Resistance equations of Chezy and Manning. Section factor for uniform flow. Most Efficient rectangular, triangular and trapezoidal sections. Velocity distribution in open channels.	5
5	**Gradually varied flow** in Prismatic channels. Specific energy of flow. Critical depth in prismatic channels. Alternate depths. Rapid, critical and sub critical Flow Mild, steep and Critical Slopes. Classification of surface curves in prismatic channels and elementary computation	4
6	**Rapidly varied flow**: Hydraulic jump or standing wave in rectangular channels. Conjugate or sequent depths Losses in jump, location of jump. velocity distribution in open channels. Energy correction factor. Moment correction factor	4
7	**Impact of free Jets:** Impact of a jet on a flat or a curved vane, moving and stationary vane. **Introduction of Hydraulic machine –** Type of pumps and turbine and its brief description. Draft tube and its principle	3

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8	**Hydrology:** Definition, Hydrologic cycle, Application to Engineering problems, measurement ofrainfall, rain gauge, peak flow, flood frequency method, catchment area formulae, Floodhydrograph, Rainfall analysis, Infiltration, Run off, Unit hydrograph and its determination,Estimation of run off.	**8**
9	**Ground Water**: Aquifers and its types, Confined and unconfined aquifer, Darcy's Law, hydraulic conductivity, transmissivity, well hydraulics.	**3**
10	**Canal Hydraulics:** Types of canals, parts of canal irrigation system, channel alignment,assessment of water requirements, estimation of channel losses, design of channels, regime andsemi theoretical approaches (Kennedy's Theory, Lacey's Theory), cross section of channels, siltcontrol in canals.	**4**
	TOTAL	**42**

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SYLLABUS

II Year-IV Semester: B.Tech. (Civil Engineering)

4CE4-07: BUILDING PLANNING

Credits: 2 **Max. Marks: 100 (IA:20, ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hrs.
1	**Introduction:** to scope, objective and outcome of subject	1
2	**Introduction**: Types of buildings, criteria for location and site selection, site plan and its detail.	2
3	**Sun Consideration :** Different methods of drawing sun chart, sun shading devices, design of louvers.	3
4	**Climatic and comfort Consideration**: Elements of climate, global climate, climatic zones of India, thermal comfort, biclimatic chart,	3
5	**Orientation:** Meaning, factors affecting orientation, orientation criteria for tropical climate.	1
6	**Building Bye Laws and NBC Regulations:** Objective of by-laws, regulation regarding; means of access, lines of building frontages, covered area, floor area ratio, open spaces around buildings, height & sizes of rooms, plinth regulation.	3
7	**Principles of Planning:** Different factors affecting planning viz-aspect, prospect, furniture requirement,roominess, grouping, circulation, elegance, privacy etc.	3
8	**Vastu Shastra In Modern Building planning:** Factors considered in Vastu, site selection, orientation,planning and design of residential buildings, school/hospital	3
9	**Functional Design And Accommodation Requirements Of Non Residential Buildings:** viz-school buildings, rest house, primary health centers, post office etc.	3
10	**Services in Buildings** (A) Lighting and ventilation, doors and windows, lifts. (B) Acoustics, sound insulation and noise control. (C) Fire fighting provisions	6
	TOTAL	28

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4CE4-08: CONCRETE TECHNOLOGY

Credit: 3 **Max. Marks: 150 (IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	Hrs.
1	**Introduction:** to objective, scope and outcome of the subject	1
2	**Ingredients of concrete:** Cement: hydration of cement and its basic compounds, structure of hydrated cement, C-S-H gel, heat of hydration, gel-space ratio etc.	2
3	**Aggregates:** types, physical properties and standard methods for their determination, including Grading of aggregates as per IS. Manufactured sand- properties and IS Specifications for use in concrete.	2
4	**Concrete:** Grade of concrete, proportioning of ingredients, water content and its quality, water/cement ratio and its role, Properties of fresh concrete including workability, air content, Flow ability, Segregation, Bleeding and Viscosity etc. Factors affecting, methods of determination.	4
5	Properties of hardened concrete such as strengths, permeability, creep, shrinkage,factors influencing, Standard tests on fresh and hardened concrete as per IS code. Aggregate- cement interface, its effect on properties of concrete.	4
6	**NDT**: Introduction and their importance. Application & use of Rebound Hammer, Ultra-sonic pulse velocity meter, Rebar & Cover meter, half-cell potential meter, corrosion resistivity meter, core sampling. Interpretation of their results,	4
7	**Concrete Handling in Field:** Batching, mixing, placing and transportation of concrete, equipments for material handling, various methods their suitability and precautions. Compaction of concrete: methods &equipments. Curing of concrete: various methods their suitability.	4
8	Durability of concrete. Causes of deterioration, Carbonation, Tests for durability assessment	3
9	**Admixture in concrete:** Chemical and mineral admixtures, their types and uses: accelerator, retarders, water-proofing, plasticisers, super plasticizers-types, their suitability. Fly ash-properties for use in concrete, specifications of flyash as per IS 3812, and effect on properties of concrete. GGBFS, Microsilica and metakaolin- propertie, specifications and utility in concrete.	7

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10	Concrete mix deign (IS method)- with and without water reducing admixtures	**2**
11	**Form work:** Requirements, their types. Typical formworks and shuttering/centering for Columns, beams, slabs, walls, etc. Slip and moving formwork.	**3**
12	**Special types of concrete:** Sulphate resisting concrete, under water concreting, pumpable concrete: methods and issues in making, salient properties and applications.	**3**
13	Concretes with tailored properties- including high performance concrete, with specific properties in fresh and hardened states, self-compacting concrete-materials, mix proportioning, test methods, use and applications with case studies.	**3**
	TOTAL	**42**

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4CE21: MATERIAL TESTING LAB

Credit: 01 **Max. Marks: 50 (IA:30, ETE:20)**

0L+0T+2P

1. Tests on Mild steel and HYSD Bar –To determine compressive and tensile strength, yield strength, percentage elongation etc.
2. Tests on Cement and concrete cubes/ core to establish their strength
3. Hardness Test – Rockwell Hardness and Brinell Hardness
4. Impact Test – Izod and Charpy
5. Modulus of Rupture of Wooden Beam
6. Fatigue Test
7. Spring Test
8. Torsion Test

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4CE4-22: HYDRAULICS ENGINEERING LAB

Credit: 01 **Max. Marks: 50 (IA:30, ETE:20)**

0L+0T+2P

1. To determine the minor losses.
2. To determine the friction factor.
3. To determine Cd of Broad crested weir.
4. To verify the momentum equation.
5. To determine the discharge of venturimeter.
6. To determine Manning's & Chezy's coefficient of roughness for the bed of a given Channel.
7. To study and plot characteristics curve of hydraulic jump.
8. To study velocity distribution in open channel flow.

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4CE4-23: BUILDING DRAWING

Credit: 1.5 **Max. Marks: 75 (IA:45, ETE: 30)**

0L+0T+3P

1- To plan and draw working drawing of a Residential building with following detail.
- (a) Site plan
- (b) Foundation plan
- (c) Plan
- (d) Two sectional elevations
- (e) Front elevation
- (f) Furniture plan
- (g) Water supply and sanitary plan
- (h) Electric fitting plan

2- To design and draw a Primary Health Center

3- To design and draw a Primary School

4- To design and draw a Rest House

5- To design and draw a Post Office

6- To design and draw a Bank

7- To design and draw a College Library

8- To design and draw a Cinema Theatre

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4CE4-24: ADVANCED SURVEYING LAB

Credit: 01 **Max. Marks: 50 (IA:30, ETE:20)**

0L+0T+2P

1. To measure the horizontal and vertical angles by Theodolite.
2. To determine the Height of an object by trigonometric leveling (Instruments in same vertical plane).
3. To determine the Height of an object by trigonometric leveling (Instruments in different vertical planes).
4. Measurement of angles, length of survey line using Total Station, finding the coordinate of station
5. To measure and adjust the angles of a braced quadrilateral.
6. To prepare the map of given area by plane tabling.
7. Measurement of area of a traverse by Total Station

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4CE4-25: CONCRETE LAB

Credit: 1.5 **Max. Marks: 75 (IA: 45, ETE: 30)**

0L+0T+3P

1. To determine the fineness of Cement by Blaine's air permeability test.
2. To determine the flexural strength of Concrete.
3. To determine Soundness of cement by Le-chatelier apparatus.
4. To determine the specific gravity of fine aggregate (sand) by Pycnometer.
5. To determine the bulking of fine aggregate and to draw curve between water content and bulking.
6. Sieve analysis of coarse aggregates and fine aggregates.
7. To determine the workability of given concrete mix by slump test.
8. To determine the optimum dose of super plastsizers by Flow table test.
9. To design concrete mix of M-20 grade in accordance with I S 10262.
10. To design concrete mix of M-40 grade with super plasticizer in accordance with I S 10262.
11. To determine the Permeability of Concrete.
12. Study of Core cutter, UPV & Rebound Hammer equipment.

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Syllabus of

UNDERGRADUATE DEGREE COURSE

B.Tech. V Semester

Civil Engineering



Rajasthan Technical University, Kota

Effective from session: 2019-20

5CE3-01: CONSTRUCTION TECHNOLOGY AND EQUIPMENT

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Engineering Economy** Principle of Engineering Economy, Minimum cost point analysis, Breakeven point analysis, Depreciation and depletion	6
3	**Safety in construction** Causes, classification, cost and measurement of an accident, safety programme for construction, protective equipment, accident report, safety measure: (a) For storage and handling of building materials. (b) Construction of elements of a building (c) In demolition of buildings; Safety lacuna in Indian scenario. Fire safety provisions as per NBC.	8
4	**Construction Planning** Need of construction planning, Constructional Resources, construction team, stages in construction, preparation of construction schedule, Job layout, inspection and quality control; **Materials Management:** Objective and functions of material management	7
5	**Construction Equipment and Management** Earth Moving Equipment-Bull dozers tractor pulled scrapers Power shovels Draglines clamshells; cranes; Hoes, Trenching machine types Hauling Equipment; Drilling, Blasting and Tunnelling Equipment; Pile Driving Equipment	6
	TOTAL	28

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5CE4-02: STRUCTURE ANALYSIS-I

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Introduction to Indeterminate structures, Degrees of freedom per node, Static and Kinematic indeterminacy (i.e. for beams, frames & portal with & without sway etc.), Releases in structures, Maxwell's reciprocal theorem and Betti's theorem. Analysis of prop cantilever structures, Analysis of Indeterminate Structure (fixed and continues beams) using Area moment method, Conjugate beam method, Three moments Theorem.	11
3	Analysis of Statically Indeterminate Structures using Slope-deflection method and Moment-distribution method applied to continuous beams and portal frames with and without inclined members	11
4	**Vibrations:** Elementary concepts of structural vibration, Mathematical models, basic elements of vibratory system. Degree of freedom. Equivalent Spring stiffness of springs in parallel and in series. **Simple Harmonic Motion**: vector representation, characteristic, addition of harmonic motions, Angular oscillation. **Undamped free vibration of SDOF system**: Newton's law of motion, D Almbert's principle, deriving equation of motions, solution of differential equation of motion, frequency & period of vibration, amplitude of motion; Introduction to damped and forced vibration.	5
	TOTAL	28

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5CE4-03: DESIGN OF CONCRETE STRUCTURES

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Fundamental concepts of design of RC members, assumptions. Types and function of reinforcement. Introduction to various related IS codes, Characteristic load and characteristic strength. **Working Stress Method:** Working stress design philosophy. Analysis and Design of singly reinforced rectangular beam section for flexure.	5
3	**Limit State Design:** Limit state design philosophy. Assumptions, Analysis and design of singly reinforced, doubly reinforced rectangular beams and flanged beams for flexure using codal provisions for simply supported, cantilever, fixed and continuous beams.	10
4	**Limit state of serviceability for deflection**: control of deflection as per codal provisions of empirical coefficients. **Limit state of collapse in shear**: Types of shear reinforcement and its detailing, analysis and design of shear reinforcement for prismatic sections. **Limit state of collapse in bond**: concept of bond stress, anchorage length and development length. Detailing and curtailment of reinforcement as per codal provisions.	6
5	**Slabs:** Analysis and design of one way and two way slabs using LSM, Detailing of reinforcement. Check for shear and deflection.	6
6	**Columns:** Short and long columns, their structural behaviour. Analysis and design of axially loaded short columns, using LSM. Analysis of eccentrically loaded short columns. Introduction to Pu-Mu interaction curves and their use for eccentrically loaded columns. **Footings:** Analysis and design of Isolated column footing for axial load. Introduction to combined footing for two columns (without central beam) for axial loads using LSM.	5 4
7	**Torsion:** Analysis and Design of beams for torsion as per codal method.	3
	TOTAL	40

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5CE4-04: GEOTECHNICAL ENGINEERING

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Soil and soil-mass constituents, water content, specific gravity, void ratio, porosity, degree of saturation, air void and air content, unit weights, density index etc. Inter-relationships of the above. Determination of index properties of soil: water content, specific gravity, particle size distribution, sieve and sedimentation analysis, consistency limits, void ratio and density index. Mineral structures, structures of Illite Montmorillonites and kaolinite and their characteristics. Darcy's law of permeability of soil and its determination in laboratory. Stresses in soil mass: total, effective and neutral pressure, calculation of stresses, influence of water table on effective stress, quicksand phenomenon. Classification of soil for general engineering purposes : particle size and I.S. Classification systems.	8
3	Mohr's circle of stress, shearing strength of soil, parameters of shear strength, Coulomb's failure envelope, determination of shear parameters by Direct Shear Box. Tri-axial and unconfined compression test apparatuses. Principles of soil compaction, laboratory compaction tests; Proctor's test, Stresses in Soil under surface loading: Bossinesq's and Westergaard's analysis for vertical pressure and its distribution in a soil mass. Vertical stresses due to concentrated loads, Isobar diagram, Vertical stress distribution on a horizontal plane. Influence diagram, Vertical stresses at a point under circular and rectangular loaded area. Approximate methods of obtaining vertical pressure due to surface loading. Newmark's chart,	8

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4	Compressibility and Consolidation: Introduction to consolidation, comparison of compaction and consolidation, Spring Analogy Terzaghis one dimensional consolidation theory, Degree of consolidation, consolidation test, Compressibility parameters, co-efficient of consolidation. Pre-consolidation pressure and its determination. Normally, over and under consolidated soils. Methods of predicting Settlement and its rate. Total and differential Settlement.	**8**
5	Stability of Slopes: Classifications of slopes, Stability analysis of infinite slopes. Stability of finite slopes by Swedish and Friction circle method. Stability analysis by Taylor's stability number , Taylor's stability number curves. . Bishop's method of stability analysis. Earth Pressure: Active, passive and earth pressure at rest. Rankine's and Coulomb's theories. Rebhann's and Culman's graphical methods for active earth pressure for vertical and inclined back retaining walls, horizontal and inclined cohesion less back fill.	**8**
6	Bearing Capacity of Soils: Terminology related to bearing capacity, Common types of foundations. Terzaghi and Meyehoff's theory for bearing capacity. Rankine's method for minimum depth of foundation. Skempton's method. Effect of eccentricity and water table on bearing capacity. IS code method, Plate load and penetration tests for determining bearing capacity. Introduction to pile, Site Investigations: Methods of explorations. Planning of Investigations, Depth of exploration, Number of boreholes, Undisturbed and Disturbed samples. Types of samplers. Brief description of procedures of sampling, Transportation and Storage of samples.	**9**
	TOTAL	**42**

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5CE4-05: WATER RESOURCE ENGINEERING

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	**Introduction**: Definitions, functions and advantages of irrigation, present status of irrigation in India, classification for agriculture, soil moisture and crop water relations, Irrigation water quality. Consumptive use of water, principal Indian crop seasons and water requirements.	5
3	**Canal Irrigation:** Types of canals, design of channels, regime and semi theoretical approaches (Kennedy's Theory, Lacey's Theory) **Diversion Head works:** Design for surface and subsurface flows, Bligh's and Khosla's methods.	6
4	**Embankment Dams:** Suitable sites, causes of failures, stability and seepage analysis, flow net, principles of design of earth dams. **Gravity Dams:** Force acting on a gravity dam, stability requirements.	5
5	**Well Irrigation:** Open wells and tube wells, types of tube wells, duty of tube well water. **Cross-Drainage Structure**: Necessity of Cross-drainage structures, their types and selection, comparative merits and demerits.	5
6	**Hydrology:** Definition, Hydrologic cycle, measurement of rainfall, Flood hydrograph, Rainfall analysis, Infiltration, Run off, Unit hydrograph and its determination.	6
		28

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5CE5-11: AIR & NOISE POLLUTION AND CONTROL

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	*Air Pollution:* Air pollutants, Sources, classification, Combustion Processes and pollutant emission, Effects on Health, vegetation, materials and atmosphere, Reactions of pollutants in the atmosphere and their effects-Smoke, smog and ozone layer disturbance, Greenhouse effect.	7
	Air sampling and pollution measurement methods, principles and instruments, Ambient air quality and emission standards, Air pollution indices, Air Act, legislation and regulations, control principles,	6
	Removal of gaseous pollutants by adsorption, absorption, reaction and other methods. Particulate emission control, settling chambers, cyclone separation, Wet collectors, fabric filters, electrostatic precipitators and other removal methods like absorption, adsorption, precipitation etc. Biological air pollution control technologies, Indoor air quality.	7
3	*Noise pollution:* Basics of acoustics and specification of sound; sound power, sound intensity and sound pressure levels; plane, point and line sources, multiple sources; outdoor and indoor noise propagation; psychoacoustics and noise criteria,	4
	Effects of noise on health, annoyance rating schemes; special noise environments: Infrasound, ultrasound, impulsive sound and sonic boom; noise standards and limit values; noise instrumentation and monitoring procedure. Noise indices. Noise control methods	3
	TOTAL	28

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5CE5-12: DISASTER MANAGEMENT

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	**Introduction:** Understanding the Concepts and definitions of Disaster, Hazard, Vulnerability, Risk, Natural and Manmade Disasters, Disaster and Development, and Climate Change.	2
3	**Types of Disasters, their occurrence/ causes, impact and preventive measures:** **Geological Disasters**: earthquakes, landslides, tsunami, mining;	4
	Hydro-Meteorological Disasters: floods, cyclones, lightning, thunder-storms, hail storms, avalanches, droughts, cold and heat waves.	3
	Biological Disasters: epidemics, pest attacks, forest fire.;	3
	Technological Disasters: chemical, industrial, radiological, nuclear.	3
	Manmade Disasters: building collapse, rural and urban fire, road and rail accidents.	2
	Disaster profile of Indian continent, Mega Disasters of India and Lessons Learnt. Risk mapping.	3
4	**Disaster Management Cycle**: Disaster Management Cycle and its components: Pre disaster and post disaster, Paradigm Shift in Disaster Management. Safety tips for various types of disasters.	3
5	**Disaster management system in India:** Disaster Management Act 2005, National Guidelines and Plans on Disaster Management; Role of Government (local, state and national),Non-Government and Inter-Governmental Agencies.	4
	TOTAL	28

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5CE5-13: TOWN PLANNING

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Introduction: Definition of town planning, Evolution of towns, Objects of town planning, Economic Justification for town planning, Principles of town planning, Necessity of town planning, Origin, Growth and patterns of town development, distribution of land use, site for ideal town, powers required to enforce T.P. scheme	6
3	Civic Surveys: Definition, Necessity, collection of data, Types of surveys, methods adopted to collect data, Drawings, reports.	3
4	Zoning: Definition, Use of land, Objects of zoning, Principles of zoning, Aspects, Advantages & Importance zoning, Transition zone, Zoning powers, Maps for zoning	3
5	Importance and Demand of housing, Classification, requirements and design of residential building, Housing agencies, Housing problems in India.	3
6	Slums: Causes, characteristics and effects of slums, Slum clearance.	2
7	Industries: Classification of industry, Concentration of industry, requirements of the industry, Industrial townships.	3
8	Public Buildings: Location, classification principle of design, town center, grouping of public buildings. Town Planning, CL-SPP/CL-DDU/Nadiad, Gujarat, INDIA 4	3
9	Re-planning of existing towns: Objects of re-planning, defects of existing town, data required for re- planning, Urban Renewal projects, De-centralization and Re-centralized, Garden city concept overview.	5
	TOTAL	28

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5CE5-14: REPAIR AND REHABILITATION OF STRUCTURES

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	**Deterioration of Concrete Structures:** Penetrability of concrete- permeability, sorptivity, diffusion. Physical processes- abrasion, erosion. Chemical- carbonation, chloride and sulfate attack. Alkali – Aggregate Reaction. Corrosion- mechanism. **Factors affecting and Preventive measures** :for all the above, including water – proofing techniques for various conditions, sacrificial anode, corrosion resistant steel, corrosion inhibitors, protective coatings etc.	8
3	**Cracks in Concrete and Masonry Structures-** Types, patterns, measurement and preventive measures	3
4	**Assessment of Risk/Damagein Structures:** *Preliminary investigation-* visual, history collection etc. *Detailed Investigation:* core cutting, rebar locator, corrosion meter, penetration resistance, pull out tests, half–cell potential, concrete resistivity etc. Interpretation of non destructive test data from all the above tests as well as rebound hammer number and ultra sonic pulse velocity. Destructive and chemical tests- on material samples from site.	5
5	**Materials for Repair:** polymers and resins, self curing compounds, FRP, ferro-cement- properties, selection criterion, cement based and polymer modified mortars etc	4
6	**Repair Techniques:** Grouting, Jacketing, External bonded plates- processes, limitations, design computations etc. including numerical problems. **Under Water Repair:** Processes	6
7	**Case Studies:** related to rehabilitation of bridge piers, heritage structures, masonry structures etc.	2
	TOTAL	28

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5CE5-15: GROUND IMPROVEMENT TECHNIQUES

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Introduction**: Formation of soil- Mechanical Weathering, Chemical weathering, types of soil-Residual soil, Transported soil, Regional soil Deposit in India, Difficult soils- Expansive soil, Collapsible soil, organic soil etc. Purpose and Principles of Ground Improvements.	03
3	**Densification by Compaction Near Surface**: Theory of compaction, Laboratory compaction tests; compaction in field, Effect of compaction on different soil properties, Factor affecting compaction in field, Measurement of density in field.	03
4	**Densification by Deep Compaction:** (a) Vibration methods- Vibro compaction, Vibro floatation, Vibratory probes method, Blasting. (b) Displacement methods- Sand compaction piles; Dynamic compaction.	04
5	**Modification Using Stone Columns:** **Introduction**- Failure mechanism, load carrying capacity, settlement analysis, installation technique, Geo-synthetic -encased stone columns, Mechanism of encasement, field control of stone columns **Pre-Compression and Vertical Drain**: Applicability and types of pre compression. Purpose and mechanism of pre-compression by pre loading. Design procedure of pre-compression by preloading. **Pre-compression by preloading with vertical drains**- Principles, Advantages, and disadvantages of Vertical drains, Type of Vertical drains, Installation, Monitoring and Instrumentation of Vertical drains.	04 03

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6	**Modification by Grouting**: Purpose, principles and classification of grouts and their properties. Desirable characteristics of grout, Grouting methods, Planning and operation of grouting, control of grouting operations and monitoring.	**4**
	Modification by Soil Reinforcement: Purpose of reinforced earth, Mechanism of reinforced soil, Failure mechanism of reinforced earth, Advantages of reinforced earth. Application of Reinforced Earth, Design methods of reinforced earth wall- (a) Check for External stability. Check for Internal stability.	**4**
7	**Miscellaneous Methods of Soil stabilization:** Lime stabilization, cement stabilization, bituminous stabilization, chemical stabilization.	**02**
	TOTAL	**28**

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5CE5-16: ENERGY SCIENCE AND ENGINEERING

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Introduction to Energy Science: Scientific principles and historical interpretation to place energy use in the context of pressing societal, environmental and climate issues; Introduction to energy systems and resources; Introduction to Energy, sustainability & the environment	5
3	Energy Sources: Overview of energy systems, sources, transformations, efficiency, and storage. Fossil fuels (coal, oil, oil-bearing shale and sands, coal gasification) - past, present & future, Remedies & alternatives for fossil fuels - biomass, wind, solar, nuclear, wave, tidal and hydrogen; Sustainability and environmental trade-offs of different energy systems	6
4	Energy & Environment: Energy efficiency and conservation; introduction to clean energy technologies and its importance in sustainable development; Carbon footprint, energy consumption and sustainability	5
5	Civil Engineering Projects connected with the Energy Sources: Coal mining technologies, Oil exploration offshore platforms, Underground and under-sea oil pipelines, solar chimney project, wave energy caissons, coastal installations for tidal power, wind mill towers; hydro power stations above-ground and underground along with associated dams, tunnels, penstocks, etc.	7
6	Engineering for Energy conservation: Concept of Green Building and Green Architecture; Green building concepts; LEED ratings; Identification of energy related enterprises	4
	TOTAL	28

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5CE4-21 : CONCRETE STRUCTURES DESIGN

Credit: 1.5 **Max. Marks: 75(IA:45, ETE:30)**
0L+0T+3P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	Revision of Typical problems of BMD and SFD	3
2	Analysis and Design of singly reinforced rectangular beam section for flexure, based on Working stress design philosophy.	3
3	Analysis and Design of singly reinforced rectangular beam section for flexure, based on Limit State design philosophy	3
4	Analysis and Design of doubly reinforced rectangular beam section for flexure, based on Limit State design philosophy	3
5	Analysis and Design of flanged beam section for flexure, based on Limit State design philosophy	3
6	Problems on Limit state of serviceability for deflection as per codal provisions of empirical coefficients.	3
7	Analysis and design of prismatic sections for shear using LSD	3
8	Problems on limit state of collapse in bond	3
9	Analysis and design of one way slabs using LSM,	3
10	Analysis and design of two way slabs using LSM,	3
11	Analysis and design of short axially loaded columns	3
12	Analysis and design of footing	3
13	Analysis and Design of beams for torsion as per codal method..	3
	TOTAL	39

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5CE4-22 : GEOTECHNICAL ENGINEERDING LAB

Credit: 1.5 **Max. Marks: 75(IA:45, ETE:30)**
0L+0T+3P **End Term Exam: 3 Hours**

1	Grain size distribution by sieve Analysis and Hydrometer
2	Determination of specific Gravity by Pycnometer.
3	Determination of liquid limit by Casagrande's apparatus and cone penetrometer.
4	Determination of plastic limit and shrinkage limit
5	Determination of field density by core-cutter and sand replacement method
6	Determination of compaction properties by standard Proctor Test Apparatus
7	Determination of C-Ø values by unconfined compression Test Apparatus, Direct Shear Test Apparatus and Triaxial Test.
8	To determine the differential free swell index of soil and swelling pressure of soil.
9	To determine the CBR of soil.
10	To determine the compressibility parameters of soil by consolidation test.
11	To determine the permeability of soil by constant and falling head methods. Design as per syllabus of theory.

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5CE4-23: WATER RESOURCES ENGINEERING DESIGN LAB

Credit: 1 **Max. Marks: 50(IA:30, ETE:20)**
0L+0T+2P **End Term Exam: 2 Hours**

Design as per syllabus of theory.

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Syllabus of

UNDERGRADUATE DEGREE COURSE

B.Tech. VI Semester

Civil Engineering

Rajasthan Technical University, Kota

Effective from session: 2019-20

6CE3-01: WIND AND SEISMIC ANALYSIS

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Structural Systems:** Types of structures and Structure's forms, Symmetry and Asymmetry in building forms, Vertical and lateral loadresting elements, shear walls, framed tubes and various multi-storey configurations.	4
3	**Design Loads:** various types of loads and relevant codes. Design loads for different types of buildings. (IS-875 part 1 & 2) & Load Flow Concept	3
4	**Wind Loads Analysis:** Wind loads & calculation of wind load on flat roof, pitched roof and single sloped roof buildings (IS: 875-Part 3).	8
5	**Earthquake Load Analysis:** Earthquake loads & calculations of earthquake loads on framed structures. (IS: 1893 – Part 1).	6
6	**Earthquake Resistant Construction:** Typical seismic failure of masonry and RCC structures.Earthquake resistant construction of buildings, and various provisions as per IS codes; IS-4326,IS-13827, IS-13828, IS-13920, IS-13935.	6
	TOTAL	28

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6CE4-02: STRUCTURAL ANALYSIS-II

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	Unit load method & their applications: deflection of determinate beams and frames, analysis of determinate and redundant frames up to two degree of redundancy, lack of fit in redundant frames. Introduction to Energy Methods: Strain energy for gradually applied, suddenly applied and impact loads, Strain energy due to axial loads, bending, shear and torsion;. Castiglione's theorems & their applications in analysis of determinate and redundant frames up to two degree of redundancy and trussed beams; Stresses due to temperature & lack of fit in redundant frames; deflection of determinate beams, frames using energy methods	12
3	**Influence line diagram & Rolling load:** ILD for beams & frames, Muller-Breslau principle and its application for drawing ILD, Rolling load, maximum stress resultants in a member/section, absolute maximum stress resultant in a structure.	10
4	**Arches:** analysis of three hinged two hinged and fixed type parabolic arches with supports at the same level and at different levels.	7
5	**Unsymmetrical bending:** Definition, location of NA, computation of stresses and deflection, shear centre and its location,	6
6	**Approximate methods for lateral loads:** Analysis of multistory frames by portal method, cantilever method & factor method. Analysis of determinate space trusses by tension coefficient method.	6
	TOTAL	42

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6CE4-03: ENVIRONMENTAL ENGINEERING

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	*Water:* -Sources of Water and quality issues, water quality requirement for different beneficial uses, Water quality standards, water quality indices. Water Supply systems, Need for planned water supply schemes, Water demand industrial and agricultural water requirements, Components of water supply system; Transmission of water, Distribution system, Various valves used in W/S systems, service reservoirs and design. Water Treatment: aeration, sedimentation, coagulation flocculation, filtration, disinfection, advanced treatments like adsorption, ion exchange, membrane processes.	4 5 6
3	*Sewage*- Domestic and Storm water, Quantity of Sewage, Sewage flow variations. Conveyance of sewage- Sewers, shapes design parameters, operation and maintenance of sewers, Sewage pumping; Sewerage, Sewer appurtenances, Design of sewerage systems. Small bore systems, Storm Water- Quantification and design of Storm water. Sewage characteristics: Quality parameters: BOD, COD, TOC, Solids, DO, Nitrogen, Phosphorus, Standards of disposal into natural watercourses and on land, Indian standards. Sewage and Sullage, Pollution due to improper disposal of sewage, Wastewater treatment, aerobic and anaerobic treatment systems, suspended and attached growth systems, recycling of sewage – quality requirements for various purposes. Wastewater Disposal and Refuse: Disposal of sewage by dilution, Self-purification of streams, sewage disposal by irrigation sewage farming, waste water reuse.	5 4 7 5
4	*Air* - Composition and properties of air, Quantification of air pollutants, Monitoring of air pollutants, Air quality standards, Control measures for Air pollution	3
5	*Noise*- Basic concept, measurement and various control methods.	2
	Total	42

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6CE-04: DESIGN OF STEEL STRUCTURES

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	Types of Steels and their broad specifications. Structural steel forms- hot rolled, tubular, light gauge etc and their applicability. Classification of cross sections as per IS 800-2007- Plastic, compact, semi compact and slender- characteristics	2
3	Plastic analysis of steel structures, fundamentals, shape factor, static and mechanism method of analysis, bending of beams of uniform cross sections (any shape)	3
4	Connections: Types of bolts, load transfer mechanism, prying action. Design of bolted and welded connections under axial and eccentric loadings with IS provisions	3
5	Tension Members: Design strength in gross section yielding, net section rupture and block shear. Design of axially loaded members.	3
6	Compression Members: Types of buckling, Imperfection factor, Buckling curves for different cross sections as per IS. Design of compression members: Axially loaded members including made up of angle section: single and in pair; built up columns including design of lacings and battens as per IS.	6
7	Beams: Design of beams: simple and compound sections. Design of laterally supported and unsupported beams including for web buckling, web crippling, lateral torsional buckling.	6
8	Member design under combined forces: Compressive load and uniaxial moment. tension and uniaxial moment	3
9	Column Bases: Design of column bases for axial and eccentric compressive loads: Slab and gusseted base.	2

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10	Design of plate girder: Design of welded and bolted sections including web and flange splicing, horizontal, intermediate and bearing stiffeners. Shear strength determination by post critical and tension field action methods. End panel design options and procedure as per IS 800. Curtailment of flange plates. Connections for flange plate to flange angles and flange angles to web, etc. Design of welded connections	**7**
11	Design of gantry girder	**2**
12	Design of roof trusses members for combined forces, wind loading etc. Purlin design	**2**
13	Introduction to Pre Engineered Buildings , characteristics and their applications.	**1**
14	Introduction of truss girder bridges-its members including portal and sway bracings etc. Design aspects of foot over bridges.	**1**
	TOTAL	**42**

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6CE5-11: PRE-STRESSED CONCRETE

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Introduction:** Basic concepts of Pre-stressing and its advantages. Materials for pre-stressed concrete. Tensioning devices. Pre-tensioning and post tensioning systems.	4
3	**Analysis of Pre-stress and Bending Stresses:** Assumptions, Flexural analysis of pre-stressed rectangular and unsymmetrical T section. Concept of load balancing.	6
4	**Losses of Pre-stress:** Losses due to - elastic deformation of concrete, successive tensioning of curved cable, shrinkage of concrete, creep of concrete, relaxation of stress in steel, friction and anchorage slip.	4
5	**Deflection of Pre-stressed Concrete Members:** Effect of tendon profileand associated factors incontinuous members.Computation of deflection in pre-stressed concrete members.	6
6	**Design of Pre-stressed Concrete Sections:** Flexural Shear and Torsional strengthusing simplified code procedure (IS-1343-2012). Design of simply supported Pre-stressed Concrete Sections forflexure.	7
	TOTAL	28

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6CE5-12: SOLID AND HAZARDOUS WASTE MANAGEMENT

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hours
1	**Introduction:** Objective, scope and outcome of the course.	**1**
2	**Introduction to SWM:** Definition of waste and solid waste, classification solid waste, sources of solid waste, its composition, factors affecting waste generation, traditional methods of waste collection and disposal	**4**
3	**Waste Collection:** Components of waste collection, waste collection containers, their characteristics, types, waste collection vehicles, collection frequency, collection route, transfer stations	**4**
4	**Solid Waste Characterization:** Physical characteristics, chemical characteristics and biological characteristics of solid wastes **Waste Processing**: Size reduction, factors affecting size reduction, size reducing equipment, volume reduction, equipment for volume reduction, waste minimization, waste hierarchy, 3 R principle	**5**
5	**Hazardous Waste:** Definition, sources, classification, collection, segregation, treatment and disposal methods **Radioactive Waste, E-Waste, Biomedical Waste:** Definition, sources, classification, segregation, management and disposal methods	**6**
6	**Treatment and Disposal of Solid Waste:** Composting, vermicomposting, biogas production, thermal treatment, incineration, pyrolysis, gasification, biological treatment, Sanitary land filling, land fill leachate and gas management **Latest Advances and Rules** related to SWM, Hazardous Waste, Plastic Waste and E-Waste Management	**5** **3**
	TOTAL	**28**

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6CE5-13: TRAFFIC ENGINEERING AND MANAGEMENT

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hours
1	**Introduction:** Objective, scope and outcome of the course.	**1**
2	**Traffic Planning and Characteristics:** Road Characteristics – Road user characteristics – PIEV theory – Vehicle – Performance characteristics – Fundamentals of Traffic Flow .	**4**
3	**Traffic Surveys**: Traffic Surveys – Speed, journey time and delay surveys – Vehicles Volume Survey including nonmotorized transports – Methods and interpretation – Origin Destination Survey – Methods and presentation – Parking Survey – Accident analyses -Methods, interpretation and presentation –Level of service – Concept, applications and significance.	**6**
4	**Traffic Design and Visual Aids:** Intersection Design – channelization, Rotary intersection design – Signal design – Coordination of signals — Grade separation – Traffic signs including VMS and road markings – Significant roles of traffic control personnel – Networking pedestrian facilities & cycle tracks.	**6**
5	**Traffic Safety and Environment**: Road accidents – Causes, effect, prevention, and cost – Street lighting – Traffic and environment hazards –	**4**
6	**Traffic Management:** Area Traffic Management System – Traffic System Management (TSM) with IRC standards –- Traffic Regulatory Measures-Travel Demand Management (TDM) – Direct and indirect methods – Congestion and parking pricing – All segregation methods-Coordination among different agencies – Intelligent Transport System for traffic management, enforcement and education.	**7**
	TOTAL	**28**

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6CE5-14: BRIDGE ENGINEERING

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hours
1	**Introduction:** Objective, scope and outcome of the course.	**1**
2	**Introduction:** Type of bridges & classification of road & railways bridges. IRC & Railwayloadings for bridges, wind load & Earthquake forces. : Expansion joints.	**3**
3	**Steel bridges**: Introduction to Design of through type &deck type steel bridges for IRC loading. Design of through type truss bridges forrailway loadings.	**9**
4	**Reinforced concrete culverts & bridges:** Reinforced concrete slab culvert, T-beam bridges-courbons & Hendry-Jaegar methods.	**10**
5	**Bearings**: Bearings for slab bridges and girder bridges. Elastomeric bearings, design concepts as per IRC 83 (Part II).	**5**
	TOTAL	**28**

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6CE5-15: ROCK ENGINEERING

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hours
1	**Introduction:** Objective, scope and outcome of the course.	**1**
2	**Engineering Classification of Rocks**: Objectives, Intact rock classification, Rock mass Classification. Terzaghi's, Rock load classification, Austrian classification, Deere's rock quality classification, rock structure rating concept, RMR classification, Q classification. Inter relation between Q and RMR.	**6**
3	**Engineering Properties and Laboratory Tests on Rocks:** Porosity, Density, Moisture content, Degree of saturation, Co-efficient of permeability, Durability, Compressive strength, Tensile strength, Shear strength, elasticity, Plasticity Deformability. Sampling and Samples Preparations, Uniaxial Compressive strength, Tensile Strength – Brazilian test, Shear strength test – Direct Shear test and Punch shear test, Triaxial Test, Flexural strength.	**7**
4	**In-situ Tests on Rocks**: Necessity of Insitu test, Plate load test for deformability, Field Shear test **Jointed Rocks:** Rocks Joint properties, Joint properties, Joint Roughness Co-efficient, Scale effects, Dilation, Orientation of Joints, Gouge, Joint Intensity, Uniaxial Compressive strength of Jointed Rocks.	**7**
5	**Strength of Rocks in Unconfined Condition**: Ramamurthy Strength Criteria, Singh and Rao Strength Criteria, Kulatilake Methodology, Barton Methodology. **Strength of Rocks in Confined Condition:** History of Hoek and Brown Failure Criterions, Parabolic Strength Criteria. **Bearing Capacity of Rocks:** Bearing capacity of intact rocks, jointed rocks,IS Code methodology, Singh and Rao Method and latest methodologies.	**7**
	TOTAL	**40**

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6CE5-16: GEOGRAPHIC INFORMATION SYSTEM & REMOTE SENSING

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hours
1	**Introduction:** Objective, scope and outcome of the course.	**1**
2	**Photogrammetry:** Definition of Photogrammetric Terms, Geometry of aerial and terrestrial photographs,Aerial camera and photo-theodolite, Scale of a Photograph, Tilt and Height displacements, Stereoscopicvision and stereoscopes, Height determination from parallax measurements, Flight planning, Maps andMap substitutes and their uses.	**7**
3	**Remote Sensing:** Introduction and definition of remote sensing terms, Remote Sensing System, Electromagnetic radiation and spectrum, Spectral signature, Atmospheric windows.	**4/6**
4	Different types of platforms, sensors and their characteristics, Orbital parameters of a satellite, Multiconcept in Remote Sensing.	**4/4**
5	**Image Interpretation:** Principles of interpretation of aerial and satellite images, equipments and aidsrequired for interpretation, ground truth – collection and verification, advantages of multidate andmultiband images. Digital Image Processing concept.	**6/5**
6	**Geographic Information System (GIS) :** Introduction & applications of GIS in map revision, Land use,Agriculture, Forestry, Archaeology, Municipal, Geology, water resources, Soil Erosion, Land suitabilityanalysis, change detection.	**6/5**
	TOTAL	**28**

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6CE4-21: Environmental Engineering Design and Lab

Credit: 1.5 **Max. Marks: 75(IA:45, ETE:30)**
0L+0T+3P **End Term Exam: 3 Hours**

Design

1. Population forecasting and water demand
2. Water Quality parameters
3. Design of Sedimentation tanks, coagulation and flocculation tanks
4. Design of rapid and slow sand filters
5. Design of disinfection units and transmission systems
6. Design of Sewer lines and storm water systems
7. Design of aerobic and anaerobic treatment units
8. Design of suspended and attached growth systems

Lab.

1. Physical Characterization of water: Turbidity, Electrical Conductivity, pH
2. Analysis of solids content of water: Dissolved, Settleable, suspended, total, volatile, inorganic etc.
3. Alkalinity and acidity, Hardness: total hardness, calcium and magnesium hardness
4. Optimum coagulant dose
5. Chemical Oxygen Demand (COD)
6. Dissolved Oxygen (D.O) and Biochemical Oxygen Demand (BOD)
7. Break point Chlorination
8. Bacteriological quality measurement: MPN,

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6CE4-22: Steel Structures Design

Credit: 1.5 **Max. Marks: 75(IA:45, ETE:30)**
0L+0T+3P **End Term Exam: 3 Hours**

Analysis and design Problems as per different topics of syllabus of theory 6CE4-05, with latest version of IS 800 and other relevant IS codes. In addition to numerical problems, following exercises:

1. Case study of foot over bridges/truss- girder bridge in vicinity /home town of the students, preferably in groups of 8-10 students. A report including photographs marked with names and section details of different members in it (maximum limit of words :1000).
2. Case study of a structure using tubular sections or light gauge sections in vicinity /home town of the students, preferably in groups of 8-10 students. A report including photographs marked with names, size and section details of different members in it (maximum limit of words: 1000).

6CE4-23: QUANTITY SURVEYING AND VALUATION

Credit: 1 **Max. Marks: 50(IA:30, ETE:20)**
0L+0T+2P **End Term Exam: 2 Hours**

Contents

1. Preliminary Estimate (Plinth Area and Cubic Content)
2. Detailed Estimate of buildings (Long wall-Short wall and Centre line method)
3. Rate Analysis of different Items of Works (Earthwork, Concrete Work, DPC, Stone masonry, Brickwork, RCC, Roofing, Flooring, and Finishing etc.)
4. Earthwork Calculation for Roads, Irrigation Canals and Channels (cutting and filling)
5. Valuation of Buildings and Properties

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6CE4-24: WATER AND EARTH RETAINING STRUCTURES DESIGN

Credit: 1 **Max. Marks: 50(IA:30, ETE:20)**
0L+0T+2P **End Term Exam: 2 Hours**

Assignments/ Exercises on the following topics:		
SN	**CONTENTS**	**Hours**
1	**Continuous Beams:** Analysis andDesign of continuous beams using coefficients (IS Code), concept of moment redistribution	**4**
2	**Curved Beams:** Analysis and design of beams curved in plan.	**4**
3	**Circular Domes:** Analysisand design of Circular domes with u.d.l. & concentrated load at crown.	**4**
4	**Water Tanks and Towers:** Water Tanks and Water Towers-design of rectangular, circular and Intze type tanks, column brace type staging.	**10**
5	**Retaining walls:** Analysis and design of Cantilever Retaining Walls: Introduction to counterfort and buttress type retaining walls, their structural behaviour and stability analysis.	**6**
	TOTAL	**28**

6CE4-25: FOUNDATION ENGINEERING

Credit: 1 **Max. Marks: 50(IA:30, ETE:20)**
0L+0T+2P **End Term Exam: 2 Hours**

1. Design of isolated shallow footings, combined footings, raft foundations.
2. Design of pile foundations.
3. Design of wells and cassions.
4. Design of machine foundation.
5. Design of retaining structures etc

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6. Specific gravity and water absorption test of aggregate.
7. Standard tar viscometer test
8. To determine the elongation index for given sample of aggregate.
9. Ductility test
10. To determine the softening point for give sample of bitumen.
11. Marshell stability test
12. Float test

7CE1A: WATER RESOURCES ENGINEERING – I (L- 3)

B.Tech. (Civil) 7th semester **Max. Marks: 80**
Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
I	**Introduction:** Definitions, functions and advantages of irrigation, present status of irrigation in India, classification for agriculture, soil moisture and crop water relations, Irrigation water quality. Consumptive use of water, principal Indian crop seasons and water requirements, multiple cropping, hybrid crops, water harvesting and conservation.	8
II	**Canal Irrigation:** Types of canals, parts of canal irrigation system, channel alignment, assessment of water requirements, estimation of channel losses, design of channels, regime and semi theoretical approaches (Kennedy's Theory, Lacey's Theory), cross section of channels, silt control in canals. **Water Distribution System:** Rotational delivery (Warabandi, Jama Bandi, Khasra Bandi, Sajra Sheets), continuous delivery and delivery on demand, Role of command area development authority, Functions and organizational structures.	8
III	**Distribution of Canal Water:** System of regulation and control, outlets, assessment of canal revenue. **Hydraulics of Alluvial Rivers :** Critical tractive force, regimes of flow, resistance relationship for natural streams, bed load, suspended load and total equations, different stages of rivers, meandering, aggradations, and degradation, river training & bank protection works.	8
IV	**Water Logging:** Causes, preventive and curative measures, drainage of irrigated lands, saline and alkaline lands, types of channels lining and design of lined channel. **Well Irrigation:** Open wells and tube wells, types of tube wells, duty of tube well water.	8
V	**Hydrology:** Definition, Hydrologic cycle, Application to Engineering problems, measurement of rainfall, rain gauge, peak flow, flood frequency method, catchment area formulae, Flood hydrograph, Rainfall analysis, Infiltration, Run off, Unit hydrograph and its determination, Estimation of run off.	8
	TOTAL	**40**

REFERENCE BOOKS

1- Irrigation Water Power and Water Resource Engineering By KR Arora, Standard Publishers and Distributers, Delhi.

2- Water Resource Engineering by Modi, Standard Publishers.

3-Irrigation and Water Power Engineering by BC Punmia & B B Lal, Laxmi Publication (P) Ltd.

4.Irrigation Engineering by G.L.Asawa, New Age International Publishers, New Delhi.

7CE2A: DESIGN OF STEEL STRUCTURES – I (L 3)

(Design procedure shall be conforming to IS 800-2007)

B.Tech. (Civil) 7th semester **Max. Marks: 80**
Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
I	**Introduction:** Types of steels and their broad specifications. **Plastic Analysis:** Plastic analysis of steel structures, fundamentals, static and mechanism method of analysis, bending of beams of rectangular and I sections beams, shape factor. Classification of Cross Sections: As per IS 800-2007 Plastic, compact, semi compact, slender sections, their characteristics including moment-rotation.	8
II	**Connections:** Types of bolts, load transfer mechanism, prying action. Design of bolted and welded connections under axial and eccentric loadings. **Tension Members**: Design strength in gross section yielding, net section rupture and block shear. Design of axially loaded tension members.	8
III	**Compression Member**: Types of buckling. Column buckling curves, Imperfection factor, Buckling curves for different cross sections. Design of compression member; Axially loaded compression members including angle section design: single and in pair, built up columns, design of lacings and battens.	8
IV	**Beams**: Design of beams: simple and compound sections, main and subsidiary beams and their connections. Laterally supported and unsupported beam design, Web buckling, web crippling, lateral torsional buckling.	8
V	**Member design under combined forces:** Compressive load and uniaxial moment. tension and uniaxial moment **Column Bases**: Design of column bases, Slab base, gusseted base for axial and eccentric compressive load. Grillage foundation design.	8
	TOTAL	**40**

REFERENCE BOOKS

1-Design of Steel Structures by N. Subramanian, Oxford University Press.

2. Limit state Design of Steel Structures: S K Duggal, TMH publication

3- Design of Steel Structures by S. Bhavikatti, I.K. International Pvt. Ltd.

4- Design of Steel Structures by V.L. Shah, Structures Publications.

7CE3A : DESIGN OF CONCRETE STRUCTURES-II (L- 3)

B.Tech. (Civil) 7th semester **Max. Marks: 80**

Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
I	**Elements of Pre-stressed Concrete:** Principles and systems, material properties, losses of pre-stress, I.S. specifications, analysis and design of rectangular and T sections for flexure and shear.	8
II	**Torsion:** Analysis and Design of beams for torsion as per codal method.. **Continuous and Curved Beams:** Analysis and Design of continuous beams using coefficients (IS Code), concept of moment redistribution. Analysis and design of beams curved in plan.	8
III	**Circular Domes:** Analysis and design of Circular domes with u.d.l. & concentrated load at crown. **Water Tanks and Towers:** Water Tanks and Water Towers-design of rectangular, circular and Intze type tanks, column brace type staging.	8
IV	**Yield Line Theory:** Introduction to Yield line concept, Application of Y.L.T. to slabs with simple support conditions. **Retaining walls:** Analysis and design of Cantilever Retaining Walls: Introduction to counterfort and buttress type retaining walls, their structural behaviour and stability analysis.	8
V	**Culverts and Bridges:** Analysis and Design of super structure of slab culverts and T-bridge for I.R.C. loading.	8
	TOTAL	**40**

REFERENCE BOOKS

1. *Reinforced Concrete Vol. II by H.J. Shah; Charotar Publication House.*
2. *Advanced Reinforced Concrete Design by Verghese; Tata Mc Graw Hill.*
3. *Advanced Reinforced Concrete Design by Krishnaraju; Tata Mc Graw Hill.*
4. *Bridge Engineering by Ponnuswamy; Tata Mc Graw Hill*
5. *Prestressed Concerte Structures by N. Krishna Raju; Tata Mc Graw Hill.*
6. *Bridge Engineering by Johnson Victor; Oxford and IBH Publishers.*
7. *Prestressed Concrete by T.Y.Lin and Burn; John Wiley & Sons.*
8. *Reinforced Concrete Structures by Park & Poulay; Willey.*

9. *Reinforced Concrete Designers Hand Book By Reynolds & Steedman*
10. *Manual of Concrete Practice ACI (www.concrete.org)*
11. Prestressed concrete structures by Praveen Nagrajan, Pearsons

7CE4A: TRANSPORTATION ENGINEERING – II (L-3)

B.Tech. (Civil) 7th semester **Max. Marks: 80**
Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
I	**Introduction and Permanent Way Components**: Types and Selection of Gauges, Selection of Alignment, Ideal Permanent Ways and Cross-sections in different conditions, Drainage, Salient Features and types of Components viz. Rails, Sleepers, Ballast, Rail Fastenings. **Study of Specific Aspects**: Coning of Wheels, Creep, Wear, failures in Rails, Rail Joints, Length of Rail, Sleeper Density and Spacing, Stations, Yards and Sidings, Turn-Table, Signaling.	8
II	**Points and Crossings**: Types of Turnouts, Points or Switches, layout Plans of different types of Crossings, Design calculations of turnouts. **Railway Systems Specific to Urban Movements**: Surface railways (sub urban railway system of Mumbai, Chennai and Delhi), Underground system (Metro of Kolkata/ Delhi), Elevated Systems (as Proposed for Jaipur, Delhi, Mumbai), Light Rail System (MRTS, Thane). Recent Developments in Railway Networking.	8
III	**Geometric Design**: Gradient and Grade Compensation, Super elevation and cant, cant deficiency, Types of Curves, Transition curves, their designs, Widening of Gauges.	8
IV	**Airport Engineering:-Introduction**: Requirements to Airport Planning, Airport Classifications, Factors in Airport Site Selection, Airport Size, Obstructions, Zoning. **Planning and Design of Airport**: Requirements of Airport, Planning of Terminal Area, and different Layouts, Location of Gates, Types of Runway patterns, Runway Layout, Runway Length, Geometric Design of Runways, Layout of Taxiways, Geometric Standards, Exit or Turnaround Taxiways, Apron and Hangers.	8
V	**Airport Pavement Design**: Factors Affecting Pavement Design, Design methods of Flexible Pavements, Design methods of Rigid Pavements.	8
	TOTAL	**40**

Text Book: 1.Railway Engineering by Sexena S.C. and Arora S.P, Dahnpat Rai Publishers, Delhi.

2- Airport Engineering by Rangwala,Charotar Publishing House.

Reference Book:

1- Transportation Engineering by A.K. Upadhyay, S.K.Kataria and Sons.

2. Railway Engineering by Satish Chandra and M.M Agarwal, Oxford University Press, Delhi.

7CE5A : Applications Numerical Methods in Civil Engineering (L-3)

B.Tech. (Civil) 7th semester **Max. Marks: 80**
Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
I	**Errors & Approximations in Numerical Computation:** Introduction to Mathematical Modeling and Engineering Problem Solving. Decimal & Binary Number system. Accuracy, Precision and Significant Digits. Errors and their types.: absolute and relative errors, approximations and round off errors, truncation errors and Taylor's series. Propagation of errors.	8
II	**Roots of Equations**: Iterative processes and their Convergence. Existence of roots in engineering practices & their geometrical representation. Roots of the equations by: Graphical Method, Method of Successive Substitution, Bisection Method, False Position Method, Newton-Raphson Method, Secant Method, Regula Falsi Method. Application to simple civil engineering problems.	8
III	**Matrices and Determinants**: Their types and basic operations. Rank of a matrix. Solution of Linear system of equations by Direct methods: Cramer's Rule, Gaussian elimination method, Gauss-Jordan Method and Cholesky Method. Application to simple civil engineering problems.	8
IV	**Iterative Methods for solving Linear system of equations**: Jacobi Method, LU decomposition and Matrix inversion, Gauss Seidel method. Application to simple civil engineering problems.	8
V	**Interpolation and Curve Fitting:** Newton's Forward Difference, Newton's Backward Difference, Newton's Central Difference, Newton's Divided Difference, Lagrangian Interpolation, Hermitian Interpolation, Method of least square. Application to simple civil engineering problems.	8
	TOTAL	**40**

REFERENCE BOOKS

1. Introductory Methods of Numerical Analysis, Sastry S.S., Prentice Hall India

2. Numerical Methods for Engineering and Scientific Computation, Jain and Jain, New Age International Pvt. Ltd. New Delhi.

3. Engineering Statistics, Bowker, A.H. and Liberman G.J., Prentice Hall.

4. Probability and Statics in Engineering, Hines, John Willey and Sons.

5. Applied Statistics and Probability for Engineers, Montgomery, John Wiley and Sons.

6. Numerical Methods for Engineers by S.C. Chapra & R.P. Canale, Tata McGraw Hill

7. Numerical Methods in Science and Engineering by S. Rajasekaran, Wheeler Publishing

7CE6.1A: ADVANCE TRANSPORTATION ENGINEERING (L- 3)

B.Tech. (Civil) 7th semester **Max. Marks: 80**
Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
I	**Traffic Studies**: Road inventories, Traffic Volume Studies, Spot Speed Studies, Travel Time and delay Studies, Origin-Destination studies, Methodology and Analysis of O-D data, Traffic capacity, Parking studies and characteristics, Accident studies and characteristics, causes and preventive measures.	8
II	**Statistical Methods for Traffic Engineering**: Elementary concepts and Probability, Mean, Standard Deviation and variance, Poisson and Binomial Distribution, Normal distribution, sampling Theory and Significance testing, Linear Regression and correlation.	8
III	**Traffic Characteristics**: Macroscopic and Microscopic Characteristics related to Volume, Speed and Density, their relationships, Road User Characteristics – Human and vehicular Characteristics. **Traffic Engineering Design**: Principles of Road Junction design, Design of Roundabouts, Bus Stops and Parking Lots, Design of Signals.	8
IV	**Traffic Management**: Traffic Laws, Regulations and Ordinances for Drivers, Pedestrians and Mixed Traffic. Traffic control Measures – One Way streets, Kerb Parking Control, Intersection Control, Speed Control, Access Control. Expressways. Traffic Control Devices – Traffic Markings, Signs, Signals, Traffic Islands, their Classification, types and Sketches, Street Lighting.	8
V	**Traffic and Environment**: Detrimental Effects of Traffic on the environment – air pollution, noise pollution, visual intrusion, aesthetics etc. **Road Safety**: The identification of problem, causation and Prevention, Road layout and Improvements, Safety equipment.	8
	TOTAL	**40**

Text Book:

1. Traffic Engineering and Transport Planning by L.R.Kadiyali, Khanna Tech Publications, Delhi.

REFERENCE BOOKS

1. Principles of Transportation Engineering by Parbha Chakrarborty & Animesh Dash, PHI.

2. Traffic System Analysis Wohl and Martin, Mc Graw Hill Co.

3.Adolf D May, Traffic Flow Fundamentals, Prentice Hall Inc.

7CE6.2A : DESIGN OF PRE-STRESSED CONCRETE STRUCTURES (L- 3)

B.Tech. (Civil) 7th semester **Max. Marks: 80**
Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
I	**Introduction:** Systems of pre-stressing in detail, pre-stressing techniques, transfer of pre-stress, types of commercially available jacks, computation of losses of pre-stress. **Anchorage Zone:** end block stresses, design.	8
II	**Cable profiles:** Concordant and non-concordant cable profile and associated factors in continuous members. Modern cable laying: materials & practices, precautions etc. Computation of deflection in pre-stressed concrete members.	8
III	**Design of Pre-stressed Concrete Sections:** Flexural, shear and torsion resistance of members, preliminary and final design of sections, design of pre and post tensioned flexural members; simply supported and continuous members.	8
IV	**Pre-stressed Slab:** Design of slabs, tendon layout, precast slab, production and their applications. **Partial Prestressing:** Principles and advantages, methods, practices and design.	8
V	Design of circular pipes and circular water retaining structures etc. Case study of one bridge girder with design and constructional features.	8
	TOTAL	**40**

Text Book: Design of Pre stressed Concrete by N.Krishnan Raju, Tata Mc Graw Hills.

REFERENCE BOOKS

1- Design of Pre stressed Concrete by T.Y. Lin, Wiley Eastern International.

2- Design of Pre stressed Concrete Structures by N.Sinha Ray, S.Chand Co.

3. Prestressed concrete structures by Praveen Nagrajan, Pearsons

7CE6.3A : RURAL WATER SUPPLY AND SANITATION (L- 3)

B.Tech. (Civil) 7th semester **Max. Marks: 80**
Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
I	**General:** Importance of village community in India, Condition of Indian villages with special regard to economics, social and health aspects. **Sources of water:** Traditional sources of water in rural areas. Different types of wells, sanitary aspects in well construction, pumps used for village wells, Hand pump Technology, its operation and maintenance. Water harvesting techniques.	8
II	**Quality of water:** Estimation of total water requirement including cattle water demand, quality of water needed for village community, water quality surveillance, standards of water quality. **Communicable Diseases:** Diseases and immunity, Source of communicable diseases, Mode of transfer, Control of communicable diseases, Guinea worm Eradication.	8
III	**Water Treatment:** Slow sand filter, horizontal roughing filter and their combination. Disinfection of rural water sources, Fluoride and its removal. **Schemes of Rural water supply:** Different Schemes of Rural water supply in Rajasthan, Their Design and project formulation including the programmes and standards laid by Govt. of India and Govt. of Rajasthan.	8
IV	**Milk and Food sanitation:** Essentials of dairy farm and cattle shed sanitation, Tests for milk and dairy products, food epidemics, food poisoning, Botulism. **Fly and Mosquito control:** Life cycle of flies and mosquitoes, various methods of flies and mosquito control.	8
V	**Rural Sanitation:** Village latrines, VIP latrines, pour flush latrines, materials, construction and cost of the latrines, Pollution aspects and pollution travel from latrines. Storm water and sludge problems. Septic tank, soak pit, small bore sewer system; its design and construction. Animal waste, method of composting, Biogas, collection and disposal of wastes. **Community Awareness and user participation:** Planning of communication support in rural supply and sanitation projects.	8
	TOTAL	40

REFERENCE BOOKS

1 Rural Water Supply & Sanitation Manual by Govt. of India

2. Municipal and Rural Sanitation E.W.Steel, Mc Graw Hill Book Co.

3.Reports of Rajeev Gandhi National Drinking Water Mission

Typical list of experiments for VII Semester Labs

7CE7A : DESIGN OF WATER RESOURCES STRUCTURES– I (P-2)

Design Problems as per syllabus of theory.

7CE8A : STEEL STRUCTURES DESIGN - I (P-3)

Design Problems as per different units of syllabus of theory.

7CE9A: CONCRETE STRUCTURES DESIGN -II (P-3)

Design Problems as per different units of syllabus of theory.

7CE10A :APPLICATION OF NUMERICAL METHODS IN CIVIL ENGINEERING (P-3)

Computer programming for application of numerical methods (as described in 7CE5) in solving problems related to Civil Engineering.

7CETR: PRACTICAL TRAINING AND INDUSTRIAL VISIT (P-2)

7CEPR : PROJECT Part- I (P-2)

8CE1A : WATER RESOURCES ENGINEERING- II (L-3, T-1)

B.Tech. (Civil) 8th semester **Max. Marks: 80**
Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
I	**Regulation of works:** Falls, Classification of falls, Design of falls, Distributory head regulator and cross-head regulator, Escape, bed bars. **Cross-Drainage Structure:** Necessity of Cross-drainage structures, their types and selection, comparative merits and demerits, design of various types of cross-drainage structure-aqueducts, siphon aqueduct, super passage siphon, level crossing and other types.	8
II	**Diversion Head works:** Design for surface and subsurface flows, Bligh's and Khosla's methods. Selection of site and layout, different parts of diversion head works, types of weirs and barrages, design of weirs on permeable foundation, silt excluders and different types of silt ejectors. Energy dissipation.	8
III	**Embankment Dams:** Suitable sites, causes of failures, stability and seepage analysis, flownet, slope stability analysis, precautions of piping, principles of design of earth dams. **Gravity Dams:** Force acting on a gravity dam, stability requirements, Instrumentation.	8
IV	**Spillways:** Spillway capacity, flood routing through spillways, different types of spillways and gates, energy dissipation below spillways. **Hydro Power Plant:** General features of hydroelectric schemes, elements of power house structure, selection of turbines, draft tube and setting of turbine, cavitations.	8
V	**Reservoirs:** Evaluation of impact of water projects on river regimes and environment. Reservoir sedimentation and water shed management. **Optimization:** Introduction to optimization techniques and system approach. Introduction to G.I.S. and Computer aided irrigation design.	8
	TOTAL	**40**

Text Book: 1.Theory and Design of Irrigation Structures by Varshney Gupta and Gupta, Nem Chand & Brothers, Roorkee.

REFERENCE BOOKS

1- Irrigation Water Power and Water Resource Engineering By KR Arora, Standard Publishers and Distributers, Delhi.

2- Water Resources Engineering by Modi ,Standard Publishers.

3. Fundamentals of Irrigation Engineering by Bharat Singh, Nem Chand Brothers, Roorkee.

8CE2A: DESIGN OF STEEL STRUCTURES–II (L 3)

B.Tech. (Civil) 8th semester **Max. Marks: 80**
Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
I	Design of gantry girder. Design of roof trusses including wind loading and purlin design, Introduction to Pre Engineered Buildings and tubular sections and their applications.	8
II	**Design of plate girder**: Design of welded and bolted sections. Connections for flange plate to flange angles and flange angles to web, etc. Design of welded connections. Web and flange splicing. Horizontal, Intermediate and Bearing stiffeners. Curtailment of plates. Shear strength determination by post critical and tension field action methods. End panel design options and procedure as per IS 800.	8
III	**Bridges**: Types of bridges, Loadings, Standard loading for railway bridges, Design of Deck type plate-girder bridges, design of its bracings and frames.	8
IV	Design aspects of foot over bridges. Design of through type truss girder bridges including stringer design, cross girder design, main truss members, portal and sway bracings etc.	8
V	Water tanks, circular tanks with segmental bottoms, rectangular tanks, pressed steel tanks, design of staging.	8
	TOTAL	**40**

REFERENCE BOOKS

1-Design of Steel Structures by S. Bhavikatti, I.K. International Pvt. Ltd.

2- Design of Steel Structures by V.L Shah, Structures Publications.

3. Limit State Design of Steel Structures: S K Duggal- Tat Mc Graw Hill

4-Design of Steel Structures by N. Subrananian, Oxford University Press.

5-Design of Steel Structures by B.C. Punmia Laxmi Publication

6-Design of Steel Structures Vol. II by Ram Chandra, Standard Publishers.

8CE3A: PROJECT PLANNING & CONSTRUCTION MANAGEMENT(L- 3)

B.Tech. (Civil) 8th semester **Max. Marks: 80**
Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS

I	**FINANCIAL EVALUATION OF PROJECTS AND PROJECT PLANNING:** Capital investment proposals, criterions to judge the worth whileness of capital projects viz. net present value, benefit cost ratio, internal rate of return, Risk cost management, main causes of project failure. Categories of construction projects, objectives, project development process, Functions of project management, Project management organization and staffing, Stages and steps involved in project planning, Plan development process, objectives of construction project management.	8
II	**PROJECT SCHEDULING:** Importance of project scheduling, project work breakdown process – determining activities involved, work breakdown structure, assessing activity duration, duration estimate procedure, Project work scheduling, Project management techniques – CPM and PERT networks analysis, concept of precedence network analysis.	8
III	**PROJECT COST AND TIME CONTROL:** Monitoring the time progress and cost controlling measures in a construction project, Time cost trade-off process: direct and indirect project costs, cost slope, Process of crashing of activities, determination of the optimum duration of a project, updating of project networks, resources allocation.	8
IV	**CONTRACT MANAGEMENT:** Elements of tender operation, Types of tenders and contracts, Contract document, Legal aspects of contracts, Contract negotiation & award of work, breach of contract, determination of a contract, arbitration.	8
V	**SAFETY AND OTHER ASPECTS OF CONSTRUCTION MANAGEMENT:** Causes and prevention of accidents at construction sites, Safety measures to be followed in various construction works like excavation, demolition of structures, explosive handling, hot bitumen work. Project Management Information System – Concept, frame work, benefits of computerized information system. Environmental and social aspects of various types of construction projects.	8
	TOTAL	**40**

Text Book: 1.Project Management with CPM /PERT by B.C. Punmia, Laxmi Publication (P) Ltd.

REFERENCE BOOKS

1.Construction Project Management by K.K. Chitkara, Tata Mc Graw Hills.

2- Project Management by Modder & Phillph, CBS Publishers.

8CE 4.1A: BRIDGE ENGINEERING (L- 3)

B.Tech. (Civil) 8th semester **Max. Marks: 80**
Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
I	**Introduction:** Type of bridges & classification of road & railways bridges. IRC & Railway loadings for bridges, wind load & Earthquake forces. Steel bridges Design of through type & deck type steel bridges for IRC loading. Design of deck type & through type truss bridges for railway loadings.	8
II	**Reinforced concrete culverts & bridges:** Reinforced concrete slab culvert, T-beam bridges-courbons & Hendry-Jaegar methods. Design of balanced cantilever bridge.	8
III	**Prestressed Concrete bridges:** Prestressed & Post stressed concrete bridges Design of deck slab & girder sections.	8
IV	**Bearings**: Bearings for slab bridges and girder bridges. Elastomeric bearings, design concepts as per IRC 83 (Part II).	8
V	**Joints**: Expansion joints.	8
	TOTAL	**40**

REFERENCE BOOKS

1- Design of Bridge Structures by T.R. Jagadeesh & M.A. Jayaram, Prentice Hall Of India (PHI).

2- Bridge Engineering by Victor, Oxford and IBH Publishers.

3- Design of Bridges by Krishna Raju, Oxford and IBH Publishers.

4- Bridge Super Structures by Raj Gopalan, Standard Publishers & Distributers.

5-Goncrete Bridge Practice by Raina V.K., Tata Mc Graw Hill Co.

6- Bridge Engineering by Ponnuswamy, Tata Mc Graw Hills.

8CE4.2A: ADVANCED FOUNDATION ENGINEERING (L- 3)

B.Tech. (Civil) 8th semester **Max. Marks: 80**
Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
I	**Shallow Foundation**: Methods of estimation of bearing capacity, computation of bearing capacity factors, Effect of eccentric and inclined loads, effect of water table on bearing capacity, Terzaghi, Vesic, Hansen, Moyerhof's analysis, Bearing capacity of stratified soils. IS code recommendations for minimum depth, factor of safety, design for local shear	8

	and general shear failure.	
II	**Settlement Under Foundation**: Methods of estimation of settlement of footings. Limits of settlements for various structures, Indian Standard Code Provisions (IS: 1904, 6403, 8009). Determination of allowable bearing capacity as per IS code. Schemartman's method, Dee beer's and Mortin method of finding out settlement from static cone penetration test. Methods of finding out bearing capacity from plate load test, standard penetration test data.	8
III	**Pile Foundation**: types of pile and their use, modes of failure. Bearing capacity and settlement of pile foundation. Types of piles, Allowable load, Pile load test, Dynamic and static formulae. Bearing Capacity factors. Pile group bearing capacity and settlement. Negative skin friction. Behavior of piles under lateral loading. Winkler's assumption. Pile resistance and deflection under lateral loads, elastic method, Brooms method.	8
IV	**Foundation on Difficult Soils:** Collapsible soil; identification, Collapse settlement: foundation design. Sanitary land fills settlement of sanitary land fill. **Expensive soils**: Behaviour of expansive soil, foundation practices, under-reamed piles. Methods of finding out load carrying capacity of under reamed piles in clayey and sandy soil. Provision of IS 2911 Part III-1980 for design of under-reamed pile foundations.	8
V	**Raft foundation:** Common types of raft, combined footing. Bearing capacity of raft, differential settlement of raft; semi empirical method of design of raft foundation. **Well foundations**: design and construction. Bearing capacity, settlement and lateral resistance. Tilts and shifts, IS and IRC codes methods.	8
	TOTAL	**40**

REFERENCE BOOKS

1- Basic & Applied Soil Mechanics -by Ranjan & Rao, New Age International Publishers.

2- Geotechnical Engineering by Gulhati & Dutta , Tata Mc Graw Hills, Delhi.

3- Design Aids in foundation Engineering by Kaniraj, Tata Mc Graw Hills, Delhi.

8CE4.3A: EARTHQUAKE RESISTANT CONSTRUCTION & DESIGN (L- 3)

B.Tech. (Civil) 8th semester **Max. Marks: 80**
Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
I	**Introductory Seismology:** Various terminology related with earthquake, Causes of earthquake, plate tectonics, Tsunami. Seismic wave propagation. Magnitude, intensity & energy of earthquake, magnitude & intensity scales, classifications of earthquakes, Seismic zoning case histories of earthquakes.	8

	Seismic hazards, induced hazards.	
II	Earthquake recording, Seismic instruments, Seismographs & Seismograms. Basic concept of liquefaction and isolation. Introduction to various IS related codes. Structural systems, Effects of earthquake on buildings in general, structural and nonstructural failures. Dynamic characteristics of buildings, natural period of vibration, damping, stiffness etc. Seismic performance of traditionally built masonry constructions, typical failure mechanism of masonry buildings under earthquakes.	8
III	IS 4326: 1993: Planning consideration & architectural concept, provisions for earthquake resistant construction/ seismic strengthening of masonry constructions.	8
IV	Seismic performance of reinforced concrete buildings. Plan, elevation & stiffness irregularities & their effects. Typical earthquake damages of RC constructions, short column effect, soft storey effect, strong column-weak beam analogy. IS 13920: 1993: Ductile detailing of reinforced concrete buildings and shear wall concept.	8
V	Seismic design philosophy, IS 1893 (part I):2002 codal provisions : Load combinations, Design lateral loads, response reduction factors, structural modeling of building frames, equivalent load method for earthquake analysis of multistory frames.	8
	TOTAL	**40**

REFERENCE BOOKS

1. Structural Dynamics by Anil K Chopra , Pearson Education.
2. Dynamics of Structures by Clough & Penzin, Mc Graw Hill Book Co.
3. Earthquake Engineering by Pankaj Agarwal & Manish Shree Khande, Prentice Hall of India.
4. Earthquake Tips by C.V R. Murthy, IIT Kanpur.
5. Earthquake-Resistant Design of Steel Structures by Duggal, Oxford University Press.

8CE5A : DESIGN OF WATER RESOURCES STRUCTURES– II (P- 3)

Design as per syllabus of theory.

6CE6A : STEEL STRUCTURES DESIGN - II (P- 3)

Design problems as per different units of syllabus of theory

8CE7A : PROFESSIONAL PRACTICES AND ESTIMATING (P-3)

1. Estimates – Methods of building estimates, types; site plan, index plan, layout plan, plinth area, floor area; Technical sanction, Administrative approval; estimate of buildings, roads, earthwork and R.C.C. works.

2. Analysis of rates- for earthwork, concrete work, D.P.C., stone masonry,, plastering, pointing and roadwork.

3. Specifications- For different classes of building and Civil Engineering works.

4. Types of contracts – Tenders, tender form, submission and opening of tenders, measurement book, muster roll, piecework agreement and work order.

5. Arbitration

6. Valuation of real estate.

8CE7 : STRUCTURAL ANALYSIS BY MATRIX METHODS OF (P- 2)

Introduction to matrix methods; Stiffness (Deflection) and Flexibility (Force) matrices for bar, plate, and beam elements w.r.t. local axes and global axes, for entire structure w.r.t. global axes (Direct method and by assembly method. Introduction of Finite Element Methods.

8CE8A : DESIGN of FOUNDATIONS (P- 3)

1. Design of isolated shallow footings, combined footings, raft foundations.

2. Design of pile foundations.

3. Design of wells and cassions.

4. Design of machine foundation.

5. Design of retaining structures etc.

8CESM: SEMINAR (P-2)

8CEPR: PROJECT Part II (P-2)

Scheme and Syllabus

Rajasthan Technical University, Kota

B. Tech. in Electrical Engineering

(Session 2019-20)

Scheme of

UNDERGRADUATE DEGREE COURSE

Electrical Engineering

Rajasthan Technical University, Kota

Effective from session: 2018 – 2019

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Teaching & Examination Scheme
B.Tech. : Electrical Engineering
2nd Year - III Semester

SN	Category	Course		Contact hrs/week			Marks				Cr
		Code	Title	L	T	P	Exm Hrs	IA	ETE	Total	
THEORY											
1	BSC	3EE2-01	Advance Mathematics	3	0	0	3	30	120	**150**	**3**
2	HSMC	3EE1-02/ 3EE1-03	Technical Communication / Managerial Economics and Financial Accounting	2	0	0	2	20	80	**100**	**2**
3	ESC	3EE3-04	Power generation Process	2	0	0	2	20	80	**100**	**2**
4	PCC	3EE4-05	Electrical Circuit Analysis	3	0	0	3	30	120	**150**	**3**
5		3EE4-06	Analog Electronics	3	0	0	3	30	120	**150**	**3**
6		3EE4-07	Electrical Machine - I	3	0	0	3	30	120	**150**	**3**
7		3EE4-08	Electromagnetic Field	2	0	0	2	20	80	**100**	**2**
			Sub Total	18	0	0		180	720	**900**	**18**
PRACTICAL & SESSIONAL											
8	PCC	3EE4-21	Analog Electronics Lab	0	0	2		30	20	**50**	**1**
9		3EE4-22	Electrical Machine-I Lab	0	0	4		60	40	**100**	**2**
10		3EE4-23	Electrical circuit design Lab	0	0	4		60	40	**100**	**2**
13	PSIT	3EE7-30	Industrial Training	0	0	2				**50**	**1**
14	SODECA	3EE8-00	Social Outreach, Discipline & Extra Curricular Activities							**25**	**0.5**
			Sub- Total	0	0	12		150	100	**325**	**6.5**
			TOTAL OF III SEMESTER	18	0	12		330	820	**1225**	**24.5**

L: *Lecture,* ***T:*** *Tutorial,* ***P:*** *Practical,* ***Cr:*** *Credits*

ETE: *End Term Exam,* ***IA:*** *Internal Assessment*

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

Scheme of

UNDERGRADUATE DEGREE COURSE

Electrical Engineering

Rajasthan Technical University, Kota

Effective from session: 2018 – 2019

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Teaching & Examination Scheme
B.Tech. : Electrical Engineering
2nd Year - IV Semester

SN	Category	Course		Contact hrs/week			Marks				Cr
		Code	Title	L	T	P	Exm Hrs	IA	ETE	Total	
THEORY											
1	BSC	4EE2-01	Biology	2	0	0	2	20	80	**100**	**2**
2	HSMC	4EE1-02/ 4EE1-03	Technical Communication / Managerial Economics and Financial Accounting	2	0	0	2	20	80	**100**	**2**
3	ESC	4EE3-04	Electronic Measurement & Instrumentation	2	0	0	2	20	80	**100**	**2**
4	PCC	4EE4-05	Electrical Machine - II	3	0	0	3	30	120	**150**	**3**
5		4EE4-06	Power Electronics	3	0	0	3	30	120	**150**	**3**
6		4EE4-07	Signals & Systems	3	0	0	3	30	120	**150**	**3**
7		4EE4-08	Digital Electronics	2	0	0	2	20	80	**100**	**2**
			Sub Total	17	0	0		170	680	**850**	**17**
PRACTICAL & SESSIONAL											
8	PCC	4EE4-21	Electrical Machine - II Lab	0	0	4		60	40	**100**	**2**
9		4EE4-22	Power Electronics Lab	0	0	4		60	40	**100**	**2**
10		4EE4-23	Digital Electronics Lab	0	0	2		30	20	**50**	**1**
11		4EE3-24	Measurement Lab	0	0	2		30	20	**50**	**1**
13	SODECA	4EE8-00	Social Outreach, Discipline & Extra Curricular Activities							**25**	**0.5**
			Sub- Total	0	0	12		180	120	**325**	**6.5**
			TOTAL OF IV SEMEESTER	17	0	12		350	800	**1175**	**23.5**

L: *Lecture,* ***T:*** *Tutorial,* ***P:*** *Practical,* ***Cr:*** *Credits*

ETE: *End Term Exam,* ***IA:*** *Internal Assessment*

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

Scheme of

UNDERGRADUATE DEGREE COURSE

B.Tech. V & VI Semester

Electrical Engineering

Rajasthan Technical University, Kota

Effective from session: 2019-20

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Teaching & Examination Scheme
B.Tech. : Electrical Engineering
3rd Year –V Semester

SN	Category	Course		Contact hrs/week			Marks				Cr
		Code	Title	L	T	P	Exm Hrs	IA	ETE	Total	
THEORY											
1	ESC	5EE3-01	Electrical Materials	2	0	0	2	20	80	**100**	**2**
2	PCC/ PEC	5EE4-02	Power System - I	3	0	0	3	30	120	**150**	**3**
3		5EE4-03	Control System	3	0	0	3	30	120	**150**	**3**
4		5EE4-04	Microprocessor	3	0	0	3	30	120	**150**	**3**
5		5EE4-05	Electrical Machine Design	3	0	0	3	30	120	**150**	**3**
6		Professional	Elective I (any one)	2	0	0	2	20	80	**100**	**2**
		5EE5-11	Restructured Power System.								
		5EE5-12	Electromagnetic Wave.								
		5EE5-13	Digital Control System.								
		Sub Total		**16**	**0**	**0**		**160**	**640**	**800**	**16**
PRACTICAL & SESSIONAL											
7	PCC	5EE4-21	Power System - I Lab	0	0	2	2	30	20	**50**	**1**
8		5EE4-22	Control System Lab	0	0	2	2	30	20	**50**	**1**
9		5EE4-23	Microprocessor Lab	0	0	2	2	30	20	**50**	**1**
10		5EE4-24	System Programming Lab	0	0	2	2	30	20	**50**	**1**
11	PSIT	5EE7-30	Industrial Training	0	0	1		75	50	**125**	**2.5**
12	SODECA	5EE8-00	Social Outreach, Discipline & Extra Curricular Activities						25	**25**	**0.5**
		Sub- Total		**0**	**0**	**9**		**195**	**155**	**350**	**7**
		TOTAL OF V SEMESTER		**16**	**0**	**9**		**355**	**795**	**1150**	**23**

L: *Lecture,* ***T:*** *Tutorial,* ***P:*** *Practical,* ***Cr:*** *Credits*
ETE: *End Term Exam,* ***IA:*** *Internal Assessment*

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Teaching & Examination Scheme
B. Tech.: Electrical Engineering
3rd Year – VI Semester

SN	Category	Course Code	Course Title	Contact hrs/week L	T	P	Marks Exm Hrs	IA	ETE	Total	Cr
THEORY											
1	ESC	6EE3-01	Computer Architecture	2	0	0	2	20	80	**100**	**2**
2	PCC/ PEC	6EE4-02	Power System - II	3	0	0	3	30	120	**150**	**3**
3		6EE4-03	Power System Protection	3	0	0	3	30	120	**150**	**3**
4		6EE4-04	Electrical Energy Conversion and Auditing	3	0	0	3	30	120	**150**	**3**
5		6EE4-05	Electric Drives	3	0	0	3	30	120	**150**	**3**
6		Professional	Elective II (any one)	3	0	0	3	30	120	**150**	**3**
		6EE5-11	Power System Planning.								
		6EE5-12	Digital Signal Processing.								
		6EE5-13	Electrical and Hybrid Vehicles.								
			Sub Total	**17**	**0**	**0**	**17**	**170**	**680**	**850**	**17**
PRACTICAL & SESSIONAL											
7	PCC	6EE4-21	Power System - II Lab	0	0	4	3	60	40	**100**	**2**
8		6EE4-22	Electric Drives Lab	0	0	4	3	60	40	**100**	**2**
9		6EE4-23	Power System Protection Lab	0	0	2	2	30	20	**50**	**1**
10		6EE4-24	Modelling and simulation lab	0	0	2	2	30	20	**50**	**1**
11	SODECA	6EE8-00	Social Outreach, Discipline & Extra Curricular Activities	0	0	0			25	**25**	**0.5**
			Sub- Total	**0**	**0**	**12**		**180**	**145**	**325**	**6.5**
			TOTAL OF VI SEMESTER	**17**	**0**	**12**		**350**	**825**	**1175**	**23.5**

L: *Lecture,* ***T:*** *Tutorial,* ***P:*** *Practical,* ***Cr:*** *Credits*

ETE: *End Term Exam,* ***IA:*** *Internal Assessment*

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

Course	Electrical Engineering	Code	EE

SEMESTER VII Subject Code	Title	Hrs. / Week L	T	P	*IA*	*Exam*	Total
7EE1A	Power System Planning	3		Theory Subjects	20	80	100
7EE2A	Power System Analysis	3	1		20	80	100
7EE3A	Artificial Intelligence Techniques	3			20	80	100
7EE4A	Non Conventional Energy Sources	3			20	80	100
7EE5A	Power System Engineering	3	1		20	80	100
7EE6.1A	Electromagnetic Field Theory	3	1		20	80	100
7EE6.2A	Computer Aided Design of Electrical Machines						
7EE6.3A	Economic Operation of Power Systems						
7EE7A	Power System Planning Lab	Practical laboratory courses		2	45	30	75
7EE8A	Power System Modelling & Simulation Lab			2	45	30	75
7EE9A	Industrial Economics & Management			2	30	20	50
7EETR	Practical Training & Industrial visit			2		100	100
7EEPR	Project-1			2	50		50
7EEDC	Discipline & Extra Curricular Activity						50
	Total	18	2	10			1000

SEMESTER VIII Subject Code	Title	Hrs. / Week L	T	P	*IA*	*Exam*	Total
8EE1A	EHV AC/DC Transmission	3	1	Theory Subjects	20	80	100
8EE2A	Electric Drives and Their Control	3	1		20	80	100
8EE3A	Protection of Power System	3			20	80	100
8EE4.1A	Utilization of Electrical Power	3			20	80	100
8EE4.2A	FACTS Devices & Their Applications						
8EE4.3A	Power System Transients						
8EE5A	Computer Based Power System Lab	Practical laboratory courses		3	60	40	100
8EE6A	Electrical Drives and Control Lab			3	60	40	100
8EE7A	High Voltage Engineering Lab			2			50
8EEPR	Project-2			2	120	80	200
8EESM	Seminar			2	60	40	100
8EEDC	Discipline & Extra Curricular Activity						50
	Total	12	2	12			1000

Syllabus of

UNDERGRADUATE DEGREE COURSE

Electrical Engineering

Rajasthan Technical University, Kota

Effective from session: 2018 – 2019

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

2nd Year - III Semester: B.Tech. (Electrical Engineering)

3EE2-01: Advance Mathematics

Credit: 3 **Max. Marks: 150 (IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	Hours
1	**Numerical Methods:** Finite differences, Relation between operators, Interpolation using Newton's forward and backward difference formulae. Gauss's forward and backward interpolation formulae. Stirling's Formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange'sformulae. Numerical Differentiation, Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules. Solution of polynomial and transcendental equations-Bisection method, Newton-Raphson method and Regula-Falsi method.	**14**
2	**Transform Calculus:** Laplace Transform: Definition and existence of Laplace transform, Properties of Laplace Transform and formulae, Unit Step function, Dirac Delta function, Heaviside function, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem. Fourier Transform: Fourier Complex, Sine and Cosine transform, properties and formulae, inverse Fourier transforms, Convolution theorem. Z-Transform: Definition, properties and formulae, Convolution theorem, inverse Z-transform, application of Z-transform to difference equation.	**20**
3	**Complex Variable:** Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties; Conformal mappings, Mobius transformations and their properties.	**06**
	TOTAL	**40**

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

2nd Year - III Semester: B.Tech. (Electrical Engineering)

3EE1-02/4EE1-02: Technical Communication

Credit: 2 **Max. Marks: 100 (IA:20, ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hours
1	**Introduction to Technical Communication-** Definition of technical communication, Aspects of technical communication, forms of technical communication, importance of technical communication, technical communication skills (Listening, speaking, writing, reading writing), linguistic ability, style in technical communication.	4
2	**Comprehension of Technical Materials/Texts and Information Design & development-** Reading of technical texts, Readingand comprehending instructions and technical manuals, Interpreting and summarizing technical texts, Note-making. Introduction of different kinds of technical documents, Information collection, factors affecting information and document design, Strategies for organization, Information design and writing for print and online media.	6
3	**Technical Writing, Grammar and Editing**- Technical writing process, forms of technical discourse, Writing, drafts and revising, Basics of grammar, common error in writing and speaking, Study of advanced grammar, Editing strategies to achieve appropriate technical style, Introduction to advanced technical communication. Planning, drafting and writing Official Notes, Letters, E-mail, Resume, Job Application, Minutes of Meetings.	8
4	**Advanced Technical Writing**- Technical Reports, types of technical reports, Characteristics and formats and structure of technical reports. Technical Project Proposals, types of technical proposals, Characteristics and formats and structure of technical proposals. Technical Articles, types of technical articles, Writing strategies, structure and formats of technical articles.	8
	TOTAL	26

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RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

2nd Year - III Semester: B.Tech. (Electrical Engineering)

3EE1-03/4EE1-03: Managerial Economics and Financial Accounting

Credit: 2 **Max. Marks: 100 (IA:20, ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hours
1.	**Basic economic concepts** Meaning, nature and scope of economics, deductive vs inductive methods, static and dynamics, Economic problems: scarcity and choice, circular flow of economic activity, national income-concepts and measurement.	4
2.	**Demand and Supply analysis** Demand-types of demand, determinants of demand, demand function, elasticity of demand, demand forecasting –purpose, determinants and methods, Supply-determinants of supply, supply function, elasticity of supply.	5
3.	**Production and Cost analysis** Theory of production- production function, law of variable proportions, laws of returns to scale, production optimization, least cost combination of inputs, isoquants. Cost concepts-explicit and implicit cost, fixed and variable cost, opportunity cost, sunk costs, cost function, cost curves, cost and output decisions, cost estimation.	5
4.	**Market structure and pricing theory** Perfect competition, Monopoly, Monopolistic competition, Oligopoly.	4
5.	**Financial statement analysis** Balance sheet and related concepts, profit and loss statement and related concepts, financial ratio analysis, cash-flow analysis, funds-flow analysis, comparative financial statement, analysis and interpretation of financial statements, capital budgeting techniques.	8
	TOTAL	**26**

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RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

2nd Year - III Semester: B.Tech. (Electrical Engineering)

3EE3-04: Power Generation Processes

Credit: 2 **Max. Marks: 100 (IA:20, ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hours
1.	**Conventional Energy Generation Methods** Thermal Power plants: Basic schemes and working principle. (ii) Gas Power Plants: open cycle and closed cycle gas turbine plants, combined gas & steam plants-basic schemes. Hydro Power Plants: Classification of hydroelectric plants. Basic schemes of hydroelectric and pumped storage plants. (iv) Nuclear Power Plants: Nuclear fission and nuclear fusion. Fissile and fertile materials. Basic plant schemes with boiling water reactor, heavy water reactor and fast breeder reactor. Efficiencies of various power plants.	6
3.	**New Energy Sources** Impact of thermal, gas, hydro and nuclear power stations on environment. Green House Effect (Global Warming).Renewable and nonrenewable energy sources. Conservation of natural resources and sustainable energy systems. Indian energy scene. Introduction to electric energy generation by wind, solar and tidal.	6
4.	**Loads and Load Curves** Types of load, chronological load curve, load duration curve, energy load curve and mass curve. Maximum demand, demand factor, load factor, diversity factor, capacity factor and utilization.	2
5.	**Power Factor Improvement** Causes and effects of low power factor and advantages of power factor improvement. Power factor improvement using shunt capacitors and synchronous condensers.	3
6.	**Power Plant Economics** Capital cost of plants, annual fixed and operating costs of plants, generation cost and depreciation. Effect of load factor on unit energy cost. Role of load diversity in power system economics. Calculation of most economic power factor when (a) kW demand is constant and (b) kVA demand is constant. (iii) Energy cost reduction: off peak energy utilization, co-generation, and energy conservation.	5
7.	**Tariff** Objectives of tariffs. General tariff form. Flat demand rate, straight meter rate, block meter rate. Two part tariff, power factor dependent tariffs, three part tariff. Spot (time differentiated) pricing.	3

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8.	**Selection of Power Plants** Comparative study of thermal, hydro, nuclear and gas power plants. Base load and peak load plants. Size and types of generating units, types of reserve and size of plant. Selection and location of power plants.	**4**
	Total	**28**

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3EE4-05 Electrical Circuit Analysis

Credit: 3 **Max. Marks: 150 (IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	Hours
1.	**Network Theorems** Superposition theorem, Thevenin theorem, Norton theorem, Maximum power transfer theorem, Reciprocity theorem, Compensation theorem. Analysis with dependent current and voltage sources. Node and Mesh Analysis. Concept of duality and dual networks.	10
2.	**Solution of First and Second order networks** Solution of first and second order differential equations for Series and parallel R-L, R-C, RL- C circuits, initial and final conditions in network elements, forced and free response, time constants, steady state and transient state response.	8
3.	**Sinusoidal steady state analysis** Representation of sine function as rotating phasor, phasor diagrams, impedances and admittances, AC circuit analysis, effective or RMS values, average power and complex power. Three-phase circuits. Mutual coupled circuits, Dot Convention in coupled circuits, Ideal Transformer.	8
4.	**Electrical Circuit Analysis Using Laplace Transforms** Review of Laplace Transform, Analysis of electrical circuits using Laplace Transform for standard inputs, convolution integral, inverse Laplace transform, transformed network with initial conditions. Transfer function representation. Poles and Zeros. Frequency response (magnitude and phase plots), series and parallel resonances	8
5.	**Two Port Network and Network Functions** Two Port Networks, terminal pairs, relationship of two port variables, impedance parameters, admittance parameters, transmission parameters and hybrid parameters, interconnections of two port networks.	6
	TOTAL	40

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RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

2nd Year - III Semester: B.Tech. (Electrical Engineering)

3EE4-06: Analog Electronics

Credit: 3 **Max. Marks: 150 (IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN		Hours
1.	**Diode circuits** P-N junction diode, I-V characteristics of a diode; review of half-wave and full-wave rectifiers, Zener diodes, clamping and clipping circuits.	4
2.	**BJT circuits** Structure and I-V characteristics of a BJT; BJT as a switch. BJT as an amplifier: small-signal model, biasing circuits, current mirror; common-emitter, common-base and common collector amplifiers; Small signal equivalent circuits, high-frequency equivalent circuits.	8
3.	**MOSFET circuits** MOSFET structure and I-V characteristics. MOSFET as a switch. MOSFET as an amplifier: small-signal model and biasing circuits, common-source, common-gate and common-drain amplifiers; small signal equivalent circuits - gain, input and output impedances, transconductance, high frequency equivalent circuit.	8
4.	**Differential, multi-stage and operational amplifiers** Differential amplifier; power amplifier; direct coupled multi-stage amplifier; internal structure of an operational amplifier, ideal op-amp, non-idealities in an op-amp (Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product)	8
5.	**Linear applications of op-amp** Idealized analysis of op-amp circuits. Inverting and non-inverting amplifier, differential amplifier, instrumentation amplifier, integrator, active filter, P, PI and PID controllers and lead/lag compensator using an op-amp, voltage regulator, oscillators (Wein bridge and phase shift). Analog to Digital Conversion.	8
6.	**Nonlinear applications of op-amp** Hysteretic Comparator, Zero Crossing Detector, Square-wave and triangular-wave generators, Precision rectifier, peak detector. Monoshot	6
	TOTAL	42

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RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

2nd Year - III Semester: B.Tech. (Electrical Engineering)

3EE4-07: Electrical Machine-I

Credit: 3 **Max. Marks: 150 (IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	Hours
1.	**Magnetic fields and magnetic circuits** Review of magnetic circuits - MMF, flux, reluctance, inductance; review of Ampere Law and Biot Savart Law; Visualization of magnetic fields produced by a bar magnet and a current carrying coil - through air and through a combination of iron and air; influence of highly permeable materials on the magnetic flux lines.	6
2.	**Electromagnetic force and torque** B-H curve of magnetic materials; flux-linkage v/s current characteristic of magnetic circuits; linear and nonlinear magnetic circuits; energy stored in the magnetic circuit; force as a partial derivative of stored energy with respect to position of a moving element; torque as a partial derivative of stored energy with respect to angular position of a rotating element. Examples - galvanometer coil, relay contact, lifting magnet, rotating element with eccentricity or saliency	9
3.	**DC machines** Basic construction of a DC machine, magnetic structure - stator yoke, stator poles, pole-faces or shoes, air gap and armature core, visualization of magnetic field produced by the field winding excitation with armature winding open, air gap flux density distribution, flux per pole, induced EMF in an armature coil. Armature winding and commutation – Elementary armature coil and commutator, lap and wave windings, construction of commutator, linear commutation Derivation of back EMF equation, armature MMF wave, derivation of torque equation, armature reaction, air gap flux density distribution with armature reaction.	8
4.	**DC machine - motoring and generation** Armature circuit equation for motoring and generation, Types of field excitations – separately excited, shunt and series. Open circuit characteristic of separately excited DC generator, back EMF with armature reaction, voltage build-up in a shunt generator, critical field resistance and critical speed. V-I characteristics and torque-speed characteristics of separately excited, shunt and series motors. Speed control through armature voltage. Losses, load testing and back-to-back testing of DC machines.	7

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5.	**Transformers** Principle, construction and operation of single-phase transformers, equivalent circuit, phasor diagram, voltage regulation, losses and efficiency Testing - open circuit and short circuit tests, polarity test, back-to-back test, separation of hysteresis and eddy current losses Three-phase. transformer - construction, types of connection and their comparative features, Parallel operation of single-phase and three-phase transformers, Autotransformers - construction, principle, applications and comparison with two winding transformer, Magnetizing current, effect of nonlinear B-H curve of magnetic core material, harmonics in magnetization current,Phase conversion - Scott connection, three-phase to six-phase conversion, Tap-changing transformers - No-load and on-load tap-changing of transformers, Three-winding transformers. Cooling of transformers.	**12**
	TOTAL	**42**

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SYLLABUS

2nd Year - III Semester: B.Tech. (Electrical Engineering)

3EE4-08: Electromagnetic Fields

Credit: 2 **Max. Marks: 100 (IA:20, ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hours
1.	**Review of Vector Calculus** Vector algebra- addition, subtraction, components of vectors, scalar and vector multiplications, triple products, three orthogonal coordinate systems (rectangular, cylindrical and spherical). Vector calculus differentiation, partial differentiation, integration, vector operatordel, gradient, divergence and curl; integral theorems of vectors. Conversion of a vector from one coordinate system to another.	4
2.	**Static Electric Field** Coulomb's law, Electric field intensity, Electrical field due to point charges. Line, Surface and Volume charge distributions. Gauss law and its applications. Absolute Electric potential, Potential difference, Calculation of potential differences for different configurations. Electric dipole, Electrostatic Energy and Energy density.	4
3.	**Conductors, Dielectrics and Capacitance** Current and current density, Ohms Law in Point form, Continuity of current, Boundary conditions of perfect dielectric materials. Permittivity of dielectric materials, Capacitance, Capacitance of a two wire line, Poisson's equation, Laplace's equation, Solution of Laplace and Poisson's equation, Application of Laplace's and Poisson's equations.	4
4.	**Static Magnetic Fields** Biot-Savart Law, Ampere Law, Magnetic flux and magnetic flux density, Scalar and Vector Magnetic potentials. Steady magnetic fields produced by current carrying conductors.	4
5.	**Magnetic Forces, Materials and Inductance** Force on a moving charge, Force on a differential current element, Force between differential current elements, Nature of magnetic materials, Magnetization and permeability, Magnetic boundary conditions, Magnetic circuits, inductances and mutual inductances.	4
6.	**Time Varying Fields and Maxwell's Equations** Faraday's law for Electromagnetic induction, Displacement current, Point form of Maxwell's equation, Integral form of Maxwell's equations, Motional Electromotive forces. Boundary Conditions.	4
7.	**Electromagnetic Waves** Derivation of Wave Equation, Uniform Plane Waves, Maxwell's equation in Phasor form, Wave equation in Phasor form, Plane waves in free space and in a homogenous material. Wave equation for a conducting medium, Plane waves in lossy dielectrics, Propagation in good conductors, Skin effect. Poynting theorem.	4
	TOTAL	**28**

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3EE4-21: Analog Electronics Lab

Credit: 1 **Max. Marks: 50 (IA:30, ETE:20)**
0L+0T+2P

1) Plot gain-frequency characteristics of BJT amplifier with and without negative feedback in the emitter circuit and determine bandwidths, gain bandwidth products and gains at 1 kHz with and without negative feedback.
2) Study of series and shunt voltage regulators and measurement of line and load regulation and ripple factor.
3) Plot and study the characteristics of small signal amplifier using FET.
4) Study of push pull amplifier. Measure variation of output power & distortion with load.
5) Study Wein bridge oscillator and observe the effect of variation in R & C on oscillator frequency.
6) Study transistor phase shift oscillator and observe the effect of variation in R & C on oscillator frequency and compare with theoretical value.
7) Study the following oscillators and observe the effect of variation of C on oscillator frequency:
   (a) Hartley (b) Colpitts.
8) To plot the characteristics of UJT and UJT as relaxation.

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3EE4-22: Electrical Machines-I Lab

Credit: 2 **Max. Marks: 100 (IA:60, ETE:40)**
0L+0T+4P

1) To perform O.C. and S.C. test on a 1-phase transformer and to determine the parameters of its equivalent circuit its voltage regulation and efficiency.
2) To perform sumpner's test on two identical 1-phase transformers and find their efficiency & parameters of the equivalent circuit.
3) To determine the efficiency and voltage regulation of a single-phase transformer by direct loading.
4) To perform the heat run test on a delta/delta connected 3-phase transformer and determine the parameters for its equivalent circuit.
5) To perform the parallel operation of the transformer to obtain data to study the load sharing.
6) Separation of no load losses in single phase transformer.
7) To study conversion of three-phase supply to two-phase supply using Scott-Connection.
8) Speed control of D.C. shunt motor by field current control method & plot the curve for speed verses field current.
9) Speed control of D.C. shunt motor by armature voltage control method & plot the curve for speed verses armature voltage.
10) To determine the efficiency at full load of a D.C shunt machine considering it as a motor by performing Swinburne's test.
11) To perform Hopkinson's test on two similar DC shunt machines and hence obtain their efficiencies at various loads.

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3EE4-23: Electrical Circuit Design Lab

Credit: 2 **Max. Marks: 100 (IA:60, ETE:40)**
0L+0T+4P

1) Introduction to Datasheet Reading.
2) Introduction to Soldering - Desoldering process and tools.
3) Simulate characteristic of BJT and UJT. Validate on Bread Board or PCB.
4) Simulate Bridge Rectifier Circuit and validate on Bread Board or PCB.
   a) Half Bridge.
   b) Full Bridge.
5) Simulate Regulated Power Supply and validate on Bread Board or PCB.
   a) Positive Regulation (03 Volt to 15 Volt).
   b) Negative Regulation (03 Volt to 15 Volt).
   c) 25 Volt, 1–10 A Power Supply.
6) Simulate Multivibrator circuit using IC 555 and BJT separately. Validate on Bread Board or PCB.
   a) Astable Mode.
   b) Bistable Mode.
   c) Monostable Mode.
7) Introduction to Sensors to measure real time quantities and their implementation in different processes.
   (Proximity, Accelerometer, Pressure, Photo-detector, Ultrasonic Transducer, Smoke, Temperature, IR, Color, Humidity, etc.).
8) Hardware implementation of temperature control circuit using Thermistor.
9) Simulate Frequency divider circuit and validate it on Bread Board or PCB.
10) Hardware implementation of 6/12 V DC Motor Speed Control (Bidirectional)
11) Simulate Buck, Boost, Buck-Boost circuit and validate on Bread Board or PCB.
12) Simulate Battery Voltage Level Indicator Circuit and validate on Bread Board or PCB.

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Syllabus of

UNDERGRADUATE DEGREE COURSE

Electrical Engineering

Rajasthan Technical University, Kota

Effective from session: 2018 – 2019

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

2nd Year - IV Semester: B.Tech. (Electrical Engineering)

4EE2-01: Biology

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**

2L+0T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Introduction:** Purpose: To convey that Biology is as important a scientific discipline as Mathematics, Physics and Chemistry. Bring out the fundamental differences between science and engineering by drawing a comparison between eye and camera, Bird flying and aircraft. Mention the most exciting aspect of biology as an independent scientific discipline. Why we need to study biology? Discuss how biological observations of 18th Century that lead to major discoveries. Examples from Brownian motion and the origin of thermodynamics by referring to the original observation of Robert Brown and Julius Mayor. These examples will highlight the fundamental importance of observations in any scientific inquiry.	1
3	**Classification:** Purpose: To convey that classification *per se* is not what biology is all about. The underlying criterion, such as morphological, biochemical or ecological be highlighted. Hierarchy of life forms at phenomenological level. A common thread weaves this hierarchy Classification. Discuss classification based on (a) cellularity- Unicellular or multicellular (b) ultrastructureprokaryotes or eucaryotes. (c) energy and Carbon utilization -Autotrophs, heterotrophs, lithotropes (d) Ammonia excretion- aminotelic, uricotelic, ureotelic (e) Habitata- acquatic or terrestrial (e) Molecular taxonomy- three major kingdoms of life. A given organism can come under different category based on classification. Model organisms for the study of biology come from different groups. E.coli, S.cerevisiae, D. Melanogaster, C. elegance, A. Thaliana, M. musculus	3
4	**Genetics:** Purpose: To convey that "Genetics is to biology what Newton's laws are to Physical Sciences". Mendel's laws, Concept of segregation and independent assortment. Concept of allele. Gene mapping, Gene interaction, Epistasis. Meiosis and Mitosis be taught as a part of genetics. Emphasis to be give not to the mechanics of cell division nor the phases but how genetic material passes from parent to offspring. Concepts of recessiveness and dominance. Concept of mapping of phenotype to genes. Discuss about the single gene disorders in humans. Discuss the concept of complementation using human genetics.	3
5	**Biomolecules:** Purpose: To convey that all forms of life has the same building blocks and yet the manifestations are as diverse as one can imagine. Molecules of life. In this context discuss monomeric units and polymeric structures. Discuss about sugars, starch and cellulose. Amino acids and proteins. Nucleotides and DNA/RNA. Two carbon units and lipids.	3

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6	**Enzymes:** Purpose: To convey that without catalysis life would not have existed on earth. Enzymology: How to monitor enzyme catalysed reactions. How does an enzyme catalyse reactions? Enzyme classification. Mechanism of enzyme action. Discuss at least two examples. Enzyme kinetics and kinetic	**3**
7	**Information Transfer:** Purpose: The molecular basis of coding and decoding genetic information is universal. Molecular basis of information transfer. DNA as a genetic material. Hierarchy of DNA structure- from single stranded to double helix to nucleosomes. Concept of genetic code. Universality and degeneracy of genetic code. Define gene in terms of complementation and recombination.	**3**
8	**Macromolecular analysis:** Purpose: To analyse biological processes at the reductionistic level. Proteins- structure and function. Hierarch in protein structure. Primary secondary, tertiary and quaternary structure. Proteins as enzymes, transporters, receptors and structural elements.	**4**
9	**Metabolism:** Purpose: The fundamental principles of energy transactions are the same in physical and biological world. Thermodynamics as applied to biological systems. Exothermic and endothermic versus endergonic and exergonic reactions. Concept of Keq and its relation to standard free energy. Spontaneity. ATP as an energy currency. This should include the breakdown of glucose to CO2 + H2O (Glycolysis and Krebs cycle) and synthesis of glucose from CO2 and H2O (Photosynthesis). Energy yielding and energy consuming reactions. Concept of Energy charge.	**4**
10	**Microbiology:** Concept of single celled organisms. Concept of species and strains. Identification and classification of microorganisms. Microscopy. Ecological aspects of single celled organisms. Sterilization and media compositions. Growth kinetics.	**3**
	Total	**28**

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RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

2nd Year - IV Semester: B.Tech. (Electrical Engineering)

4EE1-03/3EE1-03: Managerial Economics and Financial Accounting

Credit: 2 **Max. Marks: 100 (IA:20, ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Basic economic concepts** Meaning, nature and scope of economics, deductive vs inductive methods, static and dynamics, Economic problems: scarcity and choice, circular flow of economic activity, national income-concepts and measurement.	3
3	**Demand and Supply analysis** Demand-types of demand, determinants of demand, demand function, elasticity of demand, demand forecasting –purpose, determinants and methods, Supply-determinants of supply, supply function, elasticity of supply.	5
4	**Production and Cost analysis** Theory of production- production function, law of variable proportions, laws of returns to scale, production optimization, least cost combination of inputs, isoquants. Cost concepts-explicit and implicit cost, fixed and variable cost, opportunity cost, sunk costs, cost function, cost curves, cost and output decisions, cost estimation.	5
5	**Market structure and pricing theory** Perfect competition, Monopoly, Monopolistic competition, Oligopoly.	4
6	**Financial statement analysis** Balance sheet and related concepts, profit and loss statement and related concepts, financial ratio analysis, cash-flow analysis, funds-flow analysis, comparative financial statement, analysis and interpretation of financial statements, capital budgeting techniques.	8
	TOTAL	26

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RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

2nd Year - IV Semester: B.Tech. (Electrical Engineering)

4EE1-02/3EE1-02: Technical Communication

Credit: 2 **Max. Marks: 100 (IA:20, ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Introduction to Technical Communication-** Definition of technical communication, Aspects of technical communication, forms of technical communication, importance of technical communication, technical communication skills (Listening, speaking, writing, reading writing), linguistic ability, style in technical communication.	3
3	**Comprehension of Technical Materials/Texts and Information Design & development-** Reading of technical texts, Readingand comprehending instructions and technical manuals, Interpreting and summarizing technical texts, Note-making. Introduction of different kinds of technical documents, Information collection, factors affecting information and document design, Strategies for organization, Information design and writing for print and online media.	6
4	**Technical Writing, Grammar and Editing**- Technical writing process, forms of technical discourse, Writing, drafts and revising, Basics of grammar, common error in writing and speaking, Study of advanced grammar, Editing strategies to achieve appropriate technical style, Introduction to advanced technical communication. Planning, drafting and writing Official Notes, Letters, E-mail, Resume, Job Application, Minutes of Meetings.	8
5	**Advanced Technical Writing**- Technical Reports, types of technical reports, Characteristics and formats and structure of technical reports. Technical Project Proposals, types of technical proposals, Characteristics and formats and structure of technical proposals. Technical Articles, types of technical articles, Writing strategies, structure and formats of technical articles.	8
	TOTAL	26

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RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

2nd Year - IV Semester: B.Tech. (Electrical Engineering)

4EE3-04: Electronic Measurement and Instrumentation

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Measuring Instruments:** Moving coil, moving iron, electrodynamic and induction instruments-construction, operation, torque equation and errors. Applications of instruments for measurement of current, voltage, single-phase power and single-phase energy. Errors in wattmeter and energy meter and their compensation and adjustment. Testing and calibration of single-phase energy meter by phantom loading.	4
3	**Polyphase Metering:** Blondel's Theorem for n-phase, p-wire system. Measurement of power and reactive kVA in 3-phase balanced and unbalanced systems: One-wattmeter, two- wattmeter and three-wattmeter methods. 3-phase induction type energy meter. Instrument Transformers: Construction and operation of current and potential transformers. Ratio and phase angle errors and their minimization. Effect of variation of power factor, secondary burden and frequency on errors. Testing of CTs and PTs. Applications of CTs and PTs for the measurement of current, voltage, power and energy.	6
5	**Potentiometers:** Construction, operation and standardization of DC potentiometers– slide wire and Crompton potentiometers. Use of potentiometer for measurement of resistance and voltmeter and ammeter calibrations. Volt ratio boxes. Construction, operation and standardization of AC potentiometer in-phase and quadrature potentiometers. Applications of AC potentiometers.	5
6	**Measurement of Resistances:** Classification of resistance. Measurement of medium resistances – ammeter and voltmeter method, substitution method, Wheatstone bridge method. Measurement of low resistances – Potentiometer method and Kelvin's double bridge method. Measurement of high resistance: Price's Guard-wire method. Measurement of earth resistance.	6
7	**AC Bridges:** Generalized treatment of four-arm AC bridges. Sources and detectors. Maxwell's bridge, Hay's bridge and Anderson bridge for self-inductance measurement. Heaviside's bridge for mutual inductance measurement. De Sauty Bridge for capacitance measurement. Wien's bridge for capacitance and frequency measurements. Sources of error in bridge measurements and precautions. Screening of bridge components. Wagner earth device.	6
	Total	28

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RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

2nd Year - IV Semester: B.Tech. (Electrical Engineering)

4EE4-05: Electrical Machines – II

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Fundamentals of AC machine windings** Physical arrangement of windings in stator and cylindrical rotor; slots for windings; single turn coil - active portion and overhang; full-pitch coils, concentrated winding, distributed winding, winding axis, 3D visualization of the above winding types, Air-gap MMF distribution with fixed current through winding - concentrated and distributed, Sinusoidally distributed winding, winding distribution factor.	7
3	**Pulsating and revolving magnetic fields** Constant magnetic field, pulsating magnetic field - alternating current in windings with spatial displacement, Magnetic field produced by a single winding - fixed current and alternating current Pulsating fields produced by spatially displaced windings, Windings spatially shifted by 90 degrees, Addition of pulsating magnetic fields, Three windings spatially shifted by 120 degrees (carrying three-phase balanced currents), revolving magnetic field.	4
4	**Induction Machines** Construction, Types (squirrel cage and slip-ring), Torque Slip Characteristics, Starting and Maximum Torque. Equivalent circuit. Phasor Diagram, Losses and Efficiency. Effect of parameter variation on torque speed characteristics (variation of rotor and stator resistances, stator voltage, frequency). Methods of starting, braking and speed control for induction motors. Generator operation. Self-excitation. Doubly-Fed Induction Machines.	12
5	**Single-phase induction motors** Constructional features, double revolving field theory, equivalent circuit, determination of parameters. Split-phase starting methods and applications.	6
6	**Synchronous machines** Constructional features, cylindrical rotor synchronous machine - generated EMF, equivalent circuit and phasor diagram, armature reaction, synchronous impedance, voltage regulation. Operating characteristics of synchronous machines, V-curves. Salient pole machine – two reaction theory, analysis of phasor diagram, power angle characteristics. Parallel operation of alternators - synchronization and load division.	10
	Total	40

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4EE4-06: Power Electronics

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Power switching devices** Diode, Thyristor, MOSFET, IGBT: I-V Characteristics; Firing circuit for thyristor; Voltage and current commutation of a thyristor; Gate drive circuits for MOSFET and IGBT.	5
3	**Thyristor rectifiers** Single-phase half-wave and full-wave rectifiers, Single-phase full-bridge thyristor rectifier with R-load and highly inductive load; Three-phase full-bridge thyristor rectifier with R-load and highly inductive load; Input current wave shape and power factor.	6
4	**DC-DC buck converter** Elementary chopper with an active switch and diode, concepts of duty ratio and average voltage, power circuit of a buck converter, analysis and waveforms at steady state, duty ratio control of output voltage.	5
5	**DC-DC boost converter** Power circuit of a boost converter, analysis and waveforms at steady state, relation between duty ratio and average output voltage.	5
6	**Single-phase voltage source inverter** Power circuit of single-phase voltage source inverter, switch states and instantaneous output voltage, square wave operation of the inverter, concept of average voltage over a switching cycle, bipolar sinusoidal modulation and unipolar sinusoidal modulation, modulation index and output voltage.	10
7	**Three-phase voltage source inverter** Power circuit of a three-phase voltage source inverter, switch states, instantaneous output voltages, average output voltages over a sub-cycle, three-phase sinusoidal modulation.	8
	Total	40

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RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

2nd Year - IV Semester: B.Tech. (Electrical Engineering)

4EE4-07: Signals and Systems

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Introduction to Signals and Systems:** Signals and systems as seen in everyday life, and in various branches of engineering and science. Signal properties: periodicity, absolute integrability, determinism and stochastic character. Some special signals of importance: the unit step, the unit impulse, the sinusoid, the complex exponential, some special time-limited signals; continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, realizability. Examples.	6
3	**Behavior of continuous and discrete-time LTI systems:** Impulse response and step response, convolution, input-output behavior with aperiodic convergent inputs, cascade interconnections. Characterization of causality and stability of LTI systems. System representation through differential equations and difference equations. State-space Representation of systems. State-Space Analysis, Multi-input, multi-output representation. State Transition Matrix and its Role. Periodic inputs to an LTI system, the notion of a frequency response and its relation to the impulse response.	14
4	**Fourier, Laplace and z- Transforms:** Fourier series representation of periodic signals, Waveform Symmetries, Calculation of Fourier Coefficients. Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete- Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem. Review of the Laplace Transform for continuous time signals and systems, system functions, poles and zeros of system functions and signals, Laplace domain analysis, solution to differential equations and system behavior. The z-Transform for discrete time signals and systems, system functions, poles and zeros of systems and sequences, z-domain analysis.	12
5	**Sampling and Reconstruction:** The Sampling Theorem and its implications. Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first-order hold. Aliasing and its effects. Relation between continuous and discrete time systems. Introduction to the applications of signal and system theory: modulation for communication, filtering, feedback control systems.	8
	Total	41

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RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

2nd Year - IV Semester: B.Tech. (Electrical Engineering)

4EE4-08: Digital Electronics

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Fundamentals of Digital Systems and logicfamilies:** Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples of IC gates, number systems-binary, signed binary, octal hexadecimal number, binary arithmetic, one's and two's complements arithmetic, codes, error detecting and correcting codes, characteristics of digital lCs, digital logic families, TTL, Schottky TTL and CMOS logic, interfacing CMOS and TTL, Tri-state logic.	4
3	**Combinational DigitalCircuits:** Standard representation for logic functions, K-map representation, simplification of logic functions using K-map, minimization of logical functions. Don't care conditions, Multiplexer, De-Multiplexer/Decoders, Adders, Subtractors, BCD arithmetic, carry look ahead adder, serial adder, ALU, elementary ALU design, popular MSI chips, digital comparator, parity checker/generator, code converters, priority encoders, decoders/drivers for display devices, Q-M method of function realization.	6
4	**Sequential circuits and systems:** A 1-bit memory, the circuit properties of Bistable latch, the clocked SR flip flop, J- K-T and D-types flip flops, applications of flip flops, shift registers, applications of shift registers, serial to parallel converter, parallel to serial converter, ring counter, sequence generator, ripple (Asynchronous) counters, synchronous counters, counters design using flip flops, special counter IC's, asynchronous sequential counters, applications of counters.	6
5	**A/D and D/A Converters:** Digital to analog converters: weighted resistor/converter, R-2R Ladder D/A converter, specifications for D/A converters, examples of D/A converter lCs, sample and hold circuit, analog to digital converters: quantization and encoding, parallel comparator A/D converter, successive approximation A/D converter, counting A/D converter, dual slope A/D converter, A/D converter using voltage to frequency and voltage to time conversion, specifications of A/D converters, example of A/D converter ICs	4
6	**Semiconductor memories and Programmable logic devices** Memory organization and operation, expanding memory size, classification and characteristics of memories, sequential memory, read only memory (ROM), read and write memory(RAM), content addressable memory (CAM), charge de coupled device memory (CCD), commonly used memory chips, ROM as a PLD, Programmable logic array, Programmable array logic, complex Programmable logic devices (CPLDS), Field Programmable Gate Array (FPGA).	7
	Total	28

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4EE4-21: Electrical Machines - II Lab

Credit: 2 **Max. Marks: 100(IA:60, ETE:40)**

0L+0T+4P

1) To study various types of starters used for 3 phase induction motor.
2) To connect two 3-phase induction motor in cascade and study their speed control.
3) To perform load test on 3-phase induction motor and calculate torque, output power, input power, efficiency, input power factor and slip for various load settings.
4) To perform no load and blocked rotor test on a 3-phase induction motor and determine the parameters of its equivalent circuits.
5) Draw the circle diagram and compute the following (i) Max. Torque (ii) Current (iii) slips (iv) p. f. (v) Efficiency.
6) Speed control of 3- Φ Induction Motor
7) To plot the O.C.C. & S.C.C. of an alternator.
8) To determine Zs , Xd and Xq by slip test, Zero power factor (ZPF)/ Potier reactance method.
9) To determine the voltage regulation of a 3-phase alternator by direct loading.
10) To determine the voltage regulation of a 3-phase alternator by synchronous impedance method.
11) To study effect of variation of field current upon the stator current and power factor of synchronous motor andPlot V-Curve and inverted V-Curve of synchronous motor for different values of loads.
12) To synchronize an alternator across the infinite bus and control load sharing.

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4EE4-22: Power Electronics Lab

Credit: 2 **Max. Marks: 100(IA:60, ETE:40)**
0L+0T+4P

1) Study the comparison of following power electronics devices regarding ratings, performance characteristics and applications: Power Diode, Power Transistor, Thyristor, Diac, Triac, GTO, MOSFET, MCT and SIT.
2) Determine V-I characteristics of SCR and measure forward breakdown voltage, latching and holding currents.
3) Find V-I characteristics of TRIAC and DIAC.
4) Find output characteristics of MOSFET and IGBT.
5) Find transfer characteristics of MOSFET and IGBT.
6) Find UJT static emitter characteristics and study the variation in peak point and valley point.
7) Study and test firing circuits for SCR-R, RC and UJT firing circuits.
8) Study and test 3-phase diode bridge rectifier with R and RL loads. Study the effect of filters.
9) Study and obtain waveforms of single-phase half wave controlled rectifier with and without filters. Study the variation of output voltage with respect to firing angle.
10) Study and obtain waveforms of single-phase half controlled bridge rectifier with R and RL loads. Study and show the effect of freewheeling diode.
11) Study and obtain waveforms of single-phase full controlled bridge converter with R and RL loads. Study and show rectification and inversion operations with and without freewheeling diode.
12) Control the speed of a dc motor using single-phase half controlled bridge rectifier and full controlled bridge rectifier. Plot armature voltage versus speed characteristics.

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4EE4-23: Digital Electronics Lab

Credit: 1 **Max. Marks: 50(IA:30, ETE:20)**
0L+0T+2P

1) To verify the truth tables of basic logic gates: AND, OR, NOR, NAND, NOR. Also to verify the truth table of Ex-OR, Ex-NOR (For 2, 3, & 4 inputs using gates with 2, 3, & 4 inputs).
2) To verify the truth table of OR, AND, NOR, Ex-OR, Ex-NOR realized using NAND & NOR gates.
3) To realize an SOP and POS expression.
4) To realize Half adder/ Subtractor & Full Adder/ Subtractor using NAND & NOR gates and to verify their truth tables.
5) To realize a 4-bit ripple adder/ Subtractor using basic half adder/ Subtractor & basic Full Adder/ Subtractor.
6) To verify the truth table of 4-to-1 multiplexer and 1-to-4 demultiplexer. Realize the multiplexer using basic gates only. Also to construct and 8-to-1 multiplexer and 1-to-8 demultiplexer using blocks of 4-to-1 multiplexer and 1-to-4 demultiplexer.
7) Design & Realize a combinational circuit that will accept a 2421 BCD code and drive a TIL -312 seven segment display.
8) Using basic logic gates, realize the R-S, J-K and D-flip flops with and without clock signal and verify their truth table.
9) Construct a divide by 2,4& 8 asynchronous counter. Construct a 4-bit binary counter and ring counter for a particular output pattern using D flip flop.
10) Perform input/output operations on parallel in/Parallel out and Serial in/Serial out registers using clock. Also exercise loading only one of multiple values into the register using multiplexer.

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4EE4-24: Measurement Lab

Credit: 1 **Max. Marks: 50(IA:30, ETE:20)**
0L+0T+2P

1) Study working and applications of (i) C.R.O. (ii) Digital Storage C.R.O. & (ii) C.R.O. Probes.
2) Study working and applications of Meggar, Tong-tester, P.F. Meter and Phase Shifter.
3) Measure power and power factor in 3-phase load by (i) Two-wattmeter method and (ii) One-wattmeter method.
4) Calibrate an ammeter using DC slide wire potentiometer.
5) Calibrate a voltmeter using Crompton potentiometer.
6) Measure low resistance by Crompton potentiometer.
7) Measure Low resistance by Kelvin's double bridge.
8) Measure earth resistance using fall of potential method.
9) Calibrate a single-phase energy meter by phantom loading at different power factors.
10) Measure self-inductance using Anderson's bridge.

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Syllabus of
UNDERGRADUATE DEGREE COURSE

B.Tech. V Semester

Electrical Engineering

Rajasthan Technical University, Kota

Effective from session: 2019 – 2020

5EE3-01: ELECTRICAL MATERIALS

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	HOURS
1.	**Introduction:** Objective, scope and outcome of the course.	01
2.	**Elementary Materials Science Concepts** Bonding and types of solids, Crystalline state and their defects, Classical theory of electrical and thermal conduction in solids, temperature dependence of resistivity, skin effect, Hall effect..	05
3.	**Dielectric Properties of Insulators in Static and Alternating field:** Dielectric constant of mono-atomic gases, poly-atomic molecules and solids, Internal field in solids and liquids, Properties of Ferro-Electric materials, Polarization, Piezoelectricity, Frequency dependence of Electronic and Ionic Polarizability, Complex dielectric constant of non-dipolar solids, dielectric losses.	08
4	**Magnetic Properties and Superconductivity** Magnetization of matter, Magnetic Material Classification, Ferromagnetic Origin, Curie-Weiss Law, Soft and Hard Magnetic Materials, Superconductivity and its origin, Zero resistance and Meissner Effect, critical current density.	05
5	**Conductivity of metals** Ohm's law and relaxation time of electrons, collision time and mean free path, electron scattering and resistivity of metals.	04
6.	**Semiconductor Materials:** Classification of semiconductors, semiconductor conductivity, temperature dependence, Carrier density and energy gap, Trends in materials used in Electrical Equipment.	04
	TOTAL	27

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5EE4-02: POWER SYSTEM - I

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	HOURS
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Basic Concepts** Evolution of Power Systems and Present-Day Scenario. Structure of a power system: Bulk Power Grids and Micro-grids. Generation: Conventional and Renewable Energy Sources. Distributed Energy Resources. Energy Storage. Transmission and Distribution Systems: Line diagrams, transmission and distribution voltage levels and topologies (meshed and radial systems). Synchronous Grids and Asynchronous (DC) interconnections. Review of Three-phase systems. Analysis of simple three-phase circuits. Power Transfer in AC circuits and Reactive Power.	4
3	**Power System Components:** Overhead Transmission Lines and Cables: Electrical and Magnetic Fields around conductors, Corona. Parameters of lines and cables. Capacitance and Inductance calculations for simple configurations. Travelling-wave Equations. Sinusoidal Steady state representation of Lines: Short, medium and long lines. Power Transfer, Voltage profile and Reactive Power. Characteristics of transmission lines. Surge Impedance Loading. Series and Shunt Compensation of transmission lines. Transformers: Three-phase connections and Phase-shifts. Three-winding transformers, autotransformers, Neutral Grounding transformers. Tap-Changing in transformers. Transformer Parameters. Single phase equivalent of three-phase transformers. Synchronous Machines: Steady-state performance characteristics. Operation when connected to infinite bus. Real and Reactive Power Capability Curve of generators. Typical waveform under balanced terminal short circuit conditions – steady state, transient and sub-transient equivalent circuits. Loads: Types, Voltage and Frequency Dependence of Loads. Per-unit System and per-unit calculations.	15
4	**Over-voltages and Insulation Requirements** Generation of Over-voltages: Lightning and Switching Surges. Protection against Overvoltages, Insulation Coordination. Propagation of Surges. Voltages produced by traveling surges. Bewley Diagrams.	04

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5	**Fault Analysis and Protection Systems** Method of Symmetrical Components (positive, negative and zero sequences). Balanced and Unbalanced Faults. Representation of generators, lines and transformers in sequence networks. Computation of Fault Currents. Neutral Grounding**.** Switchgear: Types of Circuit Breakers. Attributes of Protection schemes, Back-up Protection. Protection schemes (Over-current, directional, distance protection, differential protection) and their application.	**09**
6	**Introduction to DC Transmission & Renewable Energy Systems** DC Transmission Systems: Line-Commutated Converters (LCC) and Voltage Source Converters (VSC). LCC and VSC based dc link, Real Power Flow control in a dc link. Comparison of ac and dc transmission. Solar PV systems: I-V and P-V characteristics of PV panels, power electronic interface of PV to the grid. Wind Energy Systems: Power curve of wind turbine. Fixed and variable speed turbines. Permanent Magnetic Synchronous Generators and Induction Generators. Power Electronics interfaces of wind generators to the grid	**09**
	TOTAL	**42**

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5EE4-03: CONTROL SYSTEM

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	HOURS
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Introduction to control problem** Industrial Control examples. Mathematical models of physical systems. Control hardware and their models. Transfer function models of linear time-invariant systems. Feedback Control: Open-Loop and Closed-loop systems. Benefits of Feedback. Block diagram algebra	4
3	**Time Response Analysis:** Standard test signals. Time response of first and second order systems for standard test inputs. Application of initial and final value theorem. Design specifications for second-order systems based on the time-response. Concept of Stability. Routh-Hurwitz Criteria. Relative Stability analysis. Root-Locus technique. Construction of Root-loci.	9
4	**Frequency-response analysis** Relationship between time and frequency response, Polar plots, Bode plots. Nyquist stability criterion. Relative stability using Nyquist criterion – gain and phase margin. Closed-loop frequency response.	6
5	**Introduction to Controller Design** Stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness of control systems. Root-loci method of feedback controller design. Design specifications in frequency-domain. Frequency-domain methods of design. Application of Proportional, Integral and Derivative Controllers, Lead and Lag compensation in designs. Analog and Digital implementation of controllers	10
6	**State variable Analysis** Concepts of state variables. State space model. Diagonalization of State Matrix. Solution of state equations. Eigenvalues and Stability Analysis. Concept of controllability and observability. Pole-placement by state feedback. Discrete-time systems. Difference Equations. State-space models of linear discrete-time systems. Stability of linear discrete-time systems	06
7	**Introduction to Optimal Control and Nonlinear Control** Performance Indices. Regulator problem, Tracking Problem. Nonlinear system–Basic concepts and analysis	05
	TOTAL	41

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5EE4-04: MICROPROCESSOR

Credit: 3 **Max. Marks: 150(IA:30, ETE:150)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	HOURS
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Fundamentals of Microprocessors** Fundamentals of Microprocessor Architecture. 8-bitMicroprocessor and Microcontroller architecture, Comparison of 8-bit microcontrollers, 16-bit and 32-bit microcontrollers. Definition of embedded system and its characteristics, Role of microcontrollers in embedded Systems. Overview of the 8051 family.	07
3	**The 8051 Architecture:** Internal Block Diagram, CPU, ALU, address, data and control bus, Working registers, SFRs, Clock and RESET circuits, Stack and Stack Pointer, Program Counter, I/O ports, Memory Structures, Data and Program Memory, Timing diagrams and Execution Cycles.	08
4	**Instruction Set and Programming** Addressing modes: Introduction, Instruction syntax, Data types, Subroutines Immediate addressing, Register addressing, Direct addressing, Indirect addressing, Relative addressing, Indexed addressing, Bit inherent addressing, bit direct addressing. 8051 Instruction set, Instruction timings. Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instruction. Assembly language programs, C language programs. Assemblers and compilers. Programming and debugging tools..	08
5	**Memory and I/O Interfacing** Memory and I/O expansion buses, control signals, memory wait states. Interfacing of peripheral devices such as General Purpose I/O, ADC, DAC, timers, counters, memory devices.	06
6	**External Communication Interface** Synchronous and Asynchronous Communication. RS232, SPI, I2C. Introduction and interfacing to protocols like Blue-tooth and Zig-bee.	06
7	**Applications** LED, LCD and keyboard interfacing. Stepper motor interfacing, DC Motor interfacing, sensor interfacing	05
	TOTAL	41

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5EE4-05: ELECTRICAL MACHINE DESIGN

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	HOURS
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Major Consideration for Design** Major considerations in electrical machine design, electrical engineering materials, space factor, choice of specific electrical and magnetic loadings, thermal considerations, heat flow, temperature rise, rating of machines.	08
3	**Transformers:** Sizing of a transformer, main dimensions, kVA output for single- and three-phase transformers, window space factor, overall dimensions, operating characteristics, regulation, no load current, temperature rise in transformers, design of cooling tank, methods for cooling of transformers	08
4	**Induction Motors** Sizing of an induction motor, main dimensions, length of air gap, rules for selecting rotor slots of squirrel cage machines, design of rotor bars & slots, design of end rings, design of wound rotor, magnetic leakage calculations, leakage reactance of polyphase machines, magnetizing current, short circuit current, circle diagram, operating characteristics.	08
5	**Synchronous Machines** Sizing of a synchronous machine, main dimensions, design of salient pole machines, short circuit ratio, shape of pole face, armature design, armature parameters, estimation of air gap length, design of rotor, design of damper winding, determination of full load field mmf, design of field winding, design of turbo alternators, rotor design.	08
6	**Computer aided Design (CAD):** Limitations (assumptions) of traditional designs, need for CAD analysis, synthesis and hybrid methods, design optimization methods, variables, constraints and objective function, problem formulation. Introduction to FEM based machine design. Introduction to complex structures of modern machines-PMSMs, BLDCs, SRM and claw-pole machines.	08
	TOTAL	41

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5EE5-11: RESTRUCTURED POWER SYSTEM

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	HOURS
1	**Introduction :** Objective, scope and outcome of the course.	01
2	**Introduction to restructuring of power industry** Reasons for restructuring of power industry; Understanding the re-structuring process, Entities involved, The levels of competition, The market place mechanisms, Sector-wise major changes required; Reasons and objectives of deregulation of various power systems across the world	05
3	**Fundamentals of Economics** Consumer and suppliers behavior, Total utility and marginal utility, Law of diminishing marginal utility, Elasticity of demand and supply curve, Market equilibrium, Consumer and supplier surplus, Global welfare, Deadweight loss	04
4	**The Philosophy of Market Models** Monopoly model, Single buyer model, Wholesale competition model, Retail competition model, distinguishing features of electricity as a commodity, Four pillars of market design, Cournot, Bertrand and Stackelberg competition model	05
5	**Transmission Congestion Management** Transfer capability, Importance of congestion management, Effects of congestion, Classification of congestion management methods, ATC, TTC, TRM, CBM, ATC calculation using DC and AC model, Nodal pricing, Locational Marginal Prices (LMPs), Implications of nodal pricing, Price area congestion management Capacity alleviation methods, Re-dispatching, Counter-trade, Curtailment	05
6	**Ancillary Service Management** Type and start capability service, Provisions of ancillary services, Markets for ancillary services, Co-optimization of energy and reserve services, Loss of opportunity cost, International practices of ancillary services.	03
7	**Pricing of transmission network usage and Market power** Introduction to transmission pricing, Principles of transmission pricing, Classification of transmission pricing, Rolled-in transmission pricing paradigm. Attributes of a perfectly competitive market, The firm's supply decision under perfect competition, Imperfect competition, Monopoly, Oligopoly. Effect of market power, Identifying market power, HHI Index, Entropy coefficient, Lerner index.	05
		28

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5EE5-12: ELECTROMAGNETIC WAVE

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	HOURS
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Transmission Lines** Introduction, Concept of distributed elements, Equations of voltage and current, Standing waves and impedance transformation, Lossless and low-loss transmission lines, Power transfer on a transmission line, Analysis of transmission line in terms of admittances, Transmission line calculations with the help of Smith chart, Applications of transmission line, Impedance matching using transmission lines.	05
3	**Maxwell's Equations** Basic quantities of Electromagnetics, Basic laws of Electromagnetics: Gauss's law, Ampere's Circuital law, Faraday's law of Electromagnetic induction. Maxwell's equations, Surfacecharge and surface current, Boundary conditions at media interface.	04
4	**Uniform Plane Wave** Homogeneous unbound medium, Wave equation for time harmonic fields, Solution of the wave equation, Uniform plane wave, Wave polarization, Wave propagation in conducting medium, Phase velocity of a wave, Power flow and Poynting vector.	04
5	**Plane Waves at Media Interface** Plane wave in arbitrary direction, Plane wave at dielectric interface, Reflection and refraction of waves at dielectric interface, Total internal reflection, Wave polarization at media interface, Brewster angle, Fields and power flow at media interface, Lossy media interface, Reflection from conducting boundary.	05
6	**Waveguides** Parallel plane waveguide: Transverse Electric (TE) mode, transverse Magnetic(TM) mode, Cut-off frequency, Phase velocity and dispersion. Transverse Electromagnetic (TEM) mode, Analysis of waveguide-general approach, Rectangular waveguides.	04
7	**Antennas** Radiation parameters of antenna, Potential functions, Solution for potential functions, Radiations from Hertz dipole, Near field, Far field, Total power radiated by a dipole, Radiation resistance and radiation pattern of Hertz dipole, Hertz dipole in receiving mode.	04
	TOTAL	27

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5EE5-13: DIGITAL CONTROL SYSTEM

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	HOURS
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Discrete Representation of Continuous Systems** Basics of Digital Control Systems. Discrete representation of continuous systems. Sample and hold circuit. Mathematical Modelling of sample and hold circuit. Effects of Sampling and Quantization. Choice of sampling frequency. ZOH equivalent.	05
3	**Discrete System Analysis** Z-Transform and Inverse Z Transform for analyzing discrete time systems. Pulse Transfer function. Pulse transfer function of closed loop systems. Mapping from s-plane to z plane. Solution of Discrete time systems. Time response of discrete time system.	05
4	**Stability of Discrete Time System** Stability analysis by Jury test. Stability analysis using bilinear transformation. Design of digital control system with dead beat response. Practical issues with dead beat response design.	05
5	**State Space Approach for discrete time systems** State space models of discrete systems, State space analysis. Lyapunov Stability. Controllability, reach-ability, Reconstructibility and observability analysis. Effect of pole zero cancellation on the controllability & observability.	04
6.	**Design of Digital Control System** Design of Discrete PID Controller, Design of discrete state feedback controller. Design of set point tracker. Design of Discrete Observer for LTI System. Design of Discrete compensator.	04
7	**Discrete output feedback control** Design of discrete output feedback control. Fast output sampling (FOS) and periodic output feedback controller design for discrete time systems	04
	Total	28

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5EE4-21: POWER SYSTEM - I LAB

Credit: 1 **Max. Marks: 50(IA:30, ETE:20)**

0L+0T+2P **End Term Exam: 2 Hours**

1) Generating station design: Design considerations, basic schemes and single line diagram of hydro, thermal, nuclear and gas power plants. Electrical equipment for power stations.
2) Distribution system Design: Design of feeders & distributors. Calculation of voltage drops in distributors. Calculation of conductor size using Kelvin's law.
3) Study of short term, medium term and long term load forecasting.
4) Sending end and receiving end power circle diagrams.
5) Substations: Types of substations, various bus–bar arrangements. Electrical equipment for substations.
6) Study high voltage testing of electrical equipment: line insulator, cable, bushing, power capacitor, and power transformer.
7) Design an EHV transmission line
8) Study filtration and Treatment of transformer oil.
9) Determine dielectric strength of transformer oil.
10) Determine capacitance and dielectric loss of an insulating material using Schering bridge.
11) Flash over voltage testing of insulators.

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5EE4-22: CONTROL SYSTEM LAB

Credit: 1 **Max. Marks: 50(IA:30, ETE:20)**

0L+0T+2P **End Term Exam: 2 Hours**

1. (a) Plot step response of a given TF and system in state-space. Take different values of damping ratio and w_n natural undamped frequency.

   (b) Plot ramp response.

2. To design 1st order R-C circuits and observe its response with the following inputs and trace the curve.
   (a) Step
   (b) Ramp (c) Impulse

3. To design 2nd order electrical network and study its transient response for step input and following cases.
   (a) Under damped system
   (b) Over damped System.
   (c) Critically damped system.

4. To Study the frequency response of following compensating Networks, plot the graph and final out corner frequencies.
   (a) Leg Network
   (b) Lead Network. (c) Leg-lead Network.

5. Draw the bode plot in real time for a Non-Inverting amplifier.

6. Draw the bode plot in real time for an Inverting amplifier.

7. Draw the bode plot for second order transfer function.

8. Draw the bode plot for first order transfer function.

9. Design and analyse Tow- Thomas biquad filter.

10. Design and calculate Kp, Ki for PI controller.

11. Design PID controller and also calculate Kp, Ki, Kd for it.

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5EE4-23: MICROPROCESSOR LAB

Credit: 1 **Max. Marks: 50(IA:30, ETE:20)**

0L+0T+2P **End Term Exam: 2 Hours**

1. Study the hardware, functions, memory structure and operation of 8085-Microprocessor kit.
2. Program to perform integer division: (1) 8-bit by 8-bit (2) 16-bit by 8-bit.
3. Transfer of a block of data in memory to another place in memory
4. Transfer of black to another location in reverse order.
5. Searching a number in an array.
6. Sorting of array in: (1) Ascending order (2) Descending order.
7. Finding party of a 32-bit number.
8. Program to perform following conversion (1) BCD to ASCII (2) BCD to hexadecimal.
9. Program to multiply two 8–bit numbers
10. Program to generate and sum 15 Fibonacci numbers.
11. Program for rolling display of message “India”, “HELLO”.
12. To insert a number at correct place in a sorted array.
13. Reversing bits of an 8-bit number.
14. Fabrication of 8-bit LED interfaces for 8085 kit through 8155 and 8255.
15. Data transfer on output port 8155 & 8255 & implementation of disco light, running light, and sequential lights on the above mentioned hardware.
16. Parallel data transfer between two DYNA-85 kit using 8253 ports.
17. Generation of different waveform on 8253/8254 programmable timer.

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5EE4-24: SYSTEM PROGRAMMING LAB

Credit: 1 **Max. Marks: 50(IA:30, ETE:20)**

0L+0T+2P **End Term Exam: 2 Hours**

1. Basics of MATLAB matrices and vectors, matrix and array operations, Saving and loading data, plotting simple graphs, scripts and functions, Script files, Function files, Global Variables, Loops, Branches, Control flow, Advanced data objects, Multi-dimensional matrices, Structures, Applications in linear algebra curve fitting and interpolation. Numerical integration, Ordinary differential equation. (All contents is to be covered with tutorial sheets)
2. Write a MATLAB program for designing Rheostat.
3. Idea about simulink, problems based on simulink. (All contents is to be covered with tutorial sheets)
4. Write a program to generate Machine Op- code table using two pass Assembler.
5. Single Phase Full Wave Diode Bridge Rectifier With LC Filter
6. Simulate Three phase Half wave diode rectifier with RL load.
7. Starting Of A 5 HP 240V DC Motor With A Three-Step Resistance Starter.
8. Simulate OC/SC test of 1-phase transformer.
9. Simulate Torque- speed characteristics of induction motor.

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Syllabus of

UNDERGRADUATE DEGREE COURSE

B.Tech. VI Semester

Electrical Engineering



Rajasthan Technical University, Kota

Effective from session: 2019 – 2020

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Syllabus

III Year - VI Semester: B.Tech. (Electrical Engineering)

6EE3-01: COMPUTER ARCHITECTURE

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	HOURS
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Introduction to computer organization** Architecture and function of general computer system, CISC Vs RISC, Data types, Integer Arithmetic - Multiplication, Division, Fixed and Floating point representation and arithmetic, Control unit operation, Hardware implementation of CPU with Micro instruction, microprogramming, System buses, Multi-bus organisation	05
3	**Memory organization** System memory, Cache memory - types and organization, Virtual memory and its implementation, Memory management unit, Magnetic Hard disks, Optical Disks	04
4	**Input – output Organization** Accessing I/O devices, Direct Memory Access and DMA controller, Interrupts and Interrupt Controllers, Arbitration, Multilevel Bus Architecture, Interface circuits - Parallel and serial port. Features of PCI and PCI Express bus.	05
5	**16 and 32 microprocessors** 80x86 Architecture, IA – 32 and IA – 64, Programming model, Concurrent operation of EU and BIU, Real mode addressing, Segmentation, Addressing modes of 80x86, Instruction set of 80x86, I/O addressing in 80x86	05
6	**Pipelining** Introduction to pipelining, Instruction level pipelining (ILP), compiler techniques for ILP, Data hazards, Dynamic scheduling, Dependability, Branch cost, Branch Prediction, Influence on instruction set	04
7	**Different Architectures** VLIW Architecture, DSP Architecture, SoC architecture, MIPS Processor and programming	04
	TOTAL	28

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6EE4-02: POWER SYSTEM –II

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	HOURS
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Power Flow Analysis** Review of the structure of a Power System and its components. Analysis of Power Flows: Formation of Bus Admittance Matrix. Real and reactive power balance equations at a node. Load and Generator Specifications. Application of numerical methods for solution of nonlinear algebraic equations – Gauss Seidel and Newton-Raphson methods for the solution of the power flow equations. Computational Issues in Large-scale Power Systems.	08
3	**Stability Constraints in synchronous grids** Swing Equations of a synchronous machine connected to an infinite bus. Power angle curve. Description of the phenomena of loss of synchronism in a single-machine infinite bus system following a disturbance like a three--phase fault. Analysis using numerical integration of swing equations (using methods like Forward Euler, Runge-Kutta 4th order methods), as well as the Equal Area Criterion. Impact of stability constraints on Power System Operation. Effect of generation rescheduling and series compensation of transmission lines on stability.	10
4	**Control of Frequency and Voltage** Turbines and Speed-Governors, Frequency dependence of loads, Droop Control and Power Sharing. Automatic Generation Control. Generation and absorption of reactive power by various components of a Power System. Excitation System Control in synchronous generators, Automatic Voltage Regulators. Shunt Compensators, Static VAR compensators and STATCOMs. Tap Changing Transformers. Power flow control using embedded dc links, phase shifters	08
5	**Monitoring and Control** Overview of Energy Control Centre Functions: SCADA systems. Phasor Measurement Units and Wide-Area Measurement Systems. State-estimation. System Security Assessment. Normal, Alert, Emergency, Extremis states of a Power System. Contingency Analysis. Preventive Control and Emergency Control	08
6	**Power System Economics and Management** Basic Pricing Principles: Generator Cost Curves, Utility Functions, Power Exchanges, Spot Pricing. Electricity Market Models (Vertically Integrated, Purchasing Agency, Whole-sale competition, Retail Competition), Demand Side-management, Transmission andDistributions charges, Ancillary Services. Regulatory framework..	06
	TOTAL	41

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6EE4-03: POWER SYSTEM PROTECTION

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	HOURS
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Introduction and Components of a Protection System** Principles of Power System Protection, Relays, Instrument transformers, Circuit Breakers.	04
3	**Faults and Over-Current Protection** Review of Fault Analysis, Sequence Networks. Introduction to Overcurrent Protection andovercurrent relay co-ordination.	08
4	**Equipment Protection Schemes** Directional, Distance, Differential protection. Transformer and Generator protection. Bus bar Protection, Bus Bar arrangement schemes.	08
5	**Digital Protection** Computer-aided protection, Fourier analysis and estimation of Phasors from DFT. Sampling, aliasing issues.	07
6	**Modeling and Simulation of Protection Schemes** CT/PT modeling and standards, Simulation of transients using Electro-Magnetic Transients (EMT) programs. Relay Testing.	08
7	**System Protection** Effect of Power Swings on Distance Relaying. System Protection Schemes. Under-frequency, under-voltage and df/dt relays, Out-of-step protection, Synchro-phasors, Phasor Measurement Units and Wide-Area Measurement Systems (WAMS). Application of WAMS for improving protection systems.	06
	TOTAL	42

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6EE4-04: ELECTRICAL ENERGY CONSERVATION And AUDITING

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	HOURS
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Energy Scenario** Commercial and Non-commercial energy, primary energy resources, commercial energy production, final energy consumption, energy needs of growing economy, long term energy scenario, energy pricing, energy sector reforms, energy and environment, energy security, energy conservation and its importance, restructuring of the energy supply sector, energy strategy for the future, air pollution, climate change. Energy Conservation Act-2001 and its features.	04
3	**Basics of Energy and its Various Forms** Electricity tariff, load management and maximum demand control, power factor improvement, selection & location of capacitors, Thermal Basics-fuels, thermal energy contents of fuel, temperature & pressure, heat capacity, sensible and latent heat, evaporation, condensation, steam, moist air and humidity & heat transfer, units and conversion.	08
4	**Energy Management & Audit** Definition, energy audit, need, types of energy audit. Energy management (audit) approachunderstanding energy costs, bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements, fuel & energy substitution, energy audit instruments. Material and Energy balance: Facility as an energy system, methods for preparing process flow, material and energy balance diagrams.	08
5	**Energy Efficiency in Electrical Systems** Electrical system: Electricity billing, electrical load management and maximum demand control, power factor improvement and its benefit, selection and location of capacitors, performance assessment of PF capacitors, distribution and transformer losses. Electric motors: Types, losses in induction motors, motor efficiency, factors affecting motor performance, rewinding and motor replacement issues, energy saving opportunities with energy efficient motors.	07
6	**Energy Efficiency in Industrial Systems** Overview of grid code technical requirements. Fault ride-through for wind farms - real and reactive power regulation, voltage and frequency operating limits, solar PV and wind farm behavior during grid disturbances. Power quality issues. Power system interconnection experiences in the world. Hybrid and isolated operations of solar PV and wind systems.	08
7	**Energy Efficient Technologies in Electrical Systems** Maximum demand controllers, automatic power factor controllers, energy efficient motors, soft starters with energy saver, variable speed drives, energy efficient transformers, electronic ballast, occupancy sensors, energy efficient lighting controls, energy saving potential of each technology.	06
	TOTAL	42

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6EE4-05: ELECTRICAL DRIVES

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	HOURS
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**DC motor characteristics** Review of emf and torque equations of DC machine, review of torque-speed characteristics of separately excited dc motor, change in torque-speed curve with armature voltage, example load torque-speed characteristics, operating point, armature voltage control for varying motor speed, flux weakening for high speed operation	05
3	**Chopper fed DC drive** Review of dc chopper and duty ratio control, chopper fed dc motor for speed control, steady state operation of a chopper fed drive, armature current waveform and ripple, calculation of losses in dc motor and chopper, efficiency of dc drive, smooth starting..	05
4	**Multi-quadrant DC drive** Review of motoring and generating modes operation of a separately excited dc machine, four quadrant operation of dc machine; single-quadrant, two-quadrant and four-quadrant choppers; steady-state operation of multi-quadrant chopper fed dc drive, regenerative braking	06
5	**Closed-loop control of DC Drive** Control structure of DC drive, inner current loop and outer speed loop, dynamic model of dc motor – dynamic equations and transfer functions, modeling of chopper as gain with switching delay, plant transfer function, for controller design, current controller specification and design, speed controller specification and design	05
6	**Induction motor characteristics** Review of induction motor equivalent circuit and torque-speed characteristic, variation of torque-speed curve with (i) applied voltage, (ii) applied frequency and (iii) applied voltage and frequency, typical torque-speed curves of fan and pump loads, operating point, constant flux operation, flux weakening operation, vector control of IM, Direct torque control of IM.	06
7	**Scalar control or constant V/f control of induction motor** Review of three-phase voltage source inverter, generation of three-phase PWM signals, sinusoidal modulation, space vector theory, conventional space vector modulation; constant V/f control of induction motor, steady-state performance analysis based on equivalent circuit, speed drop with loading, slip regulation	06
8	**Control of slip ring induction motor** Impact of rotor resistance of the induction motor torque-speed curve, operation of slip-ring induction motor with external rotor resistance, starting torque, power electronic based rotor side control of slip ring motor, slip power recovery	06
	TOTAL	40

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6EE5-11: POWER SYSTEM PLANNING

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	HOURS
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Introduction of power planning:** National and Regional Planning, structure of Power System, planning tools. Electricity Regulation, Electrical Forecasting, forecasting techniques modeling.	08
3	**Power system Reliability**: System Reliability, Reliability Planning Criteria for Generation, Transmission and Distribution, Grid Reliability, Reliability Target, Security Requirement, Disaster Management, Roadmap for Reliability and Quality.	08
4	**Generation Planning**: Objectives & Factors affecting Generation Planning, Generation Sources, Integrated Resource Planning, Generation System Model, Loss of Load (Calculation and Approaches), Outage Rate, Capacity Expansion, Scheduled Outage, Loss of Energy, Evaluation Methods. Interconnected System, Factors affecting interconnection under Emergency Assistance.	08
5	**Transmission & Distribution Planning**: Introduction, Objectives of Transmission Planning, Network Reconfiguration, System and Load Point Indices, Data required for Composite System Reliability. Radial Networks – Introduction, Network Reconfiguration, Evaluation Techniques, Interruption Indices, Effects of Lateral Distribution Protection, Effects of Disconnects, Effects of Protection Failure, Effects of Transferring Loads, Distribution Reliability Indices	08
6	**Demand Side Planning**: Computer aided planning, wheeling. Environmental effects, the greenhouse effect. Technological impacts. Insulation coordination. Reactive compensation.	08
	TOTAL	41

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6EE5-12: DIGITAL SIGNAL PROCESSING

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	HOURS
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Discrete-time signals and systems** Discrete time signals and systems: Sequences; representation of signals on orthogonal basis; Representation of discrete systems using difference equations, Sampling and reconstruction of signals - aliasing; Sampling theorem and Nyquist rate	06
3	**Z-transform** z-Transform, Region of Convergence, Analysis of Linear Shift Invariant systems using ztransform, Properties of z-transform for causal signals, Interpretation of stability in z-domain, Inverse z-transforms.	06
4	**Discrete Fourier Transform** Frequency Domain Analysis, Discrete Fourier Transform (DFT), Properties of DFT, Connvolution of signals, Fast Fourier Transform Algorithm, Parseval's Identity, Implementation of Discrete Time Systems	10
5	**Design of Digital filters** Design of FIR Digital filters: Windowmethod, Park-McClellan's method. Design of IIR Digital Filters: Butterworth, Chebyshev and Elliptic Approximations; Low-pass, Band-pass, Bandstop and High-pass filters. Effect of finite register length in FIR filter design. Parametric and non-parametric spectral estimation. Introduction to multi-rate signal processing	11
6	**Applications of Digital Signal Processing** Correlation Functions and Power Spectra, Stationary Processes, Optimal filtering using ARMA Model, Linear Mean-Square Estimation, Wiener Filter.	06
	TOTAL	40

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6EE5-13: ELECTRICAL AND HYBRID VEHICLES

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	HOURS
1	**Introduction:** Objective, scope and outcome of the course.	01
2	Conventional Vehicles: Basics of vehicle performance, vehicle power source characterization, transmission characteristics, and mathematical models to describe vehicle performance.	05
3	**Hybrid Electric Vehicles** History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies. Hybrid Electric Drive-trains: Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.	07
4	**Electric Trains** Electric Drive-trains: Basic concept of electric traction, introduction to various electric drivetrain topologies, power flow control in electric drive-train topologies, fuel efficiency analysis. Electric Propulsion unit: Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.	10
5	**Energy Storage** Energy Storage: Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices. Sizing the drive system: Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics, selecting the energy storage technology, Communications, supporting subsystems	10
6	**Energy Management Strategies** Energy Management Strategies: Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies. Case Studies: Design of a Hybrid Electric Vehicle (HEV), Design of a Battery Electric Vehicle (BEV).	08
	TOTAL	41

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6EE4-21: POWER SYSTEM - II LAB

Credit: 2
0L+0T+4P

Max. Marks: 100(IA:60, ETE:40)
End Term Exam: 3 Hours

1. Fault analysis (for 3 to 6 bus) and verify the results using MATLAB or any available software for the cases: (i) LG Fault (ii) LLG Fault (iii) LL Fault and (iv) 3-Phase Fault.

2. Load flow analysis for a given system (for 3 to 6 bus) using (i) Gauss Seidal (ii) Newton Raphson (iii) Fast Decoupled Method and verify results using MATLAB or any available software.

3. Three phase short circuit analysis in a synchronous machine(symmetrical fault analysis)

4. Study of voltage security analysis.

5. Study of overload security analysis and obtain results for the given problem using MATLAB or any software.

6. Study of economic load dispatch problem with different methods.

7. Study of transient stability analysis using MATLAB/ETAP Software.

8. Power flow analysis of a slack bus connected to different loads.

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6EE4-22: ELECTRIC DRIVE LAB

Credit: 2 **Max. Marks: 100(IA:60, ETE:40)**

0L+0T+4P **End Term Exam: 3 Hours**

1. Study and test the firing circuit of three phase half controlled bridge converter.
2. Power quality analysis of 3 phase half controlled bridge converter with R and RL loads.
3. Power Quality analysis of 3-phase full controlled bridge converter feeding R and RL load.
4. Study and obtain waveforms of 3-phase full controlled bridge converter with R and RL loads.
5. Experimental analysis of 3-phase AC voltage regulator with delta connected, star connected (with floating load), R& RL load
6. Control speed of dc motor using 3-phase half controlled bridge converter. Plot armature voltage versus speed characteristic.
7. Control speed of dc motor using 3-phase full controlled bridge converter. Plot armature voltage versus speed characteristic.
8. Control speed of a 3-phase induction motor in variable stator voltage mode using 3-phase AC voltage regulator.
9. Control speed of a 3-phase BLDC motor.
10. Control speed of a 3-phase PMSM motor using frequency and voltage control
11. Control speed of universal motor using AC voltage regulator.
12. Study 3-phase dual converter.
13. Study speed control of dc motor using 3-phase dual converter.
14. Study three-phase cyclo-converter and speed control of synchronous motor using cyclo-converter.
15. Control of 3-Phase Induction Motor in variable frequency V/f constant mode using 3-phase inverter.

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6EE4-23: POWER SYSTEM PROTECTION LAB

Credit: 1
0L+0T+2P

Max. Marks: 50(IA:30, ETE:20)
End Term Exam: 2 Hours

1. To determine fault type, fault impedance and fault location during single line to ground fault.
2. To determine fault type, fault impedance and fault location during single line-to-line fault.
3. To determine fault type, fault impedance and fault location during double line to ground fault.
4. To study the operation of micro-controller based over current relay in DMT type and IDMT type.
5. To analyse the operation of micro-controller based directional over current relay in DMT type and IDMT type.
6. To study the micro-controller based under voltage relay.
7. To study the micro-controller based over voltage relay.
8. To study the operation of micro-controller based un-biased single-phase differential relay.
9. To study the operation of micro-controller based biased single-phase differential relay.
10. To study the operation of micro-controller un-based biased three phase differential relay.
11. To study the operation of micro-controller based biased three phase differential relay.

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6EE4-24: MODELLING AND SIMULATION LAB

Credit: 1
0L+0T+2P

Max. Marks: 50(IA:30, ETE:20)
End Term Exam: 2 Hours

1. Simulate Swing Equation in Simulink (MATLAB)
2. Modeling of Synchronous Machine.
3. Modeling of Induction Machine.
4. Modeling of DC Machine.
5. Simulate simple circuits.
6. (a) Modeling of Synchronous Machine with PSS (b) Simulation of Synchronous Machine with FACTS device.
7. (a) Modeling of Synchronous Machine with FACTS device (b) Simulation of Synchronous Machine with FACTS devices.
8. FACTS Controller designs with FACT devices for SMIB system.

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Syllabus B.Tech. (Electrical Engineering), 7th semester

7EE1A: POWER SYSTEM PLANNING (Common for EE and EX)

B. Tech. (Electrical) 7th Semester **Max. Marks: 80**
3L+1T **Exam Hours: 3**

UNIT	CONTENTS	CONTACT HOURS
1	Introduction of power planning, National and Regional Planning, structure of P.S., planning tools	4
	Electricity Regulation, Electrical Forecasting, forecasting techniques modeling.	4
2	Generation planning, Integrated power generation cogeneration/captive power, Power pooling and power trading. Transmission and distribution planning.	4
	Power system Economics. Power sector finance, financial planning, private participation Rural Electrification investment, concept of Rational tariffs.	4
3	Power supply Reliability, Reliability planning. System operation planning, load management, load prediction, reactive power balance	4
	Online power flow studies, state estimation, computerized management, power system simulator.	4
4	Computer aided planning, wheeling. Environmental effects, the greenhouse effect	4
	Technological impacts. Insulation coordination. Reactive compensation.	4
5	Optimal power system expansion planning : Formulation of least cost optimization problem incorporating the capital,	3
	Operating and maintenance cost of candidate plants of different types (Thermal, Hydro, Nuclear, Non-conventional etc.) and minimum assured reliability constraint – optimization techniques for solution by programming.	5

Text Books

S. No.	Name of authors'/books/publisher	Year of pub.
1	X. Wang, J. R. Mc Donald: Modern Power System Planning, MGH.	1994
2	A. S. Pabla: Electrical Power System Planning, Machmillan India Ltd.	2012

Reference Books

S. No.	Name of authors'/books/publisher	Year of pub.
1	M. Tllic, F. Faliana and L. Fink: Power System Restructuring Engineering and Economics, Kulwar Academic Publisher.	2010
2	L. L. Lie: Power System Restructuring and Deregulation, John Willey & Sons UK.	2001

7EE2A: POWER SYSTEM ANALYSIS (Common for EE and EX)

B. Tech. (Electrical) 7th Semester **Max. Marks: 80**

3L+1T **Exam Hours: 3**

UNIT	CONTENTS	CONTACT HOURS
1	Percent and per unit quantities. Single line diagram for a balanced 3-phase system	4
	Admittance Model: Branch and node admittances Equivalent admittance network and calculation of Y bus. Modification of an existing Y bus.	4
2	**Impendence Model:** Bus admittance and impedance matrices. Thevenin's theorem and Z bus. Direct determination of Z bus. Modification of an existing bus.	3
	Symmetrical fault Analysis: Transient on a Transmission line, short circuit of a synchronous machine on no load, short circuit of a loaded synchronous machine. Equivalent circuits of synchronous machine under sub transient, transient and steady state conditions. Selection of circuit breakers, Algorithm for short circuit studies. Analysis of three-phase faults.	5
3	**Symmetrical Components:** Fortescue theorem, symmetrical component transformation. Phase shift in star-delta transformers. Sequence Impedances of transmission lines, Synchronous Machine and Transformers, zero sequence network of transformers and transmission lines. Construction of sequence networks of power system.	4
	Fault Analysis: Analysis of single line to ground faults using symmetrical components, connection of sequence networks under the fault condition.	4
4	**Unsymmetrical Fault Analysis:** (i) Analysis of line-to-line and double line to ground faults using symmetrical components, connection of sequence networks under fault conditions.	5
	Analysis of unsymmetrical shunt faults using bus impedance matrix method.	3
5	**Load Flow Analysis:**Load flow problem, development of load flow equations, bus classification	4
	Gauss Seidel, Newton Raphosn, decoupled and fast decoupled methods for load flow analysis. Comparison of load flow methods.	4

Text Books

S. No.	Name of authors'/books/publisher	Year of pub.
1	J. J. Grainger, William, D. Stevenson Jr.: Power System Analysis, MGH.	2003
2	T. K. Nagsarkar & M. S. Sukhija: Power System Analysis, Oxford University Press.	2007

Reference Books

S. No.	Name of authors'/books/publisher	Year of pub.
1	J. D. Glover, M. S. Sharma & T. J. Overbye: Power System Analysis and Design, Cengage Learning.	2007
2	Nasser Tleis: Power System Modelling and Fault Analysis, Elsevier.	2007
3	Kothari & Nagrath: Modern Power System Analysis, MGH.	2011
4	Haadi Saadat: Power System Analysis.	2002

7EE3A: ARTIFICIAL INTELLIGENCE TECHNIQUES (Common for EE and EX)

B. Tech. (Electrical) 7th Semester **Max. Marks: 80**
3L **Exam Hours: 3**

UNIT	CONTENTS	CONTACT HOURS
1	**Artificial Intelligence:** Introduction to AI and knowledge based Expert systems,	4
	Introduction, Importance and Definition of AI, ES, ES building tools and shells.	4
2	**Knowledge Representation:** Concept of knowledge, Representation of knowledge using logics rules, frames. Procedural versus. Declarative knowledge, forward versus backward chaining	4
	Control Strategies: Concept of heuristic search, search techniques depth first search, Breath first search, Generate & test hill climbing, best first search.	4
3	**Artificial Neural Network:** Biological Neurons and synapses, characteristics Artificial Neural Networks, types of activation functions.	4
	Perceptions: Perception representation, limitations of perceptrons. Single layer and multiplayer perceptrons. Perceptron learning algorithms.	4
4	**Basic Concepts in Learning ANN:** Supervised learning, Back propagation algorithm, unsupervised learning, Kohonen's top field network & Algorithm.	8
5	**Fuzzy Logic:** Fuzzy logic concepts, Fuzzy relation and membership functions, Defuzzification, Fuzzy controllers,	4
	Genetic Algorithm: concepts, coding, reproduction, crossover, mutation, scaling and fitness.	4

Text Books

S. No.	Name of authors'/books/publisher	Year of pub.
1	Saroj Kaushik: Artificial Intelligence, Cengage Learning.	2007
2	Elaine Rich and Kevin Knight: Artificial Intelligence 3/e, MGH	2004

Reference Books

S. No.	Name of authors'/books/publisher	Year of pub.
1	Padhy: Artificial Intelligence & Intelligent Systems, Oxford	2005
2	James Anderson: An introduction to Neural Networks.	1995
3	Dan. W Patterson: Artificial Intelligence and Expert Systems.	1990
4	Kumar Satish: Neural Networks, 2nd ed., MGH.	2004
5	S. Rajsekaran & G. A. Vijayalakshmi Pai: Neural Networks, Fuzzy Logic and Genetic Algorithm- Synthesis and Applications, Prentice Hall of India.	2003
6	Siman Haykin: Neural Netowrks, Prentice Hall of India.	2004

7EE4A: NON CONVENTIONAL ENERGY SOURCES (Common for EE and EX)

B. Tech. (Electrical) 7th Semester **Max. Marks: 80**
3L **Exam Hours: 3**

UNIT	CONTENTS	CONTACT HOURS
1	**Introduction:** World energy situation, conventional and non-conventional energy sources, Indian energy scene.	4
	Tidal Energy: Introduction to tidal power. Components of tidal power plants, double basin arrangement. Power generation. Advantages and limitations of tidal power generation. Prospects of tidal energy in India.	4
2	**Solar Energy:** Solar radiation, solar radiation geometry, solar radiation on tilted surface. Solar energy collector. Flat- plate collector, concentrating collector - parabolidal and heliostat.	4
	Solar pond. Basic solar power plant. Solar cell, solar cell array, basic photo-voltaic power generating system.	4
3	**Wind Energy:** Basic principle of wind energy conversion, efficiency of conversion, site selection. Electric power generation-basic components, horizontal axis and vertical axis wind turbines, towers, generators, control and monitoring components. Basic electric generation schemes- constant speed constant frequency, variable speed constant frequency and variable speed variable frequency schemes. Applications of wind energy.	4
	Geothermal Energy: Geothermal fields, estimates of geothermal power. Basic geothermal steam power plant, binary fluid geothermal power plant and geothermal preheat hybrid power plant. Advantages and disadvantages of geothermal energy. Applications of geothermal energy. Geothermal energy in India.	4
4	**Nuclear Fusion Energy:** Introduction, nuclear fission and nuclear fusion. Requirements for nuclear fusion. Plasma confinement – magnetic confinement and inertial confinement.	4
	Basic Tokamak reactor, laser fusion reactor. Advantages of nuclear fusion. Fusion hybridand cold fusion.	4
5	**Biomass Energy:** Introduction, biomass categories, bio-fuels. Introduction to biomass conversion technologies.	3
	Biogas generation, basic biogas plants-fixed dome type, floating gasholder type, Deen Bandhu biogas plant, Pragati design biogas plant. Utilization of bio gas. Energy plantation. Pyrolysis scheme. Alternative liquid fuels –ethanol and methanol. Ethanol production.	5

Text Books

S. No.	Name of authors'/books/publisher	Year of pub.
1	G. D. Rao: Renewable Energy	2010
2	B. H. Khan: Non-Conventional Energy Resources, MGH.	2006

Reference Books

S. No.	Name of authors'/books/publisher	Year of pub.
1	A. N. Mathur: Non-Conventional Resources of Energy.	2010
2	Boyle: Renewable Energy, 3rded Oxford.	2007
3	Bent Sorensen, 4th ed.: Renewable Energy, Elsevier.	2009
4	V. V. N. Kishore: Renewable Energy Engineering and Technology, TERI.	2006
5	Garg & Prakash: Solar Energy : Fundamentals and Applications, MGH	2000
6	David Boyles: Bio Energy, Elis Horwood Ltd.,	1984

7	N.K. Bansal, M. Kleemann, M. Heliss: Renewable energy sources and conversion technology, MGH, 1990.	1990

7EE5A: POWER SYSTEM ENGINEERING (Common for EE and EX)

B. Tech.(Electrical) 7th Semester **Max. Marks: 80**

3L+1T **Exam Hours: 3**

UNIT	CONTENTS	CONTACT HOURS
1	**Economic Operation of Power Systems:** Introduction, system constraints, optimal operation of power systems. Input output, heat rate and incremental rate curves of thermal generating units.	3
	Economic distribution of load between generating units within a plant. Economic distribution of load between power stations, transmission loss equation. Introduction to unit commitment and dynamic programming.	5
2	**Power System Stability-I:** Power angle equations and power angle curves under steady state and transient conditions. Rotor dynamics and swing equation (solution of swing equation not included).	5
	Synchronizing power coefficient. Introduction to steady state and dynamic stabilities, steady state stability limit.	3
3	**Power System Stability-II:** Introduction to transient stability. Equal area criterion and its application to transient stability studies under basic disturbances.	4
	Critical clearing angle and critical clearing time. Factors affecting stability and methods to improve stability.	4
4	**Excitation Systems:** Introduction of excitation systems of synchronous machines, types of excitation systems, Elements of various excitation systems and their control (functional block diagrams and their brief description)-DC excitation systems, AC excitation systems, brushless excitation system.	4
	Interconnected Power Systems: Introduction to isolated and interconnected powers systems. Reserve capacity of power stations, spinning and maintenance resaves. Advantages and problems of interconnected power systems. Power systems inter connection in India.	4
5	Tap Changing transformer, phase angle control and phase shifting transformer. Series compensation of transmission lines, location and protection of series capacitors, advantages and problems	5
	Introduction to power system security. Introduction to voltage stability.	3

Text Books

S. No.	Name of authors'/books/publisher	Year of pub.
1	J. Nagrath and D.P. Kothari: Power System Engineering 2/e, MGH.	2011
2	J. J. Grainger and W. D. Stevenson: Power System Analysis, MGH.	2003

Reference Books

S. No.	Name of authors'/books/publisher	Year of pub.
1	B. R. Gupta: Power System Analysis and Design, Third Edition, S. Chand & Co.	2008
2	C. L. Wadhwa: Electrical Power Systems, New age international Ltd. Third Edition	2009
3	W. D. Stevenson: Element of Power System Analysis, MGH.	1955
4	B. R. Gupta: Generation of Electrical Energy, S. Chand Publication.	2009

7EE6.1A: ELECTROMAGNETIC FIELD THEORY

B. Tech. (Electrical) 7th Semester **Max. Marks: 80**
3L+1T **Exam Hours: 3**

UNIT	CONTENTS	CONTACT HOURS
1	**Introduction:** Vector Relation in rectangular, cylindrical, spherical and general curvilinear coordinate system.	4
	Concept and physical interpretation of gradient, Divergence and curl, Green's Stoke's and Helmholz theorems	4
2	**Electrostatics:** Electric field vectors-electric field intensity, flux density & polarization. Electric field due to various charge configurations. The potential functions and displacement vector.	4
	Gauss's law, Poisson's and Laplace's equation and their solution. Uniqueness theorem. Continuity equation. Capacitance and electrostatics energy. Field determination by method of images. Boundary conditions. Field mappings and concept of field cells.	4
3	**Magnetostatics:** Magnetic field vector: Magnetic field intensity, flux density & magnetization, Bio-Savart's law, Ampere's law, Magnetic scalar and vector potential, self & mutual inductance.	4
	Energy stored in magnetic field, Boundary conditions, Analogy between electric and magnetic field, Field mapping and concept of field cells.	4
4	**Time Varying Fields:** Faraday's law, Displacement currents and equation of continuity.	4
	Maxwell's equations, Uniform plane wave in free space, dielectrics and conductors, skin effect sinusoidal time variations, reflections, refraction & polarization of UPW, standing wave ratio. Pointing vector and power considerations.	4
5	**Transmission Lines:** The high-frequency circuit. LCR ladder model. The transmission Lin equation. Solution for loss-less lines.	4
	Wave velocity and wave impedance. Reflection and Transmission coefficients at junctions. VSWR.	4

Text Books

S. No.	Name of authors'/books/publisher	Year of pub.
1	Hayt: Engineering Electromagnetics, 7/e, (With CD), MGH	2012
2	Matthew N. O. Sadiku: Principles of Electromagnetics, 4th ed., Oxford	2009

Reference Books

S. No.	Name of authors'/books/publisher	Year of pub.
1	G. S. N. Raju: Electromagnetic Field Theory and Transmission Lines, Pearson.	2006
2	J. D. Kraus: Electromagnetic. 5th edition, MGH.	1999
3	S. Baskaran and K. Malathi: Electromagnetic Field and Waves, Scitech Pub.	2013
4	R. S. Kshetrimayum, Electromagnetic Field Theory, Cengage Learning.	2012
5	V.V. Sarwate: Electromagnetic Field and Waves, Willey Eastern Ltd.	1993
6	Bhag Guru: Electromagnetic Field Theory Fundamentals, Cambridge Uni. Press.	2004

7EE6.2A: COMPUTER AIDED DESIGN OF ELECTRICAL MACHINES (Common for EE and EX)

B. Tech. (Electrical) 7th Semester **Max. Marks: 80**

3L+1T **Exam Hours: 3**

UNIT	CONTENTS	CONTACT HOURS
1	**Basic Principles of Electrical Machine Design:** Specifications, Factors affecting the design, Limitations, main dimension, loadings, output equation, factor affecting the size and rating,	4
	Electrical Engineering Materials: conducting, magnetic and insulating materials. Magnetic Circuit Calculation: Ohm's law for magnetic circuit, mmf required for air gap and iron parts, tapered teeth, real and apparent flux density, magnetizing current.	4
2	**Heating and Cooling of Electrical Machines:** heat dissipation and heat flow equations, Newton's law of cooling, equations for temperature rise,	4
	Rating of Machines: Continuous, short and intermittent ratings, mean temperature rise, hydrogen cooling of turbo alternators, quantity of cooling medium.	4
3	**Computer Aided Design of Transformers:** Power and Distribution Transformers, core and yoke cross sections, square and stepped core, output equations, main dimensions, types & design of windings, optimization concepts.	8
4	**Computer Aided Design of Synchronous Machines:** Turbo and Hydro alternators, choice of specific magnetic & electric loading, short circuit ratio and its effects air gap length, output equation, main dimensions, flow charts for design of synchronous machine, design of stator core & winding.	8
5	**Computer Aided Design of Induction Machines:** Output equation, main dimensions, design criteria, flow charts for design of induction motor, air gap length, design of stator core and winding, rotor design.	8

Text Books

S. No.	Name of authors'/books/publisher	Year of pub.
1	A. K. Sawhney: A Course in Electrical Machine Design, Dhanpat Rai & Sons.	1984
2	B. Edikins: Generalized Theory of Electrical Machines.	1995

Reference Books

S. No.	Name of authors'/books/publisher	Year of pub.
1	Fitzegerald: Electrical Machinery, Kingsley.	2002
2	M. G. Say: The Performance and Design of AC Machines, Pitman & Sons.	1958
3	R. K. Agrawal: Electrical Machine Design	2009

7EE6.3A: ECONOMIC OPERATION OF POWER SYSTEMS

B. Tech. (Electrical) 7th Semester **Max. Marks: 80**
3L+1T **Exam Hours: 3**

UNIT	CONTENTS	CONTACT HOURS
1	**Economics of Power Generation:** Introduction, cost of electrical energy, expression for cost of electrical energy, depreciation, power plant cost analysis, economics in plant selection,	4
	selection of types of generation and types of equipments, factors effecting economic generations and distributions, generating cost, economics of different types of generating plants	4
2	**Economical Operations of Thermal Power Plants:** Methods of loading turbo generators, input, output and heat rate characteristics, incremental cost, two generations units,	4
	large no of units, sequence of adding units, effects of transmission losses, economic scheduling considering transmission losses, coordination equations, penalty factors	4
3	**Hydro Thermal coordination:** Advantages of combined operation, base load peak load operation requirement, combined working of run-off river and steam plant	4
	Reservoirs hydroplants and thermal plants (long term operational aspects), short term hydro thermal coordination, coordination equations, scheduling methods and applications.	4
4	**Parallel Operations of Generators:** Conditions, synchronizingcurrent and power, two alternators in parallel (effect of change in excitation, load sharing, sharing of load currents),	4
	Infinite bus bars, active and reactive power control, synchronizing power, torque, operating limits of alternators, operating characteristics of cylindrical alternator rotor.	4
5	**Economics for Electrical Engineers:** Concepts of physical and financial efficiencies of electrical goods and services, supply and demand, break even and minimum cost analysis, linear and nonlinear break even, min cist analysis	8

Text Books

S. No.	Name of authors'/books/publisher	Year of pub.
1	J. Wood & B. F. Wollenburg: Power Generation, Operation and Control, John Wiley.	2013
2	D. P. Kothari & I. J. Nagrath: Modern Power System Analysis, MGH.	2003

Reference Books

S. No.	Name of authors'/books/publisher	Year of pub.
1	O. I. Elgerd: Electric Energy System Theory, MGH.	1983
2	P. Kundur: Power System Stability and Control, MGH.	1994
3	Arthur R. Bergen and Vijay Vittal: Power System Analysis, Second Edition. PHI.	1999
4	C. L. Wadhwa: Electrical Power Systems, Newage International (P) Ltd.	2000
5	C. Gross, Power Systems Analysis, 2nd Edition. John Wiley &Sons.	1986

7EE7A: POWER SYSTEM PLANNNG LAB (Common for EE and EX)

1. Status of National and Regional Planning, for power system
2. Write components of Structure of power system
3. Explain in detail various planning tools.
4. Write short note on Electricity Regulation
5. Modeling of Electrical Forecasting techniques
6. Transmission and distribution planning
7. concept of Rational tariffs
8. Rural Electrification

7EE8A: POWER SYSTEM MODELLING AND SIMULATION LAB (Common for EE and EX)

1. Simulate Swing Equation in Simulink (MATLAB)
2. Modeling of Synchronous Machine.
3. Modeling of Induction Machine.
4. Simulate simple circuits using Circuit Maker.
5. (a) Modeling of Synchronous Machine with PSS (b) Simulation of Synchronous Machine with FACTS device.
6. (a) Modeling of Synchronous Machine with FACTS device (b) Simulation of Synchronous Machine with FACTS devices.
7. FACTS Controller designs with FACT devices for SMIB system.

7EE9A: INDUSTRIAL ECONOMICS &MANAGEMENT(Common for EE and EX)

UNIT	CONTENTS
1	**Money Banking and Trade:** Functions of money, supply & demand for money, money price level & inflation, black money, meaning, magnitude & consequences. Functions of Commercial banks, banking system in India, shortcomings and improvements. Function of RBI, monetary policy-making, objectives and features. Sources of public revenue, principles of taxation, direct and indirect taxes, Theory of international trade, balance of trade and payment, Foreign exchange control, devaluation New economic policy: Liberalization, extending privatization, globalization.
2	**Management Principles:** Management functions, responsibilities of management to society, development of management thought. Nature of planning, decision making, management by objectives, Line and staff authority relationships, decentralization and delegation of authority, span of management.
3	**Production Management:** Production planning and control, inventory control, quality control and Total quality management. ISO standards Related to quality/Environment/safety etc. **Tools of Project Management:** CPM, PERT, project information systems. Marketing functions, management of sales and advertising marketing research.
4	**Human Resource Management:** Function, application of industrial psychology for selection, training and recruitment. Communication process, media channels and barriers to effective communication, theories of motivation, leadership.
5	**Finance and Account Management:** Engineering Economics: Investment decision, present worth, annual worth and rate of return methods. Payback time. Need for good cost accounting system, cost control techniques of financial control, financial statements, financial ratios, breakeven analysis, budgeting and budgetary control.

Syllabus B.Tech. (Electrical Engineering), 8th semester

8EE1A: EHV AC/DC TRANSMISSION (Common for EE and EX)

B. Tech. (Electrical) 8th Semester **Max. Marks: 80**
3L+1T **Exam Hours: 3**

UNIT	CONTENTS	CONTACT HOURS
1	**EHV AC Transmission:** Need of EHV transmission lines, power handling capacity and surge impedance loading. Problems of EHV transmission,	4
	Bundled Conductors: geometric mean radius of bundle, properties of bundle conductors. Electrostatic fields of EHV lines and their effects, corona effects: Corona loss, audio and radio noise.	4
2	**Load Frequency Control:** Introduction to control of active and reactive power flow, turbine speed governing system. Speed governing characteristic of generating unit and load sharing between parallel operating generators	4
	Method of Load Frequency Control: Flat frequency, flat tie line and tie line load bias control. Automatic generation control (description of block diagram only).	4
3	**Voltage Control:** No load receiving end voltage and reactive power generation. Methods of voltage control. Synchronous phase modifier	4
	Shunt capacitors and reactors, saturable reactors, Thyristorised static VAR compensators- TCR, FC-TCR and TSC- TCR.	4
4	**FACTS:** Introduction to FACTS controllers, types of FACTS controllers, Brief description of STATCOM, Thyristor controlled series capacitors and unified power flow controller.	8
5	**HVDC Transmission:** Types of D.C. links, advantages and disadvantages of HVDC transmission. Basic scheme and equipment of converter station. Ground return.	4
	Basic principles of DC link control and basic converter control characteristics. Application of HVDC transmission.	4

Text Books

S. No.	Name of authors'/books/publisher	Year of pub.
1	E. W. Kimbark: Direct Current Transmission, Vol. 1, Wiley Interscience.	1971
2	K. R. Padiyar: HVDC Power Transmission System, Wiley Eastern Ltd.	1990

Reference Books

S. No.	Name of authors'/books/publisher	Year of pub.
1	K. R. Padiyar: HVDC Power Transmission Systems. NEW AGE PUB	1992
2	J. Arrillaga: H.V.D.C Transmission, Peter Peregrines.	1983
3	J. Arrillaga HVDC et. al, : Computer Modelling of Electrical Power System. John Wiley.	1993

8EE2A: ELECTRIC DRIVES AND THEIR CONTROL (Common for EE and EX)

B. Tech. (Electrical) 8th Semester **Max. Marks: 80**
3L+1T **Exam Hours: 3**

UNIT	CONTENTS	CONTACT HOURS
1	**Dynamics of Electric Drives:** Fundamental torque equations, speed-torque conventions and multi-quadrant operation,	4
	Nature and classification of load torques, steady state stability, load equalization, close loop configurations of drives.	4
2	**DC Drives:** Speed torque curves, torque and power limitation in armature voltage and field control,	4
	Starting, **Braking:** Regenerative Braking, dynamic braking and plugging. Speed Control-Controlled Rectifier fed DC drives, Chopper Controlled DC drives.	4
3	**Induction Motor Drives-I:** Starting, Braking-Regenerative braking, plugging and dynamic braking.	4
	Speed Control: Stator voltage control, variable frequency control from voltage source, Voltage Source Inverter (VSI) Control.	4
4	**Induction Motor Drives-II:** Variable frequency control from current source, Current Source Inverter (CSI) Control,	4
	Cycloconverter Control, Static rotor resistance control, Slip Power Recovery- Stator Scherbius drive, Static Kramer drive.	4
5	**Synchronous Motor Drive:** Control of Synchronous Motor-Separately Controlled and VSI fed Self-Controlled Synchronous Motor Drives.	4
	Dynamic and Regenerative Braking of Synchronous Motor with VSI. Control of Synchronous Motor Using Current Source Inverter (CSI).	4

Text Books

S. No.	Name of authors'/books/publisher	Year of pub.
1	G. K. Dubey: Fundamentals of Electrical Drives, Narosa Publishing House, New Delhi.	2002
2	B. K. Bose: Power Electronics and Motor Drives, Elsevier.	2010

Reference Books

S. No.	Name of authors'/books/publisher	Year of pub.
1	V. Subrahmanyam: Electric Drives- Concepts and Applications, MGH.	2011
2	Theodore Wildi: Electrical Machines, Drives and Power Systems, Pearson	2007
3	S. K. Pillai: A First Course on Electrical Drives, Wiley Eastern limited, India.	1989
4	N. K. De and Prashant K. Sen: Electric Drives, Prentice Hall of India Ltd.	1999

8EE3A: PROTECTION OF POWER SYSTEM (Common for EE and EX)

B. Tech. (Electrical) 8th Semester **Max. Marks: 80**
3L+1T **Exam Hours: 3**

UNIT	CONTENTS	CONTACT HOURS
1	**Causes and consequences of dangerous currents**: Faults, overloads and switching over currents. Introduction to protection, trip circuit of a circuit breaker. Functional characteristics of a relay, zone of protection, primary and backup protection.	4
	CTs &PTs: Current transformer construction, measurement and protective CTs. Type of potential transformers. Steady state ratio and phase angle errors in CTs and PTs. Transient errors in CT and CVT (Capacitive Voltage Transformer).	4
2	**Overcurrent Protection:** HRC fuse and thermal relay. Overcurrent relays – instantaneous, definite time, inverse time and inverse definite minimum time overcurrent relays, time and current gradings.	4
	Induction disc type relay. Directional overcurrent relay, 30^0, 60^0 and 90^0 connections. Earth fault relay. Brief description of overcurrent protective schemes for a feeder, parallel feeders and ring mains.	4
3	**Generator Protection:** Stator protection–differential and percentage differential protection, protection against stator inter-turn faults, stator overheating protection.	4
	Rotor protection-protection against excitation and prime mover failure, field earth fault and unbalanced stator currents (negative sequence current protection).	4
4	**Transformer Protection:** Percentage differential protection, magnetizing inrush current, percentage differential relay with harmonic restraint. Buchholz relay. Differential protection of generator transfer unit.	4
	Busbar Protection: Differential protection of busbars. Highimpedance relay scheme, frame leakage protection	4
5	**Transmission Line Protection:** Introduction to distance protection. Construction, operating principle and characteristics of an electromagnetic impedance relay. Effect of arc resistance.Induction cup type reactance and mho relays. Comparison between impedance, reactance and mho relays. Three stepped distance protection of transmission line.	4
	Induction Motor Protection: Introduction to various faults and abnormal operating conditions, unbalance supply voltage and single phasing. Introduction to protection of induction motors- HRC fuse and overcurrent, percentage differential, earth fault and negative sequence voltage relays	4

Text Books

S. No.	Name of authors'/books/publisher	Year of pub.
1	Badri Ram: Power System Protection and Switchgear, MGH.	2011
2	Ravindra Nath M. Chander: Power System Protection and Switch Gear, John Wiley Eastern.	1977

Reference Books

S. No.	Name of authors'/books/publisher	Year of pub.
1	Sunil S. Rao.: Power System Protection and Switch Gear, Khanna Publishers.	1999
2	Oza: Power System Protection and Switchgear, MGH.	2010

3	T. S. Madhava Rao: Power System Protections (Static Relays), MGH.	1989
4	A. R. Van C Warrington: Protective Relays, Chapman and Hall London.	1968
5	S. K. Basu and S. Chaudhary: Power System Protection, Raju Primlan Oxford.	1983

8EE4.1A: UTILIZATION OF ELECTRICAL POWER (Common for EE and EX)

B. Tech. (Electrical) 8th Semester **Max. Marks: 80**
3L+1T **Exam Hours: 3**

UNIT	CONTENTS	CONTACT HOURS
1	**Electric Heating:** Different methods of electric heating. Principle of high frequency induction and dielectric heating. Construction, operation, performance and applications of arc furnace and induction furnace	4
	Electric Welding: Welding process, welding transformer, Classification of Electric Welding: arc welding, resistance welding, welding of various metals.	4
2	**Illuminations:** Definitions, laws of illuminations, polar curves, luminous efficiency, photometer, incandescent lamps, filament materials,	4
	Halogen lamp, electric discharge lamps, sodium vapour lamp, mercury vapour lamp and fluorescent lamp. Light Calculations: commercial, industrial, street and flood lighting.	4
3	**Electrolytic Process:** Principles and applications of electrolysis, electro-deposition, Manufactures of chemicals, anodizing, electro-polishing , electro-cleaning, electroextraction, electro-refining, electro-stripping (parting) power supplies for electrolytic process.	4
4	**Electric Traction & Means of Supplying Power:** Systems of Electric Traction: DC & AC Systems, Power Supply for Electric Traction System: Comparison and application of different systems. Sub-station equipment and layout, conductor rail & pantograph.	4
5	**Traction Methods:** Types of services, speed time and speed distance curves, estimation of power and energy requirements, Mechanics of train movement.	4
	Co-efficient of adhesion, Adhesive weight, effective weight. Traction Motor Controls: DC and AC traction motors, Series parallel starting. Methods of electric braking of traction motors.	4

Text Books

S. No.	Name of authors'/books/publisher	Year of pub.
1	C. L. Wadhwa: Utilization of Electric Traction Electric Power.	1989
2	H. Partab: Art and Science of Electrical Energy, Dhanpat Rai & Sons.	1975

Reference Books

S. No.	Name of authors'/books/publisher	Year of pub.
1	H. Partab:Modern Electric Traction, Dhanpat Rai & Sons	1973

8EE4.2A: FACTS DEVICES & THEIR APPLICATIONS

B. Tech. (Electrical) 8th Semester **Max. Marks: 80**
3L+1T **Exam Hours: 3**

UNIT	CONTENTS	CONTACT HOURS
1	Problems of AC transmission systems, power flow inparallel paths and meshed system, factors limiting loading capability,	4
	Stability consideration. Power flow control of an ac transmission line. Basic types of facts controllers. Advantages of FACTS technology.	4
2	**Voltage-Sourced Converters:** Basic concept of voltage-sourced converters, single and three phase bridge converters. Introduction to power factor control. Transformer connections for 12-pulse, 24 pulse and 48 pulse operations.	4
	Static Shunt Compensators: Mid-point and end point voltage regulation of transmission line, and stability improvement. Basic operating principle of Static Synchronous Compensators (STATCOM). Comparison between STATCOM and SVC.	4
3	**Static Series Compensators:** Concept of series capacitive compensation, voltage and transient stabilities, power oscillation and sub synchronous oscillation damping.	4
	Introduction to thyristors witched series capacitor (TSSC), thyristor controlled series capacitor (TCSC), and static synchronous series compensator, - operation, characteristics and applications.	4
4	**Static Voltage and Phase Angle Regulators:** Voltage and phase angle regulation. Power flow control and improvement of stability by phase angle regulator.	4
	Introduction to thyristor controlled voltage and phase angle regulators (TCVR and TCPAR) (ii) Introduction to thyristor controlled braking resistor and thyristor controlled voltage limiter.	4
5	**UPFC:** Unified Power Flow Controller (UPFC), basic operating principles, conventional transmission control capabilities. Comparison of UPFC to series compensators and phase angle regulator. Applications of UPFC.	4
	IPFC: Interline Power Flow Controller (IPFC), basic operating principles and characteristics. Applications of IPFC.	4

Text Books

S. No.	Name of authors'/books/publisher	Year of pub.
1	K. R. Padiyar: Flexible AC Transmission Systems	2009
2	N. G. Hingorani, L. Gyugyi: Understanding FACTS: IEEE Press Book.	2000

Reference Books

S. No.	Name of authors'/books/publisher	Year of pub.
1	Yong Hua Song, Allan T Johns : Flexible AC Transmission Systems FACTS	1999
2	Xiao Ping Zhang, Christian Rehtanz, Bikash Pal: Flexible AC Transmission Systems.	2006
3	R. Mohan & R. M. Mathur: Thyristor-based FACTS Controllers for Electrical Transmission Systems, John Wiley	2002

8EE4.3A: POWER SYSTEM TRANSIENTS

B. Tech. (Electrical) 8th Semester **Max. Marks: 80**
3L+1T **Exam Hours: 3**

UNIT	CONTENTS	CONTACT HOURS
1	Wave terminology, Development of wave quotations, Terminal problems, Lattice diagrams,	4
	Origin and Nature of power system transients and surges, Surge parameters of plants, Equivalent Circuit representations. Lumped and distributed circuit transients.	4
2	Line energisation and de-energisation transients-Earth and earthwire effects. Current chopping in circuit breakers.	4
	Short line fault condition and its relation to circuit breaker duty. Trapped charge effects. Effect of source and source representation in short line fault studies.	4
3	Control of transients, Lightening phenomenon, influence of tower footing resistance and earth resistance,	4
	Traveling waves in distributed parameters multiconductor lines, parameters as a function of frequency.	4
4	Mechanism of Lightning Discharge Types of Lightning strokes, Harmful effects of lighting, protections against lightning, overhead Ground wires.	8
5	Lightening Arresters, Types of lightening arresters, Surge Absorber simulation of surge diverters in transient analysis. Fourier integral and z transform methods in power system transient	8

Text Books

S. No.	Name of authors'/books/publisher	Year of pub.
1	C. S. Indulkar and D. P. Kothari: Power System Transients, NEW AGE.	2010
2	Lou Van der Sluis: Transients in Power Systems, John Wiley	2001

Reference Books

S. No.	Name of authors'/books/publisher	Year of pub.
1	N. R. Watson, J. Arrillaga: Power Systems Electromagnetic Transients, John Wiley	2001

8EE5A: COMPUTER BASED POWER SYSTEM LAB (Common for EE and EX)

1. Fault analysis (for 3 to 6 bus) and verify the results using MATLAB or any available software for the cases: (i) LG Fault (ii) LLG Fault (iii) LL Fault and (iv) 3-Phase Fault
2. Load flow analysis for a given system (for 3 to 6 bus) using (i) Gauss Seidal (ii) Newton Raphson (iii) Fast Decoupled Method and verify results using MATLAB or any available software
3. Study of voltage security analysis
4. Study of overload security analysis and obtain results for the given problem using MATLAB or any software.
5. Study of economic load dispatch problem with different methods.
6. Study of transient stability analysis using MATLAB/ETAP Software.

8EE6A: ELECTRICAL DRIVES AND CONTROL LAB (Common for EE and EX)

1. Study and test the firing circuit of three phase half controlled bridge converter.
2. Study and obtain waveforms of 3 phase half controlled bridge converter with R and RL loads.
3. Study and test the firing circuit of 3-phase full controlled bridge converter.
4. Study and obtain waveforms of 3-phase full controlled bridge converter with R and RL loads.
5. Study and test 3-phase AC voltage regulator.
6. Control speed of dc motor using 3-phase half controlled bridge converter. Plot armature voltage versus speed characteristic.
7. Control speed of dc motor using 3-phase full controlled bridge converter. Plot armature voltage versus speed characteristic.
8. Control speed of a 3-phase induction motor in variable stator voltage mode using 3-phase AC voltage regulator.
9. Control speed of a 3-phase BLDC motor.
10. Control speed of a 3-phase PMSM motor using frequency and voltage control
11. Control speed of universal motor using AC voltage regulator.
12. Study 3-phase dual converter.
13. Study speed control of dc motor using 3-phase dual converter.
14. Study three-phase cycloconverter and speed control of synchronous motor using cycloconverter.
15. Control of 3-Phase Induction Motor in variable frequency V/f constant mode using 3-phase inverter

8EE7A: HIGH VOLTAGE ENGINEERING LAB

1. Study filtration and Treatment of transformer oil.
2. Determine dielectric strength of transformer oil.
3. Determine capacitance and dielectric loss of an insulating material using Schering bridge.
4. Study solid dielectrics used in power apparatus.
5. Study applications of insulating materials.
6. Study direct testing and indirect testing of circuit breakers.
7. Study high voltage testing of electrical equipment: line insulator, cable, bushing, power capacitor, and power transformer.
8. Design an EHV transmission line.

Scheme and Syllabus

Rajasthan Technical University, Kota

B. Tech. in Information Technology

(Session 2019-20)

Scheme of

UNDERGRADUATE DEGREE COURSE

Information Technology



Rajasthan Technical University, Kota

Effective from session: 2018 – 2019

Teaching & Examination Scheme
B.Tech. : Information Technology
2nd Year - III Semester

SN	Category	Course		Contact hrs/week			Marks				Cr
		Code	Title	L	T	P	Exm Hrs	IA	ETE	Total	
THEORY											
1	BSC	3IT2-01	Advanced Engineering Mathematics	3	0	0	3	30	120	**150**	**3**
2	HSMC	3IT1-02/ 3IT1-03	Technical Communication/ Managerial Economics and Financial Accounting	2	0	0	2	20	80	**100**	**2**
3	ESC	3IT3-04	Digital Electronics	3	0	0	3	30	120	**150**	**3**
4	PCC	3IT4-05	Data Structures and Algorithms	3	0	0	3	30	120	**150**	**3**
5		3IT4-06	Object Oriented Programming	3	0	0	3	30	120	**150**	**3**
6		3IT4-07	Software Engineering	3	0	0	3	30	120	**150**	**3**
			Sub Total	17	0	0		170	680	**850**	**17**
PRACTICAL & SESSIONAL											
8	PCC	3IT4-21	Data Structures and Algorithms Lab	0	0	3		45	30	**75**	**1.5**
9		3IT4-22	Object Oriented Programming Lab	0	0	3		45	30	**75**	**1.5**
10		3IT4-23	Software Engineering Lab	0	0	3		45	30	**75**	**1.5**
11		3IT4-24	Digital Electronics Lab	0	0	3		45	30	**75**	**1.5**
13	PSIT	3IT7-30	Industrial Training	0	0	1		0	0	**50**	**1**
14	SODECA	3IT8-00	Social Outreach, Discipline & Extra Curricular Activities	0	0	0		0	0	**25**	**0.5**
			Sub- Total	0	0	13		180	120	**375**	**7.5**
			TOTAL OF III SEMESTER	17	0	13		350	800	**1225**	**24.5**

L: *Lecture,* ***T:*** *Tutorial,* ***P:*** *Practical,* ***Cr:*** *Credits*

ETE: *End Term Exam,* ***IA:*** *Internal Assessment*

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

Scheme of

UNDERGRADUATE DEGREE COURSE

Information Technology



Rajasthan Technical University, Kota

Effective from session: 2018 – 2019

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Teaching & Examination Scheme
B.Tech. : Information Technology
2nd Year - IV Semester

SN	Category	Course		Contact hrs/week			Marks				Cr
		Code	Title	L	T	P	Exm Hrs	IA	ETE	Total	
THEORY											
1	BSC	4IT2-01	Discrete Mathematics Structure	3	0	0	3	30	120	**150**	**3**
2	HSMC	4IT1-03/ 4IT1-02	Managerial Economics and Financial Accounting / Technical Communication	2	0	0	2	20	80	**100**	**2**
3	ESC	4IT3-04	Principle of Communication	3	0	0	3	30	120	**150**	**3**
4	PCC	4IT4-05	Database Management System	3	0	0	3	30	120	**150**	**3**
5		4IT4-06	Theory of Computation	3	0	0	3	30	120	**150**	**3**
6		4IT4-07	Data Communication and Computer Networks	3	0	0	3	30	120	**150**	**3**
			Sub Total	17	0	0		170	680	**850**	**17**
PRACTICAL & SESSIONAL											
8	PCC	4IT4-21	Linux Shell Programming Lab	0	0	2		30	20	**50**	**1**
9		4IT4-22	Database Management System Lab	0	0	3		45	30	**75**	**1.5**
10		4IT4-23	Network Programming Lab	0	0	3		45	30	**75**	**1.5**
11		4IT4-24	Java Lab	0	0	2		30	20	**50**	**1**
12		4IT4-25	Web Technology Lab	0	0	2		30	20	**50**	**1**
13	SODECA	4IT8-00	Social Outreach, Discipline & Extra Curricular Activities							**25**	**0.5**
			Sub- Total	0	0	12		180	120	**325**	**6.5**
			TOTAL OF IV SEMEESTER	17	0	12		350	800	**1175**	**23.5**

L: *Lecture,* ***T:*** *Tutorial,* ***P:*** *Practical,* ***Cr:*** *Credits*

ETE: *End Term Exam,* ***IA:*** *Internal Assessment*

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

Scheme of

UNDERGRADUATE DEGREE COURSE

B.Tech. V & VI Semester

Information Technology

Rajasthan Technical University, Kota

Effective from session: 2019 – 2020

Teaching & Examination Scheme
B.Tech. : Information Technology
3rd Year – V Semester

SN	Category	Course		Contact hrs/week			Marks				Cr
		Code	Title	L	T	P	Exm Hrs	IA	ETE	Total	
THEORY											
1	ESC	5IT3-01	Microprocessor And Interfaces	2	0	0	2	20	80	**100**	**2**
2	PCC/ PEC	5IT4-02	Compiler Design	3	0	0	3	30	120	**150**	**3**
3		5IT4-03	Operating System	3	0	0	3	30	120	**150**	**3**
4		5IT4-04	Computer Graphics & Multimedia	3	0	0	3	30	120	**150**	**3**
6		5IT4-05	Analysis of Algorithms	3	0	0	3	30	120	**150**	**3**
7		Professional Elective 1 (any one)		2	0	0	2	20	80	**100**	**2**
		5IT5-11	Wireless Communication								
		5IT5-12	Software Testing and Project Management								
		5IT5-13	Bioinformatics								
			Sub-Total	**16**	**0**	**0**		**160**	**640**	**800**	**16**
PRACTICAL & SESSIONAL											
8	PCC	5IT4-21	Computer Graphics & Multimedia Lab	0	0	2	2	30	20	**50**	**1**
9	PCC	5IT4-22	Compiler Design Lab	0	0	2	2	30	20	**50**	**1**
10	PCC	5IT4-23	Analysis of Algorithms Lab	0	0	2	2	30	20	**50**	**1**
11	PCC	5IT4-24	Advanced Java Lab	0	0	2	2	30	20	**50**	**1**
12	PSIT	5IT7-30	Industrial Training	0	0	1		75	50	**125**	**2.5**
13	SODECA	5IT8-00	Social Outreach, Discipline & Extra Curricular Activities						25	**25**	**0.5**
			Sub- Total	**0**	**0**	**9**		**195**	**155**	**350**	**7**
			TOTAL OF V SEMESTER	**16**	**0**	**9**		**355**	**795**	**1150**	**23**

L: *Lecture,* ***T:*** *Tutorial,* ***P:*** *Practical,* ***Cr:*** *Credits*

ETE: *End Term Exam,* ***IA:*** *Internal Assessment**

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Teaching & Examination Scheme
B.Tech. : Information Technology
3rd Year – VI Semester

SN	Category	Course		Contact hrs/week			Marks				Cr
		Code	Title	L	T	P	Exm Hrs	IA	ETE	Total	
THEORY											
1	ESC	6IT3-01	Digital Image Processing	2	0	0	2	20	80	**100**	**2**
2	PCC /PEC	6IT4-02	Machine Learning	3	0	0	3	30	120	**150**	**3**
3		6IT4-03	Information Security System	2	0	0	2	20	80	**100**	**2**
4		6IT4-04	Computer Architecture and Organization	3	0	0	3	30	120	**150**	**3**
5		6IT4-05	Artificial Intelligence	2	0	0	2	20	80	**100**	**2**
6		6IT4-06	Distributed System	3	0	0	3	30	120	**150**	**3**
7		Professional	Elective1 (Any one)	2	0	0	2	20	80	**100**	**2**
		6IT5-11	Information Theory & Coding								
		6IT5-12	Cloud Computing								
		6IT5-13	Ecommerce & ERP								
		Sub Total		**17**	**0**	**0**		**170**	**680**	**850**	**17**
PRACTICAL & SESSIONAL											
8	PCC	6IT4-21	Digital Image Processing Lab	0	0	3	2	45	30	**75**	**1.5**
9		6IT4-22	Machine Learning Lab	0	0	3	2	45	30	**75**	**1.5**
10		6IT4-23	Python Lab	0	0	3	2	45	30	**75**	**1.5**
11		6IT4-24	Mobile Application Development Lab	0	0	3	2	45	30	**75**	**1.5**
12	SODECA	6IT8-00	Social Outreach, Discipline & Extra Curricular Activities						25	**25**	**0.5**
		Sub- Total		**0**	**0**	**12**		**180**	**145**	**325**	**6.5**
		TOTAL OF VI SEMESTER		**17**	**0**	**12**		**350**	**825**	**1175**	**23.5**

L: *Lecture,* ***T:*** *Tutorial,* ***P:*** *Practical,* ***Cr:*** *Credits*
ETE: *End Term Exam,* ***IA:*** *Internal Assessment*

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

VII	Information Technology	Teaching Hrs			Exm Hrs	Max. Marks			Comments
Course Code	Subject Name (Revised)	L	T	P		IA	TE	TOTAL	Common to
7IT1A	Software Project management	3	-		3	20	80	100	
7IT2A	Information System Security	3			3	20	80	100	CS, IT
7IT3A	Data Mining & Ware Housing	3			3	20	80	100	CS, IT
7IT4A	Internet Programming	3	-		3	20	80	100	
7IT5A	Computer Graphics & Multimedia Techniques	3			3	20	80	100	
7IT6.1A	Advance Database Management Systems	3	-		3	20	80	100	
7IT6.2A	Intelligent Systems								
7IT6.3A	Speech Processing								
7IT7A	Computer Graphics & Multimedia Lab.			2		30	20	50	
7IT8A	DMW Lab			3		60	40	100	
7IT9A	Internet Programming Lab.			2		30	20	50	
7ITPR	Project-I			2		50		50	CS, IT
7ITTR	Practical Training*			2			100	100	CS, IT
7ITDC	Discipline & Extra Curricular Activities							50	CS, IT
		18	0	11				1000	

VIII	Information Technology	Teaching Hrs			Exm Hrs	Max. Marks			Comments
Course Code	Subject Name (Revised)	L	T	P		IA	TE	TOTAL	Common to
8IT1A	Software Testing & Validation	3			3	20	80	100	
8IT2A	Digital Image Processing	3	-		3	20	80	100	CS, IT
8IT3A	Data Compression Techniques	3			3	20	80	100	
8IT4.1A	Mobile Computing	3	-		3	20	80	100	CS, IT
8IT4.2A	Information Retrieval								CS, IT
8IT4.3A	Robotics								
8IT5A	Software Testing Lab.			3		60	40	100	
8IT6A	Digital Image Processing lab			2		30	20	50	CS, IT
8IT7A	Advanced Web Programming			2		30	20	50	
8IT8A	Mobile Application Development Lab			2		30	20	50	
8ITPR	Project-II			2		120	80	200	CS, IT
8ITSM	Seminar			2		60	40	100	CS, IT
8ITDC	Discipline & Extra Curricular Activities							50	CS, IT
		12	0	13				1000	

Syllabus of

UNDERGRADUATE DEGREE COURSE

Information Technology



Rajasthan Technical University, Kota

Effective from session: 2018 – 2019

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

II Year- III Semester: B.Tech. (Information Technology)

3IT2-01: Advanced Engineering Mathematics

Credit- 3 **Max. Marks : 150 (IA:30,ETE:120)**
3L+0T+0P **End Term Exam: 03 Hours**

SN	CONTENTS	Hours
1	**Random Variables:** Discrete and Continuous random variables, Joint distribution, Probability distribution function, conditional distribution. Mathematical Expectations: Moments, Moment Generating Functions, variance and correlation coefficients, Chebyshev's Inequality, Skewness and Kurtosis.	7
2	**Binomial distribution**, Normal Distribution, Poisson Distribution and their relations, Uniform Distribution, Exponential Distribution. Correlation: Karl Pearson's coefficient, Rank correlation. Curve fitting. Line of Regression.	5
3	**Historical development**, Engineering Applications of Optimization, Formulation of Design Problems as a Mathematical Programming Problems, Classification of Optimization Problems	8
4	**Classical Optimization using Differential Calculus:** Single Variable and Multivariable Optimization with & without Constraints, Langrangian theory, Kuhn Tucker conditions	6
5	**Linear Programming:** Simplex method, Two Phase Method and Duality in Linear Programming. Application of Linear Programming: Transportation and Assignment Problems.	14
	TOTAL	40

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

II Year- III Semester: B.Tech. (Information Technology)

3IT1-02/4IT1-02: Technical Communication

Credit- 2 **Max. Marks : 100 (IA:20,ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hours
1	**Introduction to Technical Communication-** Definition of technical communication, Aspects of technical communication, forms of technical communication, importance of technical communication, technical communication skills (Listening, speaking, writing, reading writing), linguistic ability, style in technical communication.	4
2	**Comprehension of Technical Materials/Texts and Information Design & development-** Reading of technical texts, Readingand comprehending instructions and technical manuals, Interpreting and summarizing technical texts, Note-making. Introduction of different kinds of technical documents, Information collection, factors affecting information and document design, Strategies for organization, Information design and writing for print and online media.	6
3	**Technical Writing, Grammar and Editing**- Technical writing process, forms of technical discourse, Writing, drafts and revising, Basics of grammar, common error in writing and speaking, Study of advanced grammar, Editing strategies to achieve appropriate technical style, Introduction to advanced technical communication. Planning, drafting and writing Official Notes, Letters, E-mail, Resume, Job Application, Minutes of Meetings.	8
4	**Advanced Technical Writing**- Technical Reports, types of technical reports, Characteristics and formats and structure of technical reports. Technical Project Proposals, types of technical proposals, Characteristics and formats and structure of technical proposals. Technical Articles, types of technical articles, Writing strategies, structure and formats of technical articles.	8
	TOTAL	**26**

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

II Year- III Semester: B.Tech. (Information Technology)

3IT1-03/ 4IT1-03: Managerial Economics and Financial Accounting

Credit- 2 **Max. Marks : 100 (IA:20,ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hours
1	**Basic economic concepts-** Meaning, nature and scope of economics, deductive vs inductive methods, static and dynamics, Economic problems: scarcity and choice, circular flow of economic activity, national income-concepts and measurement.	4
2	**Demand and Supply analysis-** Demand-types of demand, determinants of demand, demand function, elasticity of demand, demand forecasting –purpose, determinants and methods, Supply-determinants of supply, supply function, elasticity of supply.	5
3	**Production and Cost analysis-** Theory of production- production function, law of variable proportions, laws of returns to scale, production optimization, least cost combination of inputs, isoquants. Cost concepts-explicit and implicit cost, fixed and variable cost, opportunity cost, sunk costs, cost function, cost curves, cost and output decisions, cost estimation.	5
4	**Market structure and pricing theory-** Perfect competition, Monopoly, Monopolistic competition, Oligopoly.	4
5	**Financial statement analysis-** Balance sheet and related concepts, profit and loss statement and related concepts, financial ratio analysis, cash-flow analysis, funds-flow analysis, comparative financial statement, analysis and interpretation of financial statements, capital budgeting techniques.	8
	TOTAL	**26**

Office of Dean Academic Affairs
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3IT3-04: Digital Electronics

Credit- 3 **Max. Marks : 150 (IA:30,ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	Hours
1	**Fundamental concepts:** Number systems and codes, Basic logic Gates and Boolean algebra: Sign & magnitude representation, Fixed point representation, complement notation, various codes & arithmetic in different codes & their inter conversion. Features of logic algebra, postulates of Boolean algebra.Theorems of Boolean algebra.	8
2	**Minimization Techniques and Logic Gates**: Principle of Duality - Boolean expression -Minimization of Boolean expressions — Minterm – Maxterm - Sum of Products (SOP) – Product of Sums (POS) – Karnaugh map Minimization – Don't care conditions – Quine - McCluskey method of minimization.	8
3	**Digital Logic Gate Characteristics:** TTL logic gate characteristics. Theory & operation of TTL NAND gate circuitry. Open collector TTL. Three state output logic. TTL subfamilies.MOS& CMOS logic families. Realization of logic gates in RTL, DTL, ECL, C-MOS & MOSFET.	8
4	**Combinational Circuits:** Combinational logic circuit design, adder, subtractor, BCD adder, encoder, decoder, BCD to 7-segment decoder, multiplexer, demultiplexer.	8
5	**Sequential Circuits:** Latches, Flip-flops - SR, JK, D, T, and Master-Slave Characteristic table and equation,counters and their design, Synchronous counters – Synchronous Up/Down counters – Programmable counters – State table and state transition diagram ,sequential circuits design methodology. Registers –shift registers.	8
	TOTAL	**40**

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RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

II Year- III Semester: B.Tech. (Information Technology)

3IT4-05: Data Structures and Algorithms

Credit- 3 **Max. Marks : 150 (IA:30,ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	Hours
1	Stacks: Basic Stack Operations, Representation of a Stack using Static Array and Dynamic Array, Multiple stack implementation using single array, Stack Applications: Reversing list, Factorial Calculation, Infix to postfix Transformation, Evaluating Arithmetic Expressions and Towers of Hanoi.	8
2	Queues: Basic Queue Operations, Representation of a Queue using array, Implementation of Queue Operations using Stack, Applications of Queues- Round Robin Algorithm. Circular Queues, DeQueue Priority Queues. Linked Lists: Introduction, single linked list, representation of a linked list in memory, Different Operations on a Single linked list, Reversing a single linked list, Advantages and disadvantages of single linked list, circular linked list, double linked list and Header linked list.	10
3	Searching Techniques: Sequential and binary search.Sorting Techniques: Basic concepts, Sorting by: bubble sort, Insertion sort, selection sort, quick sort, heap sort, merge sort, radix sort and counting sorting algorithms.	7
4	Trees: Definition of tree, Properties of tree, Binary Tree, Representation of Binary trees using arrays and linked lists, Operations on a Binary Tree, Binary Tree Traversals (recursive), Binary search tree, B-tree , B+ tree, AVL tree, Threaded binary tree.	7
5	Graphs: Basic concepts, Different representations of Graphs, Graph Traversals (BFS & DFS), Minimum Spanning Tree(Prims &Kruskal), Dijkstra's shortest path algorithms.Hashing: Hash function, Address calculation techniques, Common hashing functions, Collision resolution: Linear and Quadratic probing, Double hashing.	8
	TOTAL	**40**

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

II Year- III Semester: B.Tech. (Information Technology)

3IT4-06: Object Oriented Programming

Credit- 3 **Max. Marks : 150 (IA:30,ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	Hours
1	Introduction to different programming paradigm, characteristics of OOP, Class, Object, data member, member function, structures in C++, different access specifiers, defining member function inside and outside class, array of objects.	8
2	Concept of reference, dynamic memory allocation using new and delete operators, inline functions, function overloading, function with default arguments, constructors and destructors, friend function and classes, using this pointer.	8
3	Inheritance, types of inheritance, multiple inheritance, virtual base class, function overriding, abstract class and pure virtual function	9
4	Constant data member and member function, static data member and member function, polymorphism, operator overloading, dynamic binding and virtual function	9
5	Exception handling, Template, Stream class, File handling.	6
	TOTAL	40

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

3IT4-07: Software Engineering

Credit- 3 **Max. Marks : 150 (IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	Hours
1	Introduction, software life-cycle models, software requirements specification, formal requirements specification, verification and validation.	8
2	Software Project Management: Objectives, Resources and their estimation, LOC and FP estimation, effort estimation, COCOMO estimation model, risk analysis, software project scheduling.	8
3	Requirement Analysis: Requirement analysis tasks, Analysis principles. Software prototyping and specification data dictionary, Finite State Machine (FSM) models. Structured Analysis: Data and control flow diagrams, control and process specification behavioural modeling	8
4	Software Design: Design fundamentals, Effective modular design: Data architectural and procedural design, design documentation.	8
5	Object Oriented Analysis: Object oriented Analysis Modeling, Data modeling. Object Oriented Design: OOD concepts, Class and object relationships, object modularization, Introduction to Unified ModelingLanguage .	8
	TOTAL	**40**

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

3IT4-21: Data Structures and Algorithms Lab

Credit- 1.5 **Max. Marks: 75 (IA:45,ETE:30)**

0L+0T+3P

SN	CONTENTS
1	Write a simple C program on a 32 bit compiler to understand the concept of array storage, size of a word. The program shall be written illustrating the concept of row major and column major storage. Find the address of element and verify it with the theoretical value. Program may be written for arrays up to 4-dimensions.
2	Simulate a stack, queue, circular queue and dequeue using a one dimensional array as storage element. The program should implement the basic addition, deletion and traversal operations.
3	Represent a 2-variable polynomial using array. Use this representation to implement addition of polynomials
4	Represent a sparse matrix using array. Implement addition and transposition operations using the representation.
5	Implement singly, doubly and circularly connected linked lists illustrating operations like addition at different locations, deletion from specified locations and traversal.
6	Repeat exercises 2, 3 & 4 with linked structure.
7	Implementation of binary tree with operations like addition, deletion, traversal.
8	Depth first and breadth first traversal of graphs represented using adjacency matrix and list.
9	Implementation of binary search in arrays and on linked Binary Search Tree.
10	Implementation of different sorting algorithm like insertion, quick, heap, bubble and many more sorting algorithms.

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

II Year- III Semester: B.Tech. (Information Technology)

3IT4-22 : Object Oriented Programming Lab

Credit-1.5 **Max. Marks: 75 (IA:45,ETE:30)**

0L+0T+3P

SN	CONTENTS
1	Understand the basics of C++ library, variables, data input-output.
2	C++ program using with the concept of structures.
3	Implement class and object concepts and function overloading.
4	Write programs to understand dynamic memory allocation and array of objects.
5	Program to understand different types of constructors and destructor.
6	Implement friend function to access private data of a class and usage of this pointer.
7	Write programs to understand the usage of constant data member and member function, static data member and member function in a class.
8	Implement different types of inheritance, function overriding and virtual function
9	Implement Operator overloading concepts.
10	Write programs to understand function template and class template.
11	Write programs to understand exception handling techniques.
12	Write programs to understand file handling techniques.

Office of Dean Academic Affairs
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3IT4-23: Software Engineering Lab

Credit- 1.5 **Max. Marks: 75 (IA:45,ETE:30)**
0L+0T+3P

SN	CONTENTS
1	Development of requirements specification, function oriented design using SA/SD, object-oriented design using UML, test case design, implementation using Java and testing. Use of appropriate CASE tools and other tools such as configuration management tools, program analysis tools in the software life cycle.
2	Develop Software Requirements Specification (SRS) for a given problem in IEEE template.
3	Develop DFD model (level-0, level-1 DFD and Data dictionary) of the project.
4	Develop structured design for the DFD model developed.
5	Developed all Structure UML diagram of the given project.
6	Develop Behavior UML diagram of the given project.
7	Manage file, using ProjectLibre project management software tool.

Office of Dean Academic Affairs
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RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

II Year- III Semester: B.Tech. (Information Technology)

3IT4-24: Digital Electronics Lab

Credit- 1.5 **Max. Marks: 75 (IA:45,ETE:30)**

0L+0T+3P

SN	CONTENTS
1	To verify the truth tables of basic logic gates: AND, OR, NOR, NAND, NOR. Also to verify truth table of Ex-OR, Ex-NOR (For 2, 3, & 4 inputs using gateswith 2, 3, & 4 inputs).
2	To verify the truth table of OR, AND, NOR, Ex-OR, Ex-NOR realized usingNAND& NOR gates.
3	To realize an SOP and POS expression.
4	To realize Half adder/ Subtractor& Full Adder/ Subtractor using NAND & NOR gatesand to verify their truth tables.
5	To realize a 4-bit ripple adder/ Subtractor using basic Half adder/ Subtractor& basic Full Adder/ Subtractor.
6	To verify the truth table of 4-to-1 multiplexer and 1-to-4 demultiplexer. Realize the multiplexer using basic gates only. Also to construct and 8-to-1 multiplexer and 1-to-8 demultiplexer using blocks of 4-to-1 multiplexer and 1-to-4 demultiplexer.
7	Design & Realize a combinational circuit that will accept a 2421 BCD code and drive a TIL -312 seven-segment display.
8	Using basic logic gates, realize the R-S, J-K and D-flip flops with and without clock signal and verify their truth table.
9	Construct a divide by 2,4& 8 asynchronous counter. Construct a 4-bit binary counter and ring counter for a particular output pattern using D flip flop.
10	Perform input/output operations on parallel in/Parallel out and Serial in/Serial out registers using clock. Also exercise loading only one of multiple values into the register using multiplexer. Note: As far as possible, the experiments shall be performed on bread board. However, experiment Nos. 1-4 are to be performed on bread board only.

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

Syllabus of

UNDERGRADUATE DEGREE COURSE

Information Technology

Rajasthan Technical University, Kota

Effective from session: 2018 – 2019

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

II Year- IV Semester: B.Tech. (Information Technology)

4IT2-01: Discrete Mathematics Structure

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	Set Theory: Definition of sets, countable and uncountable sets, Set operations, Partition of set, Cardinality (Inclusion-Exclusion & Addition Principles) Venn Diagrams, proofs of some general identities on sets. Relation: Definition, types of relation, composition of relations, Pictorial representation of relation, Equivalence relation, Partial ordering relation, Job-Scheduling problem. Function: Definition, type of functions, one to one, into and onto function, inverse function, composition of functions, recursively defined functions, pigeonhole principle. Theorem proving Techniques: Mathematical induction, Proof by contradiction. Composition of Functions. The Pigeonhole and Generalized Pigeonhole Principles.	7
3	Propositional Logic: Proposition, First order logic, Basic logical operation, truth tables, tautologies, Contradictions, Algebra of Proposition, logical implications, logical equivalence, predicates, Normal Forms, Universal and existential quantifiers. 2 way predicate logic. Introduction to finite state machine Finite state machines as models of physical system equivalence machines, Finite state machines as language recognizers.	8
4	Posets, Hasse Diagram and Lattices: Introduction, ordered set, Hasse diagram of partially, ordered set, isomorphic ordered set, well ordered set, properties of Lattices, bounded and complemented lattices. Combinatorics: Introduction, Permutation and combination, Binomial Theorem, Multimodal Coefficients Recurrence Relation and Generating Function: Introduction to Recurrence Relation and Recursive algorithms, linear recurrence relations with constant coefficients, Homogeneous solutions, Particular solutions, Total solutions, Generating functions, Solution by method of generating functions.	8
5	Algebraic Structures: Definition, Properties, types: Semi Groups, Monoid, Groups, Abelian group, properties of groups, Subgroup, cyclic groups, Cosets, factor group, Permutation groups, Normal subgroup, Homomorphism and isomorphism of Groups, example and standard results, Rings and Fields: definition and standard results.	8
6	Graph Theory: Introduction and basic terminology of graphs, Planer graphs, Multigraphs and weighted graphs, Isomorphic graphs, Paths, Cycles and connectivity, Shortest path in weighted graph, Introduction to Eulerian paths and circuits, Hamiltonian paths and circuits, Graph coloring, chromatic number, Isomorphism and Homomorphism of graphs, matching, vertex/edge covering.	8
	Total	40

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RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

II Year- IV Semester: B.Tech. (Information Technology)

4IT1-03/3IT1-03: Managerial Economics and Financial Accounting

Credit- 2 **Max. Marks : 100 (IA:20,ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Basic economic concepts-** Meaning, nature and scope of economics, deductive vs inductive methods, static and dynamics, Economic problems: scarcity and choice, circular flow of economic activity, national income-concepts and measurement.	3
3	**Demand and Supply analysis-** Demand-types of demand, determinants of demand, demand function, elasticity of demand, demand forecasting –purpose, determinants and methods, Supply-determinants of supply, supply function, elasticity of supply.	5
4	**Production and Cost analysis-** Theory of production- production function, law of variable proportions, laws of returns to scale, production optimization, least cost combination of inputs, isoquants. Cost concepts-explicit and implicit cost, fixed and variable cost, opportunity cost, sunk costs, cost function, cost curves, cost and output decisions, cost estimation.	5
5	**Market structure and pricing theory-** Perfect competition, Monopoly, Monopolistic competition, Oligopoly.	4
6	**Financial statement analysis-** Balance sheet and related concepts, profit and loss statement and related concepts, financial ratio analysis, cash-flow analysis, funds-flow analysis, comparative financial statement, analysis and interpretation of financial statements, capital budgeting techniques.	8
	TOTAL	26

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RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

II Year- IV Semester: B.Tech. (Information Technology)

4IT1-02/3IT1-02: Technical Communication

Credit- 2 **Max. Marks : 100 (IA:20,ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Introduction to Technical Communication-** Definition of technical communication, Aspects of technical communication, forms of technical communication, importance of technical communication, technical communication skills (Listening, speaking, writing, reading writing), linguistic ability, style in technical communication.	3
3	**Comprehension of Technical Materials/Texts and Information Design & development-** Reading of technical texts, Readingand comprehending instructions and technical manuals, Interpreting and summarizing technical texts, Note-making. Introduction of different kinds of technical documents, Information collection, factors affecting information and document design, Strategies for organization, Information design and writing for print and online media.	6
4	**Technical Writing, Grammar and Editing**- Technical writing process, forms of technical discourse, Writing, drafts and revising, Basics of grammar, common error in writing and speaking, Study of advanced grammar, Editing strategies to achieve appropriate technical style, Introduction to advanced technical communication. Planning, drafting and writing Official Notes, Letters, E-mail, Resume, Job Application, Minutes of Meetings.	8
5	**Advanced Technical Writing**- Technical Reports, types of technical reports, Characteristics and formats and structure of technical reports. Technical Project Proposals, types of technical proposals, Characteristics and formats and structure of technical proposals. Technical Articles, types of technical articles, Writing strategies, structure and formats of technical articles.	8
	TOTAL	26

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4IT3-04: Principles of Communication

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	ANALOG MODULATION: Concept of frequency translation. Amplitude Modulation: Description of full AM, DSBSC, SSB and VSB in time and frequency domains, methods of generation & demodulation, frequency division multiplexing (FDM). Angle Modulation: Phase and frequency modulation. Descriptions of FM signal in time and frequency domains, methods of generation & demodulation, pre- emphasis & de-emphasis, PLL.	7
3	PULSE ANALOG MODULATION: Ideal sampling, Sampling theorem, aliasing, interpolation, natural and flat top sampling in time and frequency domains. Introduction to PAM, PWM, PPM modulation schemes. Time division multiplexing (TDM)	8
4	PCM & DELTA MODULATION SYSTEMS: Uniform and Non-uniform quantization. PCM and delta modulation, Signal to quantization noise ratio in PCM and delta modulation. DPCM, ADM, T1 Carrier System, Matched filter detection. Error probability in PCM system.	8
5	DIGITAL MODULATION: Baseband transmission: Line coding (RZ, NRZ), inter symbol interference (ISI), pulse shaping, Nyquist criterion for distortion free base band transmission, raised cosine spectrum. Pass band transmission: Geometric interpretation of signals, orthogonalization. ASK PSK, FSK, QPSK and MSK modulation techniques, coherent detection and calculation of error probabilities.	8
6	SPREAD-SPECTRUM MODULATION: Introduction, Pseudo-Noise sequences, direct sequence spread spectrum (DSSS) with coherent BPSK, processing gain, probability of error, frequency-hop spread spectrum (FHSS). Application of spread spectrum: CDMA.	8
	Total	40

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SYLLABUS

II Year- IV Semester: B.Tech. (Information Technology)

4IT4-05: Database Management System

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	Introduction to database systems: Overview and History of DBMS. File System v/s DBMS. Advantage of DBMS Describing and Storing Data in a DBMS. Queries in DBMS. Structure of a DBMS. Entity Relationship model: Overview of Data Design Entities, Attributes and Entity Sets, Relationship and Relationship Sets. Features of the ER Model- Key Constraints, Participation Constraints, Weak Entities, Class Hierarchies, Aggregation, Conceptual Data Base, and Design with ER Model- Entity v/s Attribute, Entity vs Relationship Binary vs Ternary Relationship and Aggregation v/s ternary Relationship Conceptual Design for a Large Enterprise.	7
3	Relationship Algebra and Calculus: Relationship Algebra Selection and Projection, Set Operations, Renaming, Joints, Division, Relation Calculus, Expressive Power of Algebra and Calculus. SQL queries programming and Triggers: The Forms of a Basic SQL Query, Union, and Intersection and Except, Nested Queries, Correlated Nested Queries, Set-Comparison Operations, Aggregate Operators, Null Values and Embedded SQL, Dynamic SQL, ODBC and JDBC, Triggers and Active Databases.	8
4	Schema refinement and Normal forms: Introductions to Schema Refinement, Functional Dependencies, Boyce-Codd Normal Forms, Third Normal Form, Normalization-Decomposition into BCNF Decomposition into 3-NF.	8
5	Transaction Processing: Introduction-Transaction State, Transaction properties, Concurrent Executions. Need of Serializability, Conflict vs. View Serializability, Testing for Serializability, Recoverable Schedules, Cascadeless Schedules.	8
6	Concurrency Control: Implementation of Concurrency: Lock-based protocols, Timestamp-based protocols, Validation-based protocols, Deadlock handling, Database Failure and Recovery: Database Failures, Recovery Schemes: Shadow Paging and Log-based Recovery, Recovery with Concurrent transactions.	8
	Total	**40**

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SYLLABUS

II Year- IV Semester: B.Tech. (Information Technology)

4IT4-06: Theory of Computation

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	Finite Automata & Regular Expression: Basic machine, Finite state machine, Transition graph, Transition matrix, Deterministic and non-deterministic finite automation, Equivalence of DFA and NDFA, Decision properties, minimization of finite automata, Mealy & Moore machines. Alphabet, words, Operations, Regular sets, relationship and conversion between Finite automata and regular expression and vice versa, designing regular expressions, closure properties of regular sets, Pumping lemma and regular sets, Myhill- Nerode theorem , Application of pumping lemma, Power of the languages.	7
3	Context Free Grammars (CFG), Derivations and Languages, Relationship between derivation and derivation trees, leftmost and rightmost derivation, sentential forms, parsing and ambiguity, simplification of CFG, normal forms, Greibach and Chomsky Normal form , Problems related to CNF and GNF including membership problem.	8
4	Nondeterministic PDA, Definitions, PDA and CFL, CFG for PDA, Deterministic PDA, and Deterministic PDA and Deterministic CFL , The pumping lemma for CFL's, Closure Properties and Decision properties for CFL, Deciding properties of CFL.	8
5	Turing Machines: Introduction, Definition of Turing Machine, TM language Acceptors and Transducers, Computable Languages and functi Universal TM & Other modification, multiple tracks Turing Machine. Hierarchy of Formal languages: Recursive & recursively enumerable languages, Properties of RL and REL, Introduction of Context sensitive grammers and languages, The Chomsky Hierarchy.	8
6	Tractable and Untractable Problems: P, NP, NP complete and NP hard problems, Un-decidability, examples of these problems like vertex cover problem, Hamiltonian path problem, traveling sales man problem.	8
	Total	40

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4IT4-07: Data Communication and Computer Networks

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	Introductory Concepts: Network hardware, Network software, topologies, Protocols and standards, OSI model, TCP model, TCP/IP model, Physical Layer:Digital and Analog Signals, Periodic Analog Signals, Signal Transmission, Limitations of Data Rate, Digital Data Transmission, Performance Measures, Line Coding, Digital Modulation, Media and Digital Transmission System.	7
3	Data Link Layer:Error Detection and Correction,Types of Errors, Two dimensional parity check, Detection verses correction, Block Coding, Linear Block Coding, Cyclic Codes, Checksum, Standardized Polynomial Code, Error Correction Methods, Forward Error Correction, Protocols: Stop and wait, Go-back-N ARQ, Selective Repeat ARQ, Sliding window, Piggy backing, Pure ALOHA, Slotted ALOHA, CSMA/CD, CSMA/CA	8
4	Network Layer:Design issues, Routing algorithms: IPV4, IPV6, Address mapping: ARQ, RARQ, Congestion control, Unicast, Multicast, Broadcast routing protocols, Quality of Service, Internetworking.	8
5	Transport Layer: Transport service, Elements of transport protocols, User Datagram Protocol, Transmission Control Protocol, Quality of service, Leaky Bucket and Token Bucket algorithm.	8
6	Application Layer**:** WWW, DNS, Multimedia, Electronic mail, FTP, HTTP, SMTP, Introduction to network security	8
	Total	40

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4IT4-21: Linux Shell Programming Lab

Credit: 1 **Max. Marks: 50(IA:30, ETE:20)**
0L+0T+2P

List of Experiments:

1. Use of Basic Unix Shell Commands: ls, mkdir, rmdir, cd, cat, banner, touch, file, wc, sort, cut, grep, dd, dfspace, du, ulimit.
2. Commands related to inode, I/O redirection and piping, process control commands, mails.
3. Shell Programming: Shell script based on control structure- **If-then-if, if-then-else-if, nested if-else to find**
   3.1 Greatest among three numbers.
   3.2 To find a year is leap year or not.
   3.3 To input angles of a triangle and find out whether it is valid triangle or not.
   3.4 To check whether a character is alphabet, digit or special character.
   3.5 To calculate profit or loss.
4. Shell Programming - Looping- while, until, for loops
   4.1 Write a shell script to print all even and odd number from 1 to 10.
   4.2 Write a shell script to print table of a given number
   4.3 Write a shell script to calculate factorial of a given number.
   4.4 Write a shell script to print sum of all even numbers from 1 to 10.
   4.5 Write a shell script to print sum of digit of any number.
5. Shell Programming - case structure, use of break
   5.1 Write a shell script to make a basic calculator which performs addition, subtraction,
   Multiplication, division
   5.2 Write a shell script to print days of a week.
   5.3 Write a shell script to print starting 4 months having 31 days.
6. Shell Programming - Functions
   6.1 Write a shell script to find a number is Armstrong or not.
   6.2 Write a shell script to find a number is palindrome or not.
   6.3 Write a shell script to print Fibonacci series.
   6.4 Write a shell script to find prime number.
   6.5 Write a shell script to convert binary to decimal and decimal to binary
7. Write a shell script to print different shapes- Diamond, triangle, square, rectangle, hollow square etc.

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8. Shell Programming – Arrays

8.1 Write a C program to read and print elements of array.

8.2 Write a C program to find sum of all array elements.

8.3 Write a C program to find reverse of an array.

8.4 Write a C program to search an element in an array.

8.5 Write a C program to sort array elements in ascending or descending order.

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4IT4-22: Database Management System Lab

Credit: 1.5 **Max. Marks: 75(IA:45, ETE:30)**
0L+0T+3P

List of Experiments:

1. Design a Database and create required tables. For e.g. Bank, College Database
2. Apply the constraints like Primary Key, Foreign key, NOT NULL to the tables.
3. Write a SQL statement for implementing ALTER,UPDATE and DELETE.
4. Write the queries to implement the joins.
5. Write the query for implementing the following functions: MAX (), MIN (), AVG () and COUNT ().
6. Write the query to implement the concept of Integrity constrains.
7. Write the query to create the views.
8. Perform the queries for triggers.
9. Perform the following operation for demonstrating the insertion , updation and deletion
10. Using the referential integrity constraints.
11. Write the query for creating the users and their role.

Data Base Designing Project:

For better understanding students (group of 3-4 students) should design data base for any data base project, understand the requirement and design methodology of project by its own.

Some example of data base design project like:

College management system, Inventory management system and Hospital management system.

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4IT4-23: Network Programming Lab

Credit: 1.5 **Max. Marks: 75(IA:45, ETE:30)**
0L+0T+3P

List of Experiments:

1. Study of Different Type of LAN& Network Equipments.
2. Study and Verification of standard Network topologies i.e. Star, Bus, Ring etc.
3. LAN installations and Configurations.
4. Write a program to implement various types of error correcting techniques.
5. Write a program to implement various types of framing methods.
6. Write two programs in C: hello_client and hello_server
    a. The server listens for, and accepts, a single TCP connection; it reads all the data it can from that connection, and prints it to the screen; then it closes the connection
    b. The client connects to the server, sends the string “Hello, world!”, then closes the connection
7. Write an Echo_Client and Echo_server using TCP to estimate the round trip time from client to the server. The server should be such that it can accept multiple connections at any given time.
8. Repeat Exercises 6 & 7 for UDP.
9. Repeat Exercise 7 with multiplexed I/O operations.
10. Simulate Bellman-Ford Routing algorithm in NS2.

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4IT4-24: Java Lab

Credit: 1 **Max. Marks: 50(IA:30, ETE:20)**
0L+0T+2P

List of Experiment:

1. Develop an in depth understanding of programming in Java: data types, variables, operators, operator precedence, Decision and control statements, arrays, switch statement, Iteration Statements, Jump Statements, Using break, Using continue, return.
2. Write Object Oriented programs in Java: Objects, Classes constructors, returning and passing objects as parameter, Inheritance, Access Control, Using super, final with inheritance Overloading and overriding methods, Abstract classes, Extended classes.
3. Develop understanding to developing packages & Interfaces in Java: Package, concept of CLASSPATH, access modifiers, importing package, Defining and implementing interfaces.
4. Develop understanding to developing Strings and exception handling: String constructors, special string operations, character extraction, searching and comparing strings, string Buffer class. Exception handling fundamentals, Exception types, uncaught exceptions, try, catch and multiple catch statements.
   Usage of throw, throws and finally.
5. Develop applications involving file handling: I/O streams, File I/O.
6. Develop applications involving concurrency: Processes and Threads, Thread Objects, Defining and Starting a Thread, Pausing Execution with Sleep, Interrupts, Joins, and Synchronization.

Indicative List of exercises:

7. Programs to demonstrate basic concepts e.g. operators, classes, constructors, control & iteration statements, recursion etc. such as complex arithmetic, matrix
   arithmetic, tower of Hanoi problem etc.
8. Development of programs/projects to demonstrate concepts like inheritance, exception handling, packages, interfaces etc. such as application for electricity department, library management, ticket reservation system, payroll system etc.

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9. Development of a project to demonstrate various file handling concepts.
10. Develop applications involving Applet: Applet Fundamentals, using paint method and drawing polygons. It is expected that each laboratory assignments to given to the students with an aim to In order to achieve the above objectives.

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4IT4-25: Web Technology Lab

Credit: 1 **Max. Marks: 50(IA:30, ETE:20)**
0L+0T+2P

List of Experiments:

1. Develop static pages (using only HTML) of an online Book store. The pages should resemble: www.amazon.com. The website should consist of the following pages: Home page, Registration and user Login, User profile page, Books catalog, Shopping cart, Payment By credit card, order confirmation.
2. Validate the registration, user login, user profile and payment by credit card pages using JavaScript.
3. Write an XML file which will display the Book information which includes the following:
   1) Title of the book
   2) Author Name
   3) ISBN number
   4) Publisher name
   5) Edition
   6) Price

   Write a Document Type Definition (DTD) to validate the above XML file. Display the XML file as follows. The contents should be displayed in a table. The header of the table should be in color GREY. And the author name column should be displayed in one color and should be capitalized and bold. Use your own colors for remaining columns. Use XML schemas XSL and CSS for the above purpose.
4. 1) Install TOMCAT web server. While installation assign port number 8080. Make sure that these ports are available i.e., no other process is using this port.

   2) Access the above developed static web pages for books web site, using these servers by putting the web pages developed in practical 1 and 2 in the document root. Access the pages by using the urls : http://localhost:8080/rama/books.html

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5. User Authentication: Assume four users user1, user2, user3 and user4 having the passwords pwd1, pwd2, pwd3 and, pwd4 respectively. Write a servlet for doing the following.
   1.) Create a Cookie and add these four user ids and passwords to this Cookie.
   2.) Read the user id and passwords entered in the Login form (Practical 1) and authenticate with the values (user id and passwords) available in the cookies. If he is a valid user (i.e., user-name and password match) you should welcome him by name (user-name) else you should display "You are not an authenticated user ".
6. Install a database (MySQL or Oracle). Create a table which should contain at least the following fields: name, password, email-id, phone number (these should hold the data from the registration form). Practice 'JDBC' connectivity. Write a java program/servlet/JSP to connect to that database and extract data from the tables and display them. Experiment with various SQL queries. Insert the details of the users who register with the web site, whenever a new user clicks the submit button in the registration page.
7. Write a JSP which does the following job: Insert the details of the 3 or 4 users who register with the web site by using registration form. Authenticate the user when he submits the login form using the user name and password from the database.
8. Create on ODBC link, Compile & execute JAVA JDBC Socket.
9. Design and implement a simple shopping cart example with session tracking API.
10. Mini Project.

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Syllabus of

UNDERGRADUATE DEGREE COURSE

B.Tech. V Semester

Information Technology



Rajasthan Technical University, Kota

Effective from session: 2019 – 2020

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

III Year- V Semester: B.Tech. (Information Technology)

5IT3-01: Microprocessor And Interfaces

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Introduction to Microprocessor, Components of a Microprocessor:** Registers, ALU and control & timing, System bus (data, address and control bus), Microprocessor systems with bus organization. Microprocessor Architecture and Operations, Memory, I/O devices, Memory and I/O operations.	03
3	**8085 Microprocessor Architecture**: Address, Data And Control Buses, 8085 Pin Functions, Demultiplexing of Buses, Generation Of Control Signals, Instruction Cycle, Machine Cycles, T-States, Memory Interfacing. Assembly Language Programming Basics, Classification of Instructions, Addressing Modes, 8085 Instruction Set, Instruction And Data Formats, Writing, Assembling & Executing A Program, Debugging The Programs.	07
4	**Assembly language:** Writing 8085 assembly language programs with decision, making and looping using data transfer, arithmetic, logical and branch instructions.	05
5	**Stack & Subroutines:** Developing Counters and Time Delay Routines, Code Conversion, BCD Arithmetic and 16-Bit Data operations.	07
6	**Interfacing Concepts:** Ports, Interfacing Of I/O Devices, Interrupts In 8085, Programmable Interrupt Controller 8259A, Programmable Peripheral Interface 8255A.	05
	Total	28

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5IT4-02: Compiler Design

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Introduction:** Objective, scope and outcome of the course. Compiler, Translator, Interpreter definition, Phase of compiler, Bootstrapping, Review of Finite automata lexical analyzer, Input, Recognition of tokens, Idea about LEX: A lexical analyzer generator, Error handling.	06
3	**Review of CFG Ambiguity of grammars:** Introduction to parsing. Top down parsing, LL grammars & passers error handling of LL parser, Recursive descent parsing predictive parsers, Bottom up parsing, Shift reduce parsing, LR parsers, Construction of SLR, Conical LR & LALR parsing tables, parsing with ambiguous grammar. Operator precedence parsing, Introduction of automatic parser generator: YACC error handling in LR parsers.	10
4	**Syntax directed definitions;** Construction of syntax trees, S-Attributed Definition, L-attributed definitions, Top down translation. Intermediate code forms using postfix notation, DAG, Three address code, TAC for various control structures, Representing TAC using triples and quadruples, Boolean expression and control structures.	10
5	**Storage organization;** Storage allocation, Strategies, Activation records, Accessing local and non-local names in a block structured language, Parameters passing, Symbol table organization, Data structures used in symbol tables.	08
6	**Definition of basic block control flow graphs;** DAG representation of basic block, Advantages of DAG, Sources of optimization, Loop optimization, Idea about global data flow analysis, Loop invariant computation, Peephole optimization, Issues in design of code generator, A simple code generator, Code generation from DAG.	07
	Total	42

5IT4-03: Operating System

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Introduction and history of Operating systems:** Structure and operations; processes and files Processor management: inter process communication, mutual exclusion, semaphores, wait and signal procedures, process scheduling and algorithms, critical sections, threads, multithreading	04
3	**Memory management:** contiguous memory allocation, virtual memory, paging, page table structure, demand paging, page replacement policies, thrashing, segmentation, case study	05
4	**Deadlock:** Shared resources, resource allocation and scheduling, resource graph models, deadlock detection, deadlock avoidance, deadlock prevention algorithms **Device management:** devices and their characteristics, device drivers, device handling, disk scheduling algorithms and policies	15
5	**File management:** file concept, types and structures, directory structure, cases studies, access methods and matrices, file security, user authentication	07
6	**UNIX and Linux operating systems as case studies;** Time OS and case studies of Mobile OS	08
	Total	40

5IT4-04: Computer Graphics & Multimedia

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Basic of Computer Graphics:** Basic of Computer Graphics, Applications of computer graphics, Display devices, Random and Raster scan systems, Graphics input devices, Graphics software and standards	06
3	**Graphics Primitives:** Points, lines, circles and ellipses as primitives, scan conversion algorithms for primitives, Fill area primitives including scan-line polygon filling, inside-outside test, boundary and flood-fill, character generation, line attributes, area-fill attributes, character attributers. Aliasing, and introduction to Anti Aliasing (No anti aliasing algorithm).	07
4	**Two Dimensional Graphics:** Transformations (translation, rotation, scaling), matrix representation, homogeneous coordinates, composite transformations, reflection and shearing, viewing pipeline and coordinates system, window-to-viewport transformation, clipping including point clipping, line clipping (cohen-sutherland, liang- bersky, NLN), polygon clipping	08
5	**Three Dimensional Graphics:** 3D display methods, polygon surfaces, tables, equations, meshes, curved lies and surfaces, quadric surfaces, spline representation, cubic spline interpolation methods, Bazier curves and surfaces, B-spline curves and surfaces.3D scaling, rotation and translation, composite transformation, viewing pipeline and coordinates, parallel and perspective transformation, view volume and general (parallel and perspective) projection transformations.	08
6	**Illumination and Colour Models:** Light sources – basic illumination models – halftone patterns and dithering techniques; Properties of light – Standard primaries and chromaticity diagram; Intuitive colour concepts – RGB colour model – YIQ colour model – CMY colour model – HSV colour model – HLS colour model; Colour selection.	06
7	**Animations & Realism:** Design of Animation sequences – animation function – raster animation – key frame systems – motion specification – morphing – tweening. COMPUTER **Graphics Realism:** Tiling the plane – Recursively defined curves – Koch curves – C curves – Dragons – space filling curves – fractals – Grammar based models – fractals – turtle graphics – ray tracing.	06
	Total	42

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5IT4-05: Analysis of Algorithms

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Background**: Review of Algorithm, Complexity Order Notations: definitions and calculating complexity. **Divide And Conquer Method**: Binary Search, Merge Sort, Quick sort and Strassen's matrix multiplication algorithms.	06
3	**Greedy Method**: Knapsack Problem, Job Sequencing, Optimal Merge Patterns and Minimal Spanning Trees. **Dynamic Programming**: Matrix Chain Multiplication. Longest CommonSubsequence and 0/1 Knapsack Problem.	10
4	**Branch And Bound**: Traveling Salesman Problem and Lower Bound Theory. Backtracking Algorithms and queens problem. **Pattern Matching Algorithms**: Naïve and Rabin Karp string matching algorithms, KMP Matcher and Boyer Moore Algorithms.	08
5	**Assignment Problems:** Formulation of Assignment and Quadratic Assignment Problem. **Randomized Algorithms-** Las Vegas algorithms, Monte Carlo algorithms, randomized algorithm for Min-Cut, randomized algorithm for 2- SAT. Problem definition of Multicommodity flow, Flow shop scheduling and Network capacity assignment problems.	08
6	**Problem Classes Np, Np-Hard And Np-Complete:** Definitions of P, NP-Hard and NP-Complete Problems. Decision Problems.Cook's Theorem. Proving NP-Complete Problems - Satisfiability problem and Vertex Cover Problem. Approximation Algorithms for Vertex Cover andSet Cover Problem.	08
	Total	41

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5IT5-11: Wireless Communication

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Wireless Channels:** Large scale path loss – Path loss models: Free Space and Two-Ray models -Link Budget design – Small scale fading- Parameters of mobile multipath channels – Time dispersion parameters-Coherence bandwidth – Doppler spread & Coherence time, Fading due to Multipath time delay spread – flat fading – frequency selective fading – Fading due to Doppler spread – fast fading – slow fading.	06
3	**Cellular Architecture:** Multiple Access techniques - FDMA, TDMA, CDMA – Capacity calculations–Cellular concept- Frequency reuse - channel assignment- hand off- interference & system capacity- trunking & grade of service – Coverage and capacity improvement.	05
4	**Digital Signaling For Fading Channels:** Structure of a wireless communication link, Principles of Offset-QPSK, p/4-DQPSK, Minimum Shift Keying, Gaussian Minimum Shift Keying, Error performance in fading channels, OFDM principle – Cyclic prefix, Windowing, PAPR.	05
5	**Multipath Mitigation Techniques:** Equalisation – Adaptive equalization, Linear and Non-Linear equalization, Zero forcing and LMS Algorithms. Diversity – Micro and Macrodiversity, Diversity combining techniques, Error probability in fading channels with diversity reception, Rake receiver,	06
6	**Multiple Antenna Techniques:** MIMO systems – spatial multiplexing -System model -Pre-coding - Beam forming - transmitter diversity, receiver diversity- Channel state information-capacity in fading and non-fading channels.	05
	Total	28

5IT5-12: Software Testing and Project Management

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Introduction, Basic concepts,** Introduction to S/W project management, S/W project management competencies, responsibilities of a software project manager, Software process, S/W process models, project planning, organization of project team, S/W size estimation, estimation of effort & duration,	04
3	**Black box testing:** Boundary value testing, Equivalence class testing, White box testing: statement coverage, Branch coverage, condition coverage, path coverage, McCabe'scyclomatic complexity; Decision Table based testing, Data flow based testing,	05
4	**White box testing:** Integration testing, System testing, Interaction testing, Performance testing, Mutation testing, Regression testing, error seeding ,	05
5	**Object oriented testing:** issues in object oriented testing , Test case design by object oriented software, Fault based testing, test cases and class hierarchy, Scenario based Test design, Testing surface structure and deep structure,	07
6	**Tests case derived from behaviour models**: Test case generation using UML diagrams, GUI testing, object oriented system testing.	06
	Total	28

5IT5-13: Bioinformatics

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Introduction:** Basics of biology	02
3	**Sequences:** Problem Statement, Edit distance and substitution matrices, HMMs and pairwise HMMs, Global and local alignments, Spliced alignment, Space-efficient sequence alignment, Multiple alignment, Database searching tools, Sequence by hybridization, Profile HMMs	07
4	**Structures:** Protein structure alignment, Protein structure prediction	06
5	**Phylogenetic trees:** Large parsimony and small parsimony problems, Probabilistic approaches, Grammar-based approaches	07
6	**Miscellaneous topics:** Pathways and networks, Microarrays, Biomedical images	05
	Total	28

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5IT4-21: Computer Graphics & Multimedia Lab

Credit: 1 **Max. Marks:50 (IA:30, ETE:20)**
0L+0T+2P **End Term Exam: 2 Hours**

SN	List of Experiments
1	Implementation of Line, Circle and ellipse attributes
2	To plot a point (pixel) on the screen
3	To draw a straight line using DDA Algorithm
4	Implementation of mid-point circle generating Algorithm
5	Implementation of ellipse generating Algorithm
6	Two Dimensional transformations - Translation, Rotation, Scaling, Reflection, Shear
7	Composite 2D Transformations
8	Cohen Sutherland 2D line clipping and Windowing
9	Sutherland – Hodgeman Polygon clipping Algorithm
10	Three dimensional transformations - Translation, Rotation, Scaling
11	Composite 3D transformations
12	Drawing three dimensional objects and Scenes
13	Generating Fractal images

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5IT4-22: Compiler Design Lab

Credit: 1 **Max. Marks:50 (IA:30, ETE:20)**
0L+0T+2P **End Term Exam: 2 Hours**

SN	List of Experiments
1	Introduction: Objective, scope and outcome of the course.
2	To identify whether given string is keyword or not.
3	Count total no. of keywords in a file. [Taking file from user]
4	Count total no of operators in a file. [Taking file from user]
5	Count total occurrence of each character in a given file. [Taking file from user]
6	Write a C program to insert, delete and display the entries in Symbol Table.
7	Write a LEX program to identify following: 1. Valid mobile number 2. Valid url 3. Valid identifier 4. Valid date (dd/mm/yyyy) 5. Valid time (hh:mm:ss)
8	Write a lex program to count blank spaces,words,lines in a given file.
9	Write a lex program to count the no. of vowels and consonants in a C file.
10	Write a YACC program to recognize strings aaab,abbb using a^nb^n, where b>=0.
11	Write a YACC program to evaluate an arithmetic expression involving operators +,-,* and /.
12	Write a YACC program to check validity of a strings abcd,aabbcd using grammar a^nb^nc^md^m, where n , m>0
13	Write a C program to find first of any grammar.

5IT4-23: Analysis of Algorithms Lab

Credit: 1 **Max. Marks:50 (IA:30, ETE:20)**
0L+0T+2P **End Term Exam: 2 Hours**

SN	List of Experiments
1	Sort a given set of elements using the Quicksort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.
2	Implement a parallelized Merge Sort algorithm to sort a given set of elements and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.
3	a. Obtain the Topological ordering of vertices in a given digraph. b. Compute the transitive closure of a given directed graph using Warshall's algorithm.
4	Implement 0/1 Knapsack problem using Dynamic Programming.
5	From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.
6	Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.
7	a. Print all the nodes reachable from a given starting node in a digraph using BFS method. b. Check whether a given graph is connected or not using DFS method.
8.	Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm.
9.	Implement All-Pairs Shortest Paths Problem using Floyd's algorithm.
10	Implement N Queen's problem using Back Tracking.

5IT4-24: Advanced Java Lab

Credit: 1 **Max. Marks:50 (IA:30, ETE:20)**
L+0T+2P **End Term Exam: 2 Hours**

SN	List of Experiments
1	Introduction To Swing, MVC Architecture, Applets, Applications and Pluggable Look and Feel, Basic swing components : Text Fields, Buttons, Toggle Buttons, Checkboxes, and Radio Buttons
2	Java database Programming, java.sql Package, JDBC driver, Network Programming With java.net Package, Client and Server Programs, Content And Protocol Handlers
3	RMI architecture, RMI registry, Writing distributed application with RMI, Naming services, Naming And Directory Services, Overview of JNDI, Object serialization and Internationalization
4	J2EE architecture, Enterprise application concepts, n-tier application concepts, J2EE platform, HTTP protocol, web application, Web containers and Application servers
5	Server side programming with Java Servlet, HTTP and Servlet, Servlet API, life cycle, configuration and context, Request and Response objects, Session handling and event handling, Introduction to filters with writing simple filter application
6	JSP architecture, JSP page life cycle, JSP elements, Expression Language, Tag Extensions, Tag Extension API, Tag handlers, JSP Fragments, Tag Files, JSTL, Core Tag library, overview of XML Tag library, SQL Tag library and Functions Tag library

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Syllabus of

UNDERGRADUATE DEGREE COURSE

B.Tech. VI Semester

Information Technology

Rajasthan Technical University, Kota

Effective from session: 2019 – 2020

6IT3-01: Digital Image Processing

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Introduction to Image Processing:** Digital Image representation, Sampling & Quantization, Steps in image Processing, Image acquisition, color image representation.	04
3	**Image Transformation & Filtering:** Intensity transform functions, histogram processing, Spatial filtering, Fourier transforms and its properties, frequency domain filters, colour models, Pseudo colouring, colour transforms, Basics of Wavelet Transforms.	06
4	**Image Restoration:** Image degradation and restoration process, Noise Models, Noise Filters, degradation function, Inverse Filtering, Homomorphism Filtering.	07
5	**Image Compression:** Coding redundancy, Interpixel redundancy, Psychovisual redundancy, Huffman Coding, Arithmetic coding, Lossy compression techniques, JPEG Compression.	05
6	**Image Segmentation & Representation:** Point, Line and Edge Detection, Thresholding, Edge and Boundary linking, Hough transforms, Region Based Segmentation, Boundary representation, Boundary Descriptors.	05
	Total	28

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6IT4-02:Machine Learning

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Supervised learning algorithm:** Introduction, types of learning, application, Supervised learning: Linear Regression Model, Naive Bayes classifier Decision Tree, K nearest neighbor, Logistic Regression, Support Vector Machine, Random forest algorithm	09
3	**Unsupervised learning algorithm:** Grouping unlabelled items using k-means clustering, Hierarchical Clustering, Probabilistic clustering, Association rule mining, Apriori Algorithm, f-p growth algorithm, Gaussian mixture model.	08
4	**Introduction to Statistical Learning Theory**, Feature extraction - Principal component analysis, Singular value decomposition. Feature selection – feature ranking and subset selection, filter, wrapper and embedded methods, Evaluating Machine Learning algorithms and Model Selection.	08
5	**Semi supervised learning, Reinforcement learning:** Markov decision process (MDP), Bellman equations, policy evaluation using Monte Carlo, Policy iteration and Value iteration, Q-Learning, State-Action-Reward-State-Action (SARSA), Model-based Reinforcement Learning.	08
6	**Recommended system,** Collaborative filtering, Content-based filtering Artificial neural network, Perceptron, Multilayer network, Backpropagation, Introduction to Deep learning.	08
	Total	42

6IT4-03: Information Security System

Credit:2 **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Introduction to security attacks:** services and mechanism, classical encryption techniques- substitution ciphers and transposition ciphers, cryptanalysis, stream and block ciphers.	06
3	**Modern block ciphers**: Block Cipher structure, Data Encryption standard (DES) with example, strength of DES, Design principles of block cipher, AES with structure, its transformation functions, key expansion, example and implementation. Multiple encryption and triple DES, Electronic Code Book, Cipher Block Chaining Mode, Cipher Feedback mode, Output Feedback mode, Counter mode.	06
4	**Public Key Cryptosystems with Applications:** Requirements and Cryptanalysis, RSA cryptosystem, Rabin cryptosystem, Elgamal cryptosystem, Elliptic curve cryptosystem.	06
5	**Cryptographic Hash Functions, their applications:** Simple hash functions, its requirements and security, Hash functions based on Cipher Block Chaining, Secure Hash Algorithm (SHA). Message Authentication Codes, its requirements and security, MACs based on Hash Functions, Macs based on Block Ciphers.Digital Signature, its properties, requirements and security, various digital signature schemes (Elgamal and Schnorr), NIST digital Signature algorithm.	05
6	**Key management and distribution:** symmetric key distribution using symmetric and asymmetric encryptions, distribution of public keys, X.509 certificates, Public key infrastructure. Remote user authentication with symmetric and asymmetric encryption, Kerberos Web Security threats and approaches, SSL architecture and protocol, Transport layer security, HTTPS and SSH.	04
	Total	28

6IT4-04: Computer Architecture and Organization

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Computer Data Representation:** Basic computer data types, Complements, Fixed point representation, Register Transfer and Micro-operations: Floating point representation, Register Transfer language, Register Transfer, Bus and Memory Transfers (Tree-State Bus Buffers, Memory Transfer), Arithmetic Micro-Operations, Logic Micro-Operations, Shift Micro-Operations, Arithmetic logical shift unit. Basic Computer Organization and Design Instruction codes, Computer registers, computer instructions, Timing and Control, Instruction cycle, Memory-Reference Instructions, Input-output and interrupt, Complete computer description, Design of Basic computer, design of Accumulator Unit.	10
3	**Programming The Basic Computer:** Introduction, Machine Language, Assembly Language, assembler, Program loops, Programming Arithmetic and logic operations, subroutines, I-O Programming. Micro programmed Control:Control Memory, Address sequencing, Micro program Example,design of control Unit	7
4	**Central Processing Unit:**Introduction, General Register Organization, Stack Organization, Instruction format, Addressing Modes, data transfer and manipulation,Program Control, Reduced Instruction Set Computer (RISC)Pipeline And Vector Processing, Flynn's taxonomy, Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction, Pipeline, RISC Pipeline, Vector Processing, Array Processors	8
5	**Computer Arithmetic:** Introduction, Addition and subtraction, Multiplication Algorithms (Booth Multiplication Algorithm), Division Algorithms, Floating Point Arithmetic operations, Decimal Arithmetic Unit.Input-Output Organization, Input-Output Interface, Asynchronous Data Transfer, Modes Of Transfer, Priority Interrupt, DMA, Input-Output Processor (IOP), CPUIOP Communication, Serial communication.	8
6	**Memory Organization:** Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory. Multipreocessors: Characteristics of Multiprocessors, Interconnection Structures, Inter-processor Arbitration, Inter-processor Communication andSynchronization, Cache Coherence, Shared Memory Multiprocessors.	8
	Total	42

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6IT4-05: Artificial Intelligence

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Introduction to AI and Intelligent agent:** Different Approach of AI, Problem Solving : Solving Problems by Searching, Uninformed search, BFS, DFS, Iterative deepening, Bi directional search, Hill climbing, Informed search techniques: heuristic, Greedy search, A* search, AO* search, constraint satisfaction problems.	01
3	**Game Playing:** Minimax, alpha-beta pruning, jug problem, chess problem, tiles problem	07
4	**Knowledge and Reasoning:** Building a Knowledge Base: Propositional logic, first order logic, situation calculus. Theorem Proving in First Order Logic. Planning, partial order planning. Uncertain Knowledge and Reasoning, Probabilities, Bayesian Networks.	07
5	**Learning:** Overview of different forms of learning, Supervised base learning: Learning Decision Trees, SVM, Unsupervised based learning, Market Basket Analysis, Neural Networks.	07
6	**Introduction to Natural Language Processing:** Different issue involved in NLP, Expert System, Robotics.	05
	Total	28

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6IT4-06: Distributed System

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	**01**
2	**Distributed Systems:** Features of distributed systems, nodes of a distributed system, Distributed computation paradigms, Model of distributed systems, Types of Operating systems: Centralized Operating System, Network Operating Systems, Distributed Operating Systems and Cooperative Autonomous Systems, design issues in distributed operating systems. Systems Concepts and Architectures: Goals, Transparency, Services, Architecture Models, Distributed Computing Environment (DCE). Theoretical issues in distributed systems: Notions of time and state, states and events in a distributed system, time, clocks and event precedence, recording the state of distributed systems.	**09**
3	**Concurrent Processes and Programming:** Processes and Threads, Graph Models for Process Representation, Client/Server Model, Time Services, Language Mechanisms for Synchronization, Object Model Resource Servers, Characteristics of Concurrent Programming Languages (Language not included).Inter-process Communication and Coordination: Message Passing, Request/Reply and Transaction Communication, Name and Directory services, RPC and RMI case studies	**08**
4	**Distributed Process Scheduling:** A System Performance Model, Static Process Scheduling with Communication, Dynamic Load Sharing and Balancing, Distributed Process Implementation. Distributed File Systems: Transparencies and Characteristics of DFS, DFS Design and implementation, Transaction Service and Concurrency Control, Data and File Replication. Case studies: Sun network file systems, General Parallel file System and Window's file systems. Andrew and Coda File Systems	**08**
5	**Distributed Shared Memory:** Non-Uniform Memory Access Architectures, Memory Consistency Models, Multiprocessor Cache Systems, Distributed Shared Memory, Implementation of DSM systems. Models of Distributed Computation: Preliminaries, Causality, Distributed Snapshots, Modelling a Distributed Computation, Failures in a Distributed System, Distributed Mutual Exclusion, Election, Distributed Deadlock handling, Distributed termination detection.	**08**
6	**Distributed Agreement:** Concept of Faults, failure and recovery, Byzantine Faults, Adversaries, Byzantine Agreement, Impossibility of Consensus and Randomized Distributed Agreement. Replicated Data Management: concepts and issues, Database Techniques, Atomic Multicast, and Update Propagation. CORBA case study: Introduction, Architecture, CORBA RMI, CORBA Services.	**08**
	Total	**42**

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6IT5-11: Information Theory & Coding

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Introduction to information theory:** Uncertainty, Information and Entropy, Information measures for continuous random variables, source coding theorem. Discrete Memory less channels, Mutual information, Conditional entropy.	04
3	**Source coding schemes for data compaction:** Prefix code, Huffman code, Shanon-Fane code & Hempel-Ziv coding channel capacity. Channel coding theorem. Shannon limit.	05
4	**Linear Block Code:** Introduction to error connecting codes, coding & decoding of linear block code, minimum distance consideration, conversion of non-systematic form of matrices into systematic form.	06
5	**Cyclic Code:** Code Algebra, Basic properties of Galois fields (GF) polynomial operations over Galois fields, generating cyclic code by generating polynomial, parity check polynomial. Encoder & decoder for cyclic codes.	06
6	**Convolutional Code:** Convolutional encoders of different rates. Code Tree, Trllis and state diagram. Maximum likelihood decoding of convolutional code: The viterbi Algorithm fee distance of a convolutional code.	06
	Total	28

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6IT5-12: Cloud Computing

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Introduction:** Objective, scope and outcome of the course. Introduction Cloud Computing: Nutshell of cloud computing, Enabling Technology, Historical development, Vision, feature Characteristics and components of Cloud Computing. Challenges, Risks and Approaches of Migration into Cloud. Ethical Issue in Cloud Computing, Evaluating the Cloud's Business Impact and economics, Future of the cloud. Networking Support for Cloud Computing. Ubiquitous Cloud and the Internet of Things	03
3	**Cloud Computing Architecture:** Cloud Reference Model, Layer and Types of Clouds, Services models, Data centre Design and interconnection Network, Architectural design of Compute and Storage Clouds. Cloud Programming and Software: Fractures of cloud programming, Parallel and distributed programming paradigms-Map Reduce, Hadoop, High level Language for Cloud. Programming of Google App engine.	05
4	**Virtualization Technology:** Definition, Understanding and Benefits of Virtualization. Implementation Level of Virtualization, Virtualization Structure/Tools and Mechanisms, Hypervisor VMware, KVM, Xen. Virtualization: of CPU, Memory, I/O Devices, Virtual Cluster and Resources Management, Virtualization of Server, Desktop, Network, and Virtualization of data-centre.	07
5	**Securing the Cloud:** Cloud Information security fundamentals, Cloud security services, Design principles, Policy Implementation, Cloud Computing Security Challenges, Cloud Computing Security Architecture . Legal issues in cloud Computing. Data Security in Cloud: Business Continuity and Disaster Recovery , Risk Mitigation , Understanding and Identification of Threats in Cloud, SLA-Service Level Agreements, Trust Management	07
6	**Cloud Platforms in Industry:** Amazon web services , Google AppEngine, Microsoft Azure Design, Aneka: Cloud Application Platform -Integration of Private and Public Clouds Cloud applications: Protein structure prediction, Data Analysis, Satellite Image Processing, CRM	05
	Total	28

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6IT5-13: Ecommerce & ERP

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Introduction to E-Commerce:** Defining Commerce; Main Activities of Electronic Commerce; Benefits of E-Commerce; Broad Goals of Electronic Commerce; Main Components of E-Commerce; Functions of Electronic Commerce – Communication, Process Management, Service Management, Transaction Capabilities; Process of E-Commerce; Types of E-Commerce; Role of Internet and Web in E-Commerce; Technologies Used; E-Commerce Systems; Pre-requisites of E-Commerce; Scope of E-Commerce; E-Business Models.	03
3	**E-Commerce Activities:** Various Activities of E-Commerce; Various Modes of Operation Associated with E-Commerce; Matrix of E-Commerce Types; Elements and Resources Impacting E-Commerce and Changes; Types of E-Commerce Providers and Vendors; Man Power Associated with E-Commerce Activities; Opportunity Development for E-Commerce Stages; Development of E-Commerce Business Case; Components and Factors for the Development of the Business Case; Steps to Design and Develop an E-Commerce Website.	05
4	**Internet – The Backbone for E-Commerce:** Early Ages of Internet; Networking Categories; Characteristics of Internet; Components of Internet – Internet Services, Elements of Internet, Uniform Resource Locators, Internet Protocol; Shopping Cart, Cookies and E-Commerce; Web Site Communication; Strategic Capabilities of Internet.	07
5	**ISP, WWW and Portals:** Internet Service Provider (ISP); World Wide Web (WWW); Portals – Steps to build homepage, Metadata; Advantages of Portal; Enterprise Information Portal (EIP). **E-Commerce & Online Publishing:** This unit explains the concept of online publishing, strategies and approaches of online publishing, and online advertising.	07
6	**XML and Data Warehousing:** Definition of eXtensible Markup Language (XML); XML Development Goals; Comparison between HTML and XML; Business importance in using XML Based Technology; Advantages, Disadvantages and Applications of XML; Structure of an XML Document; XHTML and X/Secure; Data Warehousing; Data Marts and Operational Data Stores. **E-Marketing:** Traditional Marketing; E-Marketing; Identifying Web Presence Goals – Achieving web presence goals, Uniqueness of the web, Meeting the needs of website visitors, Site Adhesion: Content, format and access; Maintaining a Website; Metrics Defining Internet Units of Measurement; Online Marketing; Advantages of Online Marketing.	05
		28

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6IT4-21: Digital Image Processing Lab

Credit: 1.5 **Max. Marks: 75(IA:45, ETE:30)**
0L+0T+3P **End Term Exam: 2 Hours**

SN	List of Experiments
1	Point-to-point transformation. This laboratory experiment provides for thresholding an image and the evaluation of its histogram. Histogram equalization. This experiment illustrates the relationship among the intensities (gray levels) of an image and its histogram.
2	Geometric transformations. This experiment shows image rotation, scaling, and translation. Two-dimensional Fourier transform
3	Linear filtering using convolution. Highly selective filters.
4	Ideal filters in the frequency domain. Non Linear filtering using convolutional masks. Edge detection. This experiment enables students to understand the concept of edge detectors and their operation in noisy images.
5	Morphological operations: This experiment is intended so students can appreciate the effect of morphological operations using a small structuring element on simple binary images. The operations that can be performed are erosion, dilation, opening, closing, open-close, close-open.

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6IT4-22: Machine Learning Lab

Credit: 1.5 **Max. Marks: 75(IA:45, ETE:30)**
0L+0T+3P **End Term Exam: 2 Hours**

SN	List of Experiments
1	Implement and demonstratethe FIND-Salgorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
2	For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithmto output a description of the set of all hypotheses consistent with the training examples.
3	Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge toclassify a new sample
4	Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets
5	Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
6	Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
7	Write a program to construct aBayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
8	Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
9	Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
10	Implement the non-parametric Locally Weighted Regressionalgorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

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6IT4-23: Python Lab

Credit: 1.5 **Max. Marks: 75(IA:45, ETE:30)**
0L+0T+3P **End Term Exam: 2 Hours**

SN	List of Experiments
1	Write a program to demonstrate basic data type in python.
2	Write a program to compute distance between two points taking input from the user Write a program add.py that takes 2 numbers as command line arguments and prints its sum.
3	Write a Program for checking whether the given number is an even number or not. Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4, . . . , 1/10
4	Write a Program to demonstrate list and tuple in python. Write a program using a for loop that loops over a sequence. Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.
5	Find the sum of all the primes below two million. By considering the terms in the Fibonacci sequence whose values do not exceed four million, WAP to find the sum of the even-valued terms.
6	Write a program to count the numbers of characters in the string and store them in a dictionary data structure Write a program to use split and join methods in the string and trace a birthday of a person with a dictionary data structure
7	Write a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file? Write a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file?
8	Write a program to print each line of a file in reverse order. Write a program to compute the number of characters, words and lines in a file.
9	Write a function nearly equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on. Write function to compute gcd, lcm of two numbers. Each function shouldn't exceed one line.
10	Write a program to implement Merge sort. Write a program to implement Selection sort, Insertion sort.

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6IT4-24: Mobile Application Development Lab

Credit: 1.5 **Max. Marks: 75(IA:45, ETE:30)**
0L+0T+3P **End Term Exam: 2 Hours**

SN	List of Experiments
1	To study Android Studio and android studio installation. Create "Hello World" application.
2	To understand Activity, Intent, Create sample application with login module.(Check username and password).
3	Design simple GUI application with activity and intents e.g. calculator.
4	Develop an application that makes use of RSS Feed.
5	Write an application that draws basic graphical primitives on the screen
6	Create an android app for database creation using SQLite Database.
7	Develop a native application that uses GPS location information
8	Implement an application that writes data to the SD card.
9	Design a gaming application
10	Create an application to handle images and videos according to size.

7IT1 A- SOFTWARE PROJECT MANAGEMENT

Class: VII Sem. B.Tech.	**Evaluation**
Branch: Info. Tech **Schedule per Week** **Lectures: 3**	**Examination Time = Three (3) Hours** **Maximum Marks = 100** **[Mid-term (20) & End-term (80)]**

Units	**Contents of the subject**
I	Project Management: The management spectrum, the people, the product, the process, the project, the W^5HH principle, critical practices Metrics for Process and Project: Metrics in the process and project Domains, software measurements, metrics for software quality, integrating metrics within software process, metrics for small organizations, establishing a software metrics program.
II	Estimation: Observations, Project planning Process, software scope and feasibility, resources, software project estimation, decomposition techniques, empirical estimation models, estimation for object oriented projects, estimation for Agile development and web engineering projects, the make/buy decision.
III	Project Scheduling: Basic concepts, project scheduling, defining a task set and task network, scheduling, earned value analysis. Risk Management: Reactive V/S proactive Risk Strategies, software risks, Risk identification, Risk projection, risk refinement, risk mitigation, monitoring and management, the RMMM plan **Quality Planning.**: Quality Concepts, Procedural Approach to Quality Management, Quantitative Approaches to Quality Management, Quantitative Quality Management Planning, Setting the Quality Goal, Estimating Defects for Other Stages, Quality Process Planning, Defect Prevention Planning.
IV	Quality Management: Quality Concepts, Software Quality assurances, software reviews, formal technical reviews, Formal approaches to SQA, Statistical Software Quality assurances, Change Management: software Configuration Management, The SCM repository, SCM Process, Configuration Management for Web Engineering
V	**Project Execution And Closure:** **Reviews.** The Review Process, Planning, Overview and Preparation, Group Review Meeting, Rework and Follow-up, One-Person Review, Guidelines for Reviews in Projects, Data Collection, Analysis and Control Guidelines, Introduction of Reviews and the NAH Syndrome. **Project Monitoring and Control:** Project Tracking, Activities Tracking, Defect Tracking, Issues Tracking, Status Reports, Milestone Analysis, Actual Versus Estimated Analysis of Effort and Schedule, Monitoring Quality, Risk-Related Monitoring. **Project Closure:** Project Closure Analysis, The Role of Closure Analysis, Performing Closure Analysis.

References:

1. R. S. Pressman, Software Engineering
2. Pankaj Jalote, Software project management in practice, Addison-Wesley
3. B. Hughest & M. Cotterell, Software Project Management.

7 IT 2 A- INFORMATION SYSTEM SECURITY (Common to CS & IT)

Class: VII Sem. B.Tech.	Evaluation
Branch: Info. Tech **Schedule per Week** **Lectures: 3**	**Examination Time = Three (3) Hours** **Maximum Marks = 100** **[Mid-term (20) & End-term (80)]**

Units	Contents of the subject
I	Introduction to security attacks, services and mechanism, classical encryption techniques- substitution ciphers and transposition ciphers, cryptanalysis, stream and block ciphers. Modern Block Ciphers: Block ciphers principals, Shannon's theory of confusion and diffusion, fiestal structure, data encryption standard(DES), differential and linear cryptanalysis of DES, block cipher modes of operations, triple DES.
II	AES, RC6, random number generation. S-box theory: Boolean Function, S-box design criteria, Bent functions, Propagation and nonlinearity, construction of balanced functions, S-box design.
III	Public Key Cryptosystems: Principles of Public Key Cryptosystems, RSA Algorithm, security analysis of RSA, Exponentiation in Modular Arithmetic. Key Management in Public Key Cryptosystems: Distribution of Public Keys, Distribution of Secret keys using Public Key Cryptosystems. X.509 Discrete Logarithms, Diffie-Hellman Key Exchange.
IV	Message Authentication and Hash Function: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions and MAC, MD5 message digest algorithm, Secure hash algorithm(SHA). Digital Signatures: Digital Signatures, authentication protocols, digital signature standards (DSS), proof of digital signature algorithm. Remote user Authentication using symmetric and Asymmetric Authentication
V	Pretty Good Privacy. IP Security: Overview, IP Security Architecture, Authentication Header, Encapsulation Security Payload in Transport and Tunnel mode with multiple security associations (Key Management not Included). Strong Password Protocols: Lamport's Hash, Encrypted Key Exchange.

Text/References:

1. Stalling Williams: Cryptography and Network Security: Principles and Practices, 4th Edition, Pearson Education, 2006.
2. Kaufman Charlie et.al; Network Security: Private Communication in a Public World, 2nd Ed., PHI/Pearson.
3. Pieprzyk Josef and et.al; Fundamentals of Computer Security, Springer-Verlag, 2008.
4. Trappe & Washington, Introduction to Cryptography, 2nd Ed. Pearson.

7IT3 A- DATA MINING & WARE HOUSING (Common to CS & IT)

Class: VII Sem. B.Tech.	Evaluation
Branch: Info. Tech Schedule per Week Lectures: 3	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the subject
I	Overview, Motivation(for Data Mining),Data Mining-Definition & Functionalities, Data Processing, Form of Data Preprocessing, Data Cleaning: Missing Values, Noisy Data, (Binning, Clustering, Regression, Computer and Human inspection), Inconsistent Data, Data Integration and Transformation. Data Reduction:-Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Clustering, Discretization and Concept hierarchy generation.
II	Concept Description: Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisons, Statistical measures in large Databases. Measuring Central Tendency, Measuring Dispersion of Data, Graph Displays of Basic Statistical class Description, Mining Association Rules in Large Databases, Association rule mining, mining Single-Dimensional Boolean Association rules from Transactional Databases– Apriori Algorithm, Mining Multilevel Association rules from Transaction Databases and Mining Multi- Dimensional Association rules from Relational Databases.
III	What is Classification & Prediction, Issues regarding Classification and prediction, Decision tree, Bayesian Classification, Classification by Back propagation, Multilayer feed-forward Neural Network, Back propagation Algorithm, Classification methods K-nearest neighbour classifiers, Genetic Algorithm. Cluster Analysis: Data types in cluster analysis, Categories of clustering methods, Partitioning methods. Hierarchical Clustering- CURE and Chameleon. Density Based Methods-DBSCAN, OPTICS. Grid Based Methods- STING, CLIQUE. Model Based Method –Statistical Approach, Neural Network approach, Outlier Analysis
IV	Data Warehousing: Overview, Definition, Delivery Process, Difference between Database System and Data Warehouse, Multi Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Process Architecture, 3 Tier Architecture, Data Mining.
V	Aggregation, Historical information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining interface, Security, Backup and Recovery, Tuning Data Warehouse, Testing Data Warehouse.

Text Books & References:

1. Data Warehousing in the Real World – Anahory and Murray, Pearson Education.
2. Data Mining – Concepts and Techniques – Jiawai Han and Micheline Kamber.
3. Building the Data Warehouse – WH Inmon, Wiley.

7 IT 4 A- INTERNET PROGRAMMING

Class: VII Sem. B.Tech.	**Evaluation**
Branch: Info. Tech **Schedule per Week** **Lectures: 3**	**Examination Time = Three (3) Hours** **Maximum Marks = 100** **[Mid-term (20) & End-term (80)]**

Units	**Contents of the subject**
I	Introduction , Editing XHTML , First XHTML Example , W3C XHTML Validation service , Headings, Linking , Images , Special Characters and horizontal rules, Lists, Tables, forms, Internet linking, web resources. Cascading Style Sheets Introduction , Inline Styles, Embedded Style Sheets, Conflicting Styles , Linking External Style Sheets, Positioning Elements , Backgrounds , Element Dimensions , Box Model and Text Flow Media types, Building a CSS drop-down menu, User Style Sheets ,CSS3, Web Resources
II	JavaScript: Introduction to Scripting, Control Structures, Functions, Arrays, Objects, and Document object model (DOM): Objects and Collections, Events. XML and RSS: Introduction, XML basics, structuring data, XML namespaces, document type definitions (DTDs), W3C XML schema documents ,XML vocabularies, Extensible style sheet language and XSL transformations, Document object model(DOM),RSS
III	Ajax-enabled rich internet applications: introduction , traditional web applications vs Ajax application , rich internet application (RIAs)with Ajax, history of Ajax, "Raw" Ajax example using the XMLHttpRequest object , using XML and the DOM, creating a full-scale Ajax –enabled application ,dojo toolkit Web Servers (IIS and Apache): introduction, HTTP transactions , multi tier application architecture ,client-side scripting versus server-side scripting ,accessing web servers, Microsoft internet information services(IIS), Apache HTTP server, requesting documents.
IV	PHP: Introduction, PHP basics, string processors and regular expressions , form processing and business logic, connecting to a database, using cookies, dynamic content, operator precedence chart ASP.NET 2.0 and ASP.NET Ajax: introduction, creating and running a simple web form example, web controls, session tracking case study : connecting to a database in ASP.NET
V	Java Server Faces Web applications: introduction, java web technologies, creating and running a simple application in NetBeans, JSF components , session tracking

References

1. Internet & WWW, How to program, DEITEL P.J., H.M., Prentice Hall

7 IT 5 A- COMPUTER GRAPHICS & MULTIMEDIA TECHNIQUES

Class: VII Sem. B.Tech.	**Evaluation**
Branch: Info. Tech **Schedule per Week** **Lectures: 3**	**Examination Time = Three (3) Hours** **Maximum Marks = 100** **[Mid-term (20) & End-term (80)]**

Units	**Contents of the subject**
I	Introduction to Raster scan displays, Storage tube displays, refreshing, flicking, interlacing, color monitors, display processors, resolution, Introduction to Interactive. Computer Graphics: Picture analysis, Overview of programmer's model of interactive graphics, Fundamental problems in geometry. Scan Conversion: point, line, circle, ellipse polygon, Aliasing, and introduction to Anti Aliasing (No anti aliasing algorithm).
II	2D & 3D Co-ordinate system**:** Homogeneous Co-ordinates, Translation, Rotation, Scaling, Reflection, Inverse transformation, Composite transformation. Polygon Representation, Flood Filling, Boundary filling. Point Clipping, Cohen-Sutherland Line Clipping Algorithm, Polygon Clipping algorithms.
III	Hidden Lines & Surfaces: Image and Object space, Depth Buffer Methods, Hidden Facets removal, Scan line algorithm, Area based algorithms. Curves and Splines: Parametric and Non parametric Representations, Bezier curve, B-Spline Curves.
IV	Rendering: Basic illumination model, diffuse reflection, specular reflection, phong shading, Gourand shading, ray tracing, color models like RGB, YIQ, CMY, HSV
V	Multimedia components, Multimedia Input/Output Technologies: Storage and retrieval technologies, Architectural and telecommunication considerations. Animation: Introduction, Rules, problems and Animation techniques.

References

1. J. Foley, A. Van Dam, S. Feiner, J. Hughes: Computer Graphics- Principles and Practice, Addison Wesley.
2. D. Hearn and Baker: Computer Graphics, PHI
3. Multimedia Systems Design, Prabhat Andleigh and Thakkar, PHI.
4. Multimedia Information Networking, N.K.Sharda, PHI.

7 IT 6.1 A- ADVANCED DATA BASE MANAGEMENT SYSTEMS

Class: VII Sem. B.Tech.	**Evaluation**
Branch: Info. Tech **Schedule per Week** **Lectures: 3**	**Examination Time = Three (3) Hours** **Maximum Marks = 100** **[Mid-term (20) & End-term (80)]**

Units	**Contents of the subject**
I	Query Processing and Optimization – Measures of query cost, Implementation of database operations, External Sorting, Materialization vs. Pipelining, Size Estimations of various database operations, Evaluation plans, Cost-based vs. Heuristic optimization, Materialized views.
II	Transaction Processing and Serializability – Database Transaction and its processing, Transaction properties, Concurrent Transactions, Need of Serializability, Conflict vs. View Serializability.
III	Concurrency and Recovery – Implementation of Concurrency: Lock-based protocols and Timestamp-based protocols, Deadlock handling, Database Failures, Recovery Schemes: Shadow Paging and Log-based Recovery, Recovery with Concurrent transactions.
IV	Database Security and Advanced SQL – Database Integrity Constraints, Assertions and Triggers in SQL, Authorization and Authentication in SQL, Nested Subqueries, Views, and Embedded SQL.
V	Distributed Database Systems – Data Storage in Distributed systems, Local vs. Global Transactions, Transaction processing, Concurrency and Recovery in Distributed database systems, Distributed Query processing.

References

1. Elmasri R and Navathe SB, Fundamentals of Database Systems, 3rd Edition, Addison Wesley, 2000.
2. Connolly T, Begg C and Strachan A, Database Systems, 2nd Edition, Addison Wesley, 1999
3. Ceri Pelagatti , Distributed Database: Principles and System - (McGraw Hill)
4. Simon AR, Strategic Database Technology: Management for the Year 2000, Morgan Kaufmann, 1995
5. Gray J and Reuter A, Transaction Processing: Concepts and Techniques, Morgan Kaufmann, 1993

7 IT 6.2 A- Intelligent Systems

Class: VIII Sem. B.Tech.	**Evaluation**
Branch: Info. Tech **Schedule per Week** **Lectures: 3**	**Examination Time = Three (3) Hours** **Maximum Marks = 100** **[Mid-term (20) & End-term (80)]**

Units	**Contents of the subject**
I	Introduction to AI: knowledge Importance of AI, Knowledge Base System, Knowledge organization & manipulation, LISP and other AI programming Languages.
II	Knowledge Representation: Syntax Semantics, Inference Rules, Non-deductive Inference methods, representations using rules, Fuzzy Logic & Natural language computations. Probabilistic Reasoning. Object Oriented Representations.
III	Knowledge Organization & Manipulation: Search & control strategies, matching techniques, knowledge organization & management.
IV	Knowledge Systems Architecture: Rule based, non-production, uncertainty knowledge system building tools.
V	Knowledge Acquisition: General concepts, learning by induction.

References:

1. Artificial Intelligence: Elaine Rich, Kevin Knight, Mc-Graw Hill.
2. Introduction to AI & Expert System: Dan W. Patterson, PHI.
3. Artificial Intelligence by Luger (Pearson Education)
4. Russel & Norvig, Artificial Intelligence: A Modern Approach, Prentice-Hall

7IT 6.3 A- SPEECH PROCESSING

Class: VII Sem. B.Tech.	**Evaluation**
Branch: Info. Tech **Schedule per Week** **Lectures: 3**	**Examination Time = Three (3) Hours** **Maximum Marks = 100** **[Mid-term (20) & End-term (80)]**

Units	**Contents of the subject**
I	**The speech chain**: current capabilities in synthesis and recognition. Acoustic phonetics. Vocal tract physiology: voiced excitation, unvoiced excitation (bursts, frication). Acoustics of uniform tubes, of two- and three-tube models. Comparison to speech data.
II	**Synthesis**: Formant synthesis (series, parallel), Articulatory synthesis, Concatenative Synthesis, Text-to-Speech (normalisation, linguistic units, rules). Articulatory parameters, shape-to-sound transformation, vocal tract imaging, revising the acoustic model.
III	**Letter-sound relations**, phonology; prosody, intelligibility, quality assessment. Ear physiology. Auditory perception. Speech perception.
IV	**Recognition**: Template matching. (Training, distance measures, dynamic time warping), Stochastic models. (Hidden Markov models, Baum-Welch and Forward-Backward algorithms). Large-Vocabulary Recognition. (Phonemic baseforms, language models), Artificial Neural Networks. (Overview, hybrid systems).
V	**Assessing recognition performance**; improving recognition performance; Knowledge-based approaches, auditory models.

References:

1. J N Holmes and W. Holmes, Speech Synthesis and Recognition, 2nd ed., Taylor and Francis, 2001.
2. B. Gold and N. Morgan, Speech and Audio Signal Processing, Wiley and Sons, 2000.
3. G. Childers, Speech Processing and Synthesis Toolboxes, Wiley and Sons, 2000.
4. J. R. Deller, J. R. Proakis, J. H. L. Hansen, Discrete-Time Processing of Speech Signals, Prentice-Hall 1993.
5. P. B. Denes and E. N. Pinson, The Speech Chain, W. H. Freeman & Co 1993.
6. S Furui, Digital Speech Processing, Synthesis and Recognition, Marcel Dekker Inc 1989.
7. D O'Shaughnessy, Speech Communications: Human & Machine, IEEE Press 1999.
8. L R Rabiner and R W Schafer, Digital Processing of Speech Signals, Prentice-Hall 1978.
9. K. N. Stevens, Acoustic Phonetics, MIT

7IT7A- COMPUTER GRAPHICS & MULTIMEDIA LAB

Class: VII Sem. B.Tech.	Evaluation
Branch: Info. Tech. Schedule per Week Practical Hrs.: 2	Examination Time = Four (4) Hours Maximum Marks = 50 [Sessional /Mid-term (30) & End-term (20)]

Objectives:

At the end of the semester, the students should have clearly understood and implemented the following:

1. To produce a single pixel and pre specified pattern on screen:
2. To implement features like changing background color, foreground color, resizing of window, repositioning of window:
3. To implement mid point algorithm to draw circle and ellipse:
4. Use the line drawing & circle drawing programs to draw composite objects containing only circle & lines. You can take shapes like a cart, car etc.
5. To Implement Clipping (various algorithms).
6. Simple fonts, graphical fonts, scalable fonts.
7. Input a polynomial by drawing lines, use appropriate methods for filling and filling convex & concave polynomials.

It is expected that each laboratory assignments to given to the students with an aim to In order to achieve the above objectives

Suggested Platform/Tools:

1. For this lab, the students can choose any platform either Microsoft Windows or Linux.
2. Compilers & Libraries: Microsoft Platform- Visual Studio.Net, Linux – Xlib.
3. No turbo C/C++. No library function except the one required to put a single pixel on the screen.

Indicative List of Experiments:

1. Programs to produce a single pixel produce a pre specified pattern with features like changing background color, foreground color, resizing of window, repositioning of window must be demonstrated.
2. Use Mid Point algorithm to draw line between two points. The program must be independent of the slope i.e. lines of all slopes must be drawn.
3. Use Mid Point algorithm to draw ellipse. Implement circle drawing as a special case of ellipse. Extend this to draw arcs between points.
4. Programs to draw composite objects containing circles & lines, drawing lines thicker than one pixel, you can take shapes like a cart, car etc.
5. Programs to demonstrate text generation e.g. simple fonts, graphical fonts, and scalable fonts.
6. Programs to demonstrate filling algorithms eg. filling convex & concave polynomials. The program must be able to (i) input a polynomial by drawing lines (ii) determine whether convex or concave (iii) use appropriate methods for filling.
7. Programs to demonstrate clipping algorithms eg. program to clip a (i) line and (ii) polygon using Cohen-Sutherland Clipping algorithm(s), clipping lines, circles against a rectangular clip area.
8. Programs to demonstrate presentation of geometrical objects e.g.circle and rectangle with audio description i.e. size, color of boundary and interior etc. played synchronously one after another.

7 IT 8 A- DMW Lab

Class: VII Sem. B.Tech.	Evaluation
Branch: I.T. Schedule per Week Practical Hrs : 3	Examination Time = Four (4) Hours Maximum Marks = 100 [Sessional/Mid-term (60) & End-term (40)]

Objectives:

1. The students shall be able to use following modules of UML for system description, implementation and finally for product development.

   - Capture a business process model.
   - The User Interaction or Use Case Model - describes the boundary and interaction between the system and users. Corresponds in some respects to a requirements model.
   - The Interaction or Communication Model - describes how objects in the system will interact with each other to get work done.
   - The State or Dynamic Model - State charts describe the states or conditions that classes assume over time. Activity graphs describe the workflows the system will implement.
   - The Logical or Class Model - describes the classes and objects that will make up the system.
   - The Physical Component Model - describes the software (and sometimes hardware components) that make up the system.
   - The Physical Deployment Model - describes the physical architecture and the deployment of components on that hardware architecture.

The students are expected to use the UML models, prepare necessary documents using UML and implement a system. Some hardware products like digital clock, digital camera, washing machine controller, air conditioner controller, an elctronic fan regulator, an elementary mobile phone etc. may also be chosen.

The students shall be assigned one problem on software based systems and another involving software as well as hardware.

7 IT 9 A- INTERNET PROGRAMMING LAB

Class: VII Sem. B.Tech.	**Evaluation**
Branch: I.T. **Schedule per Week** **Practical Hrs : 2**	**Examination Time = Four (4) Hours** **Maximum Marks = 50** **[Sessional/Mid-term (30) & End-term (20)]**

Objectives: At the end of the semester, the students should have clearly understood and implemented the following:

1. Develop basic understanding of HTML script: overview of HTML, basic HTML tags, title, head and body.
2. Write web pages in HTML: formatting text in HTML, inserting photographs on the page, drawing tables, creating hyperlinks-internal and external, creating hyperlinks of external web sites.
3. Develop understanding of creating standard view of web site: displaying multiple pages over a single page, displaying it as standard view like header and footer, creating standard text formatting over the web site.
4. Develop understanding common formation over a web site: creating and using css, understanding importance of common text formatting over a website.
5. Develop understanding of server side scripting language: basic concepts of scripting language, client side and server side scripting, introduction to php, variable, control statements, loops .
6. Develop applications using php and MySQL: using php to access database, mysql database selection, create, update and delete script in php.

It is expected that each laboratory assignments to given to the students with an aim to In order to achieve the above objectives

Indicative List of Experiments:

1. Develop a static html page using style sheet to show your own profile. Add pages one by one to show 5 photos, to show your academics in tabular format, a page containing 5 links to your favorite website, navigational links to all above pages (menu), header, footer, left-sidebar, right sidebar etc.
2. Use Cascading Style Sheets to format your all pages in a common format.
3. Write a simple "hello word" program using php.
4. Write a program to accept two strings (name and age) from user. Print welcome statement e.g. “Hi Ram, your age is 24."
5. Write a program to create a calculator, which can support addition, subtraction, multiply and division operations.
6. Write a program to take input parameters for a table (no. of rows and no. of columns) and create the desired table.
7. Create a "Contact Me" page -Ask user to enter his name, email ID, Use Java-Script to verify entered email address. Store submitted value in a MySql database. Display latest 5 submitted records in contact me page. Display above record with navigation support. e.g. (next, previous, first, last)

8 IT 1 A- Software Testing & Validation

Class: VIII Sem. B.Tech.	Evaluation
Branch: Information Technology **Schedule per Week** **Lectures: 3**	**Examination Time = Three (3) Hours** **Maximum Marks = 100** **[Mid-term (20) & End-term (80)]**

Units	Contents of the subject
I	**Software verification and validation**-introduction, verification, methods of verification, validation, level of validation, principle of testing, context of texting in producing software, white box testing- definition, static testing, structural testing, black box testing
II	**Integration Testing-**Scenario Testing, defect bash, system and acceptance testing, functional, non-functional testing, performance testing, methodology, tools and process
III	**Regression Testing, internationalization**-Introduction, test phases of internationalization testing, enabling testing, locale testing, language testing ,localization testing ,ad-hoc testing-overview, buddy testing, pair testing, explainatory testing, iterative testing agile and extreme testing.
IV	**Testing of object oriented systems**- Introduction, primer on object-oriented software, Differences in OO testing. **Usability and Accessibility Testing-** what is usability testing, approach to usability,when to do usability testing, how to achieve usability, quality factors for usability, accessibility testing, tools for usability.
V	Test planning, Test management, Test process and reporting,Software test automation, design and architecture of automation, process model for automation, test matrices and measurement- type of metrics, project metrics, productivity metrics, progress metrics, release metrics

8IT2 A- Digital Image Processing (Common to CS & IT)

Class: VIII Sem. B.Tech.	Evaluation
Branch: Computer Engg. **Schedule per Week** **Lectures: 3**	**Examination Time = Three (3) Hours** **Maximum Marks = 100** **[Mid-term (20) & End-term (80)]**

Units	Contents of the subject
I	**Introduction to Image Processing:** Digital Image representation, Sampling & Quantization, Steps in image Processing, Image acquisition, color image representation
II	**Image Transformation & Filtering:** Intensity transform functions, histogram processing, Spatial filtering, Fourier transforms and its properties, frequency domain filters, colour models, Pseudo colouring, colour transforms, Basics of Wavelet Transforms
III	**Image Restoration:** Image degradation and restoration process, Noise Models, Noise Filters, degradation function, Inverse Filtering, Homomorphism Filtering
IV	**Image Compression:** Coding redundancy, Interpixel redundancy, Psychovisual redundancy, Huffman Coding, Arithmetic coding, Lossy compression techniques, JPEG Compression
V	**Image Segmentation & Representation:** Point, Line and Edge Detection, Thresholding, Edge and Boundary linking, Hough transforms, Region Based Segmentation, Boundary representation, Boundary Descriptors, Regional

Suggested Readings/Books

1. Gonzalez and Woods: Digital Image Processing ISDN 0-201-600- 781, Addison Wesley 1992.

Boyle and Thomas: Computer Vision - A First Gurse 2nd Edition, ISBN 0-632-028-67X, Blackwell

Science 1995.

2. Gonzalez and Woods: Digital Image Processing ISDN 0-201-600- 781, Addison Wesley 1992.

3. Pakhera Malay K: Digital Image Processing and Pattern Recogination, PHI.

4. Trucco&Verri: Introductory Techniques for 3-D Computer Vision, Prentice Hall, Latest Edition

5. Low: Introductory Computer Vision and Image Processing, McGraw-Hill 1991, ISBN 0-07-707403-3.

8 IT3A- Data Compression Techniques

Class: VII Sem. B.Tech.	Evaluation
Branch: Computer Engg. **Schedule per Week** **Lectures: 3**	**Examination Time = Three (3) Hours** **Maximum Marks = 100** **[Mid-term (20) & End-term (80)]**

Units	Contents of the subject
I	Compression Techniques: Lossless, lossy, measure of performance, modeling & coding. Lossless compression: Derivation of average information, data models, uniquely decodable codes with tests, prefix codes, Kraft-Mc Millan inequality. Huffman coding: Algorithms, minimum variance Huffman codes, optimality, length extended codes, adaptive coding, Rice codes, using Huffman codes for lossless image compression.
II	Arithmetic coding with application to lossless compression. Dictionary Techniques: LZ77, LZ78, LZW Predictive coding: Burrows-Wheeler Transform and move-to-front coding, JPEG-LS Facsimile Encoding: Run length, T.4 and T.6
III	Lossy coding- Mathematical preliminaries: Distortion criteria, conditional entropy, average mutual information, differential entropy, rate distortion theory, probability and linear system models. Scalar quantization: The quantization problem, uniform quantizer, Forward adaptive quantization, non-uniform quantization-Formal adopting quantization, companded Quantization Vector quantization: Introduction, advantages, The Linde-Ruzo-Grey algorithm, lattice vector quantization.
IV	Differential encoding – Introduction, Basic algorithm, Adaptive DPCM, Delta modulation, speech and image coding using delta modulation. Sampling in frequency and time domain, z-transform, DCT, DST, DWHT, quantization and coding of transform coefficient.
V	Sub band coding: Introduction, Filters, Basic algorithm, Design of Filter banks, G.722, MPEG. Wavelet based compression: Introduction, wavelets multi-resolution analysis and the scaling function implementation using filters.

Text Books & References:

1. Sayood K: Introduction to Data Compression: ELSEVIER 2005.

8 IT 4.1 A- MOBILE COMPUTING (Common to CS & IT)

Class: VIII Sem. B.Tech.	**Evaluation**
Branch: Info. Tech **Schedule per Week** **Lectures: 3**	**Examination Time = Three (3) Hours** **Maximum Marks = 100** **[Mid-term (20) & End-term (80)]**

Units	**Contents of the subject**
I	Mobile computing: Definitions, adaptability issues (transparency, Environmental Constraints, application aware adaptation), mechanisms for adaptation and incorporating adaptations. Mobility management: mobility management, location management principle and techniques, PCS location management Scheme.
II	Data dissemination and management: challenges, Data dissemination, bandwidth allocation for publishing, broadcast disk scheduling, mobile cache maintenance schemes, Mobile Web Caching. Introduction to mobile middleware.
III	Middleware for application development: adaptation, Mobile agents. Service Discovery Middleware: Service Discovery & standardization Methods (universally Unique Identifiers, Textual Description & using interfaces), unicast Discovery, Multicast Discovery & advertisement, service catalogs, Garbage Collection, Eventing.
IV	Mobile IP, Mobile TCP, Database systems in mobile environments, World Wide Web and mobility
V	Ad Hoc networks, localization, MAC issues, Routing protocols, global state routing (GSR), Destination sequenced distance vector routing (DSDV), Dynamic source routing (DSR), Ad Hoc on demand distance vector routing (AODV), Temporary ordered routing algorithm (TORA), QoS in Ad Hoc Networks, applications.

References:

1. Frank Adelstein, Sandeep Gupta, Golden Richard III, Loren Schwiebert, Fundamentals of Mobile and Pervasive Computing, TMH.
2. Principles of mobile computing Hansmann & Merk., Springer
3. Mobile communications Jochen Schiller , Pearson
4. 802.11 wireless networks Matthew S.Gast, O'REILLY.
5. Wireless LANs: Davis & McGuffin, McGraw Hill
6. Mobile Communications Handbook by Jerry D. Gybson
7. Mobile Communications Handbook by Raymond Steel

8 IT 4.2 A- Information Retrieval (Common to CS & IT)

Class: VIII Sem. B.Tech.	Evaluation
Branch: Info. Tech **Schedule per Week** **Lectures: 3**	**Examination Time = Three (3) Hours** **Maximum Marks = 100** **[Mid-term (20) & End-term (80)]**

Units	Contents of the subject
I	Knowledge Representation: Knowledge representation, Basics of Prepositional logic, Predicate logic, reasoning using first order logic, unification, forward chaining, backward chaining, resolution Production rules, frames, semantic networks scripts.
II	Ontology Development: Description logic-taxonomies, Topic maps Ontology, Definition expressing ontology, logically ontology representations, – XML, RDF, RDFS, OWL, OIL, ontology development for specific domain, ontology engineering, Semantic web services.
III	Information Retrieval Modeling: Information retrieval, taxonomy, formal characterization, classic information retrieval, set theoretic model, algebraic model, probabilistic model, structured text, retrieval models, models for browsing, retrieval performance evaluation, keyword based querying, pattern matching, structural queries, query operations.
IV	Text and Multimedia Languages and Properties: Introduction, metadata, markup languages, multimedia. Text operations: document preprocessing, document clustering text Compressionbasic concepts - statistical methods. Indexing and searching: inverted files, suffix trees, signature file,Booleanqueries, sequential searching, pattern matching.
V	Recent Trends in IR: Parallel and distributed IR, multimedia IR, data modeling, query languages, A generic Multimedia indexing Approach, one dimensional time series, two dimensional color

	images, Automatic feature extraction. Web Searching, Characterizing the Web, Search Engines, Browsing, Meta searchers, Searching using hyperlinks

TEXT BOOKS

1. Stuart Russell and Peter Norvig, "Artificial Intelligence – A Modern Approach", Pearson Education, Second edition, 2003. (UNIT I)

2. Michael C. Daconta, Leo J. Obart and Kevin J. Smith,"Semantic Web – A Guide to the Future of XML, Web Services and Knowledge Management", Wiley Publishers, 2003 (UNIT II)

3. Ricardo Baeza-Yates, BerthierRibeiro-Neto, "Modern Information Retrieval", Addison Wesley, 1999. (UNITs III, IV & V)

REFERENCES

1. Elain Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw-Hill, Third edition, 2003

2. Christopher D. Manning, PrabhakarRaghavan and HinrichSchutze, "Introduction to Information Retrieval", Cambridge University Press, 2008.

8 IT 4.3A- Robotics

Class: Vlll Sem. B.Tech.	Evaluation
Branch: Info. Tech **Schedule per Week** **Lectures: 3**	**Examination Time = Three (3) Hours** **Maximum Marks = 100** **[Mid-term (20) & End-term (80)]**

Unit	Contents
I	Introduction -- brief history, types, classification and usage, Science and Technologyof robots, Some useful websites, textbooks and research journals.
II	Elements of robots -- joints, links, actuators, and sensorsPosition and orientation of a rigid body, Homogeneous transformations,Representation of joints, link representation using D-H parameters, Examples of D-Hparameters and link transforms, different kinds of actuators – stepper, DC servo andbrushless motors, model of a DC servo motor, Types of transmissions, Purpose ofsensors, internal and external sensors, common sensors – encoders, tachometers,strain gauge based force-torque sensors
III	Introduction, Direct and inverse kinematics problems, Examples of kinematics of common serial manipulators, workspace of a serial robot, Inverse kinematics of constrained and redundant robots, Tractrix based approach for fixed and free robots and multi-body systems, simulations and experiments, Solution procedures usingtheory of elimination, Inverse kinematics solution for the general 6R serialmanipulator.
IV	Degrees-of-freedom of parallel mechanisms and manipulators, Active and passivejoints, Constraint and loop-closure equations, Direct kinematics problem, Mobility ofparallel manipulators, Closed-from and numerical solution, Inverse kinematics ofparallel manipulators and mechanisms, Direct kinematics of Gough-Stewart platform.
V	Linear and angular velocity of links, Velocity propagation, Manipulator Jacobians forserial and parallel manipulators, Velocity ellipse and ellipsoids, Singularity analysisfor serial and parallel manipulators, Loss and gain of degree of freedom, Statics ofserial and parallel manipulators, Statics and force transformation matrix of a Gough-Stewart platform, Singularity analysis and statics.

TEXT BOOKS

1. Mittal and Nagrath, Robotics and Control, Tata McGraw-Hill Education, 2003.

2. Fred G. Martin, Robotic Explorations: A Hands On Introduction to Engineering, Pearson Education, 2001.

8IT5A- Software Testing Lab

Class: VIII Sem. B.Tech.	**Evaluation**
Branch: I.T. **Schedule per Week** **Practical Hrs.: 3**	**Examination Time = Four (4) Hours** **Maximum Marks = 100** **[Sessional/Mid-term (60) & End-term (40)]**

S. No.	**List of Experiments**
1	Hands on Software Engineering principles Infrastructure.
2.	usage of Front-end and Back-end technologies and packages Prepare the following documents for three of the experiments listed below using software engineering methodology. 1. Program Analysis and Project Planning. 2. Thorough study of the problem – Identify project scope, Objectives, 3. Software requirement Analysis
3	Describe the individual Phases / Modules of the project, Identify deliverables
4	Software Design a. Use work products – Data dictionary, Use case diagrams and activity diagrams, build and test class diagrams, b. Sequence diagrams and add interface to class diagrams, DFD, ER diagrams c. Software Development and Debugging using any Front end and Back end tool d. Software Verification and Validation procedures

8IT6A- Digital Image Processing lab (Common to CS & IT)

Class: VIII Sem. B.Tech.	Evaluation
Branch: Info. Tech **Schedule per Week** **Practical Hrs:2**	**Examination Time = Three (3) Hours** **Maximum Marks =50** **[Mid-term (30) & End-term (20)]**

S. No.	List of Experiment
1	Color image segmentation algorithm development
2	Wavelet/vector quantization compression
3	Deformable templates applied to skin tumor border finding
4	Helicopter image enhancement
5	High-speed film image enhancement
6	Computer vision for skin tumor image evaluation
7	New Border Images

8IT7A- Advance Web Programming

Class: VIIl Sem. B.Tech.	Evaluation
Branch: Info. Tech **Schedule per Week** **Practical Hrs: 2**	**Examination Time = Three (3) Hours** **Maximum Marks = 50** **[Mid-term (60) & End-term (40)]**

S. No.	List of Experiment
1	. Creation of HTML Files
2	Working with Client Side Scripting : VBScript, JavaScript
3	Configuration of web servers: Apache Web Server, Internet Information Server (IIS)
4	Working with ActiveX Controls in web documents
5	Experiments in Java Server Pages: Implementing MVC Architecture using Servlets, Data Access Programming (using ADO), Session and Application objects, File System Management
6	Working with other Server Side Scripting: Active Server Pages, Java Servlets, PHP
7	Experiments in Ajax Programming
8	Developing Web Services
9	Developing any E-commerce application (Mini Project)
10	Application Development in cloud computing Environment
11	Experiment Using Open Source Tool e.g. ANEKA

8IT8A- MOBILE APPLICATION DEVELOPMENT LAB

Class: VIII Sem. B.Tech.	Evaluation
Branch: Info. Tech **Schedule per Week** **Practical Hrs:2**	**Examination Time = Three (3) Hours** **Maximum Marks = 50** **[Mid-term (30) & End-term (20)]**

S. No.	List of Experiment
1	Installation of Java wireless toolkit (J2ME)
2	Working with J2ME Features
3	Threads and High Level UI
4	Working on drawing and images
5	Developing Networked Applications using the wireless toolkit
6	Authentication with a web server

Scheme and Syllabus

Rajasthan Technical University, Kota

B. Tech. in Mechanical Engineering

(Session 2019-20)

Scheme of
UNDERGRADUATE DEGREE COURSE

Mechanical Engineering

Rajasthan Technical University, Kota
Effective from session: 2018 – 2019

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Teaching & Examination Scheme

B.Tech. : Mechanical Engineering
2nd Year - III Semester

THEORY												
SN	**Category**	**Course**		**Contact hrs/week**			**Marks**				**Cr**
		Code	**Title**	**L**	**T**	**P**	**Exm Hrs**	**IA**	**ETE**	**Total**	
1	BSC	3ME2-01	Advance Engineering Mathematics-I	3	0	0	3	30	120	**150**	**3**
2	HSMC	3ME1-02/ 3ME1-03	Technical Communication/ Managerial Economics and Financial Accounting	2	0	0	2	20	80	**100**	**2**
3	ESC	3ME3-04	Engineering Mechanics	2	0	0	2	20	80	**100**	**2**
4	PCC	3ME4-05	Engineering Thermodynamics	3	0	0	3	30	120	**150**	**3**
5		3ME4-06	Materials Science and Engineering	3	0	0	3	30	120	**150**	**3**
6		3ME4-07	Mechanics of Solids	3	1	0	3	40	160	**200**	**4**
			Sub Total	16	1	0		170	680	**850**	**17**
PRACTICAL & SESSIONAL											
7	PCC	3ME4-21	Machine drawing practice	0	0	3		45	30	**75**	**1.5**
8		3ME4-22	Materials Testing Lab	0	0	3		45	30	**75**	**1.5**
9		3ME4-23	Basic Mechanical Engineering Lab	0	0	3		45	30	**75**	**1.5**
10		3ME4-24	Programming using MATLAB	0	0	3		45	30	**75**	**1.5**
11	PSIT	3ME7-30	Industrial Training	0	0	1		0	0	**50**	**1**
12	SODECA	3ME8-00	Social Outreach, Discipline & Extra Curricular Activities	0	0	0		0	0	**25**	**0.5**
			Sub- Total	0	0	13		180	120	**375**	**7.5**
			TOTAL OF III SEMESTER	16	1	13		350	800	**1225**	**24.5**

L: *Lecture,* ***T:*** *Tutorial,* ***P:*** *Practical,* ***Cr:*** *Credits*

ETE: *End Term Exam,* ***IA:*** *Internal Assessment*

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

Scheme of

UNDERGRADUATE DEGREE COURSE

Mechanical Engineering

Rajasthan Technical University, Kota

Effective from session: 2018 – 2019

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Teaching & Examination Scheme

B.Tech. : Mechanical Engineering
2nd Year - IV Semester

THEORY												
SN	**Category**	**Course**		**Contact hrs/week**			**Marks**				**Cr**
		Code	**Title**	**L**	**T**	**P**	**Exm Hrs**	**IA**	**ETE**	**Total**	
1	BSC	4ME2-01	Data analytics	2	0	0	2	20	80	**100**	**2**
2	HSMC	4ME1-03/ 4ME1-02	Managerial Economics and Financial Accounting/ Technical Communications	2	0	0	2	20	80	**100**	**2**
3	ESC	4ME3-04	Digital Electronics	2	0	0	2	20	80	**100**	**2**
4	PCC	4ME4-05	Fluid Mechanics and Fluid Machines	3	1	0	3	40	160	**200**	**4**
5		4ME4-06	Manufacturing Processes	3	0	0	3	30	120	**150**	**3**
6		4ME4-07	Theory of machines	3	1	0	3	40	160	**200**	**4**
			Sub Total	15	2	0		170	680	**850**	**17**
PRACTICAL & SESSIONAL											
7	PCC	4ME3-21	Digital Electronics lab	0	0	3		45	30	**75**	**1.5**
8		4ME4-22	Fluid Mechanics lab	0	0	3		45	30	**75**	**1.5**
9		4ME4-23	Production practice lab	0	0	3		45	30	**75**	**1.5**
10		4ME4-24	Theory of machines Lab	0	0	3		45	30	**75**	**1.5**
11	SODECA	4ME8-00	Social Outreach, Discipline & Extra Curricular Activities	0	0	0		0	0	**25**	**0.5**
			Sub- Total	0	0	12		180	120	**325**	**6.5**
			TOTAL OF IV SEMESTER	15	2	12		350	800	**1175**	**23.5**

L: *Lecture,* ***T:*** *Tutorial,* ***P:*** *Practical,* ***Cr:*** *Credits*

ETE: *End Term Exam,* ***IA:*** *Internal Assessment*

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

Scheme of

UNDERGRADUATE DEGREE COURSE

B.Tech. V & VI Semester

Mechanical Engineering



Rajasthan Technical University, Kota

Effective from session: 2019-20

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Teaching & Examination Scheme
B.Tech. : Mechanical Engineering
3rd Year –V Semester

SN	Category	Course		Contact hrs/week			Marks				Cr
		Code	Title	L	T	P	Exm Hrs	IA	ETE	Total	
THEORY											
1	ESC	5ME3-01	Mechatronic Systems	2	0	0	2	20	80	**100**	**2**
2	PCC/ PEC	5ME4-02	Heat Transfer	3	0	0	3	30	120	**150**	**3**
3		5ME4-03	Manufacturing Technology	3	0	0	3	30	120	**150**	**3**
4		5ME4-04	Design of Machine Elements I	3	0	0	3	30	120	**150**	**3**
5		5ME4-05	Principles of Management	2	0	0	2	20	80	**100**	**2**
6		Professional	Elective I (any one)	3	0	0	3	30	120	**150**	**3**
		5ME5-11	Steam Engineering								
		5ME5-12	Automobile Engineering								
		5ME5-13	Non Destructive Evaluation & Testing								
		Sub Total		**16**	**0**	**0**		**160**	**640**	**800**	**16**
PRACTICAL & SESSIONAL											
7	ESC	5ME3-21	Mechatronic Lab	0	0	2	2	30	20	**50**	**1**
8	PCC	5ME4-22	Heat Transfer lab	0	0	2	2	30	20	**50**	**1**
9		5ME4-23	Production Engineering Lab	0	0	2	2	30	20	**50**	**1**
10		5ME4-24	Machine Design Practice I	0	0	2	2	30	20	**50**	**1**
11	PSIT	5ME7-30	Industrial Training	0	0	1	1	75	50	**125**	**2.5**
12	SODECA	5ME8-00	Social Outreach, Discipline & Extra Curricular Activities						25	**25**	**0.5**
		Sub- Total		**0**	**0**	**9**		**195**	**155**	**350**	**7**
		TOTAL OF V SEMESTER		**16**	**0**	**9**		**355**	**795**	**1150**	**23**

L: *Lecture,* ***T:*** *Tutorial,* ***P:*** *Practical,* ***Cr:*** *Credits*
ETE: *End Term Exam,* ***IA:*** *Internal Assessment*

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

Teaching & Examination Scheme
B. Tech.: Mechanical Engineering
3rd Year – VI Semester

SN	Category	Course Code	Course Title	Contact hrs/week L	T	P	Marks Exm Hrs	IA	ETE	Total	Cr
THEORY											
1	ESC	6ME3-01	Measurement and Metrology	2	0	0	2	20	80	**100**	**2**
2	PCC/ PEC	6ME4-02	CIMS	3	0	0	3	30	120	**150**	**3**
3		6ME4-03	Mechanical Vibrations	3	0	0	3	30	120	**150**	**3**
4		6ME4-04	Design of Machine Elements II	3	0	0	3	30	120	**150**	**3**
5		6ME4-05	Quality Management	3	0	0	3	30	120	**150**	**3**
6		Professional	Elective II (any one)	3	0	0	3	30	120	**150**	**3**
		6ME5-11	Refrigeration and Air Conditioning								
		6ME5-12	NON Conventional Machining Methods								
		6ME5-13	MEMS and Microsystems								
		Sub Total		**17**	**0**	**0**		**170**	**680**	**850**	**17**
PRACTICAL & SESSIONAL											
7	PCC	6ME4-21	CIMS Lab	0	0	3	3	45	30	**75**	**1.5**
8		6ME4-22	Vibration Lab	0	0	3	3	45	30	**75**	**1.5**
9		6ME4-23	Machine Design Practice II	0	0	3	3	45	30	**75**	**1.5**
10		6ME4-24	Thermal Engineering Lab I	0	0	3	3	45	30	**75**	**1.5**
11	SODECA	6ME8-00	Social Outreach, Discipline & Extra Curricular Activities						25	**25**	**0.5**
		Sub- Total		**0**	**0**	**12**		**180**	**145**	**325**	**6.5**
		TOTAL OF VI SEMESTER		**17**	**0**	**12**		**350**	**825**	**1175**	**23.5**

L: *Lecture,* ***T:*** *Tutorial,* ***P:*** *Practical,* ***Cr:*** *Credits*

ETE: *End Term Exam,* ***IA:*** *Internal Assessment*

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

Rajasthan Technical University, Kota
B.Tech. (Mechanical Engineering Scheme)

Subject Code	Title		L	T	P			
7ME1A	Finite Element Methods		3		Theory Subjects	20	80	100
7ME2A	Refrigeration & Air-conditioning		3	1		20	80	100
7ME3A	Operations Research		3	1		20	80	100
7ME4A	Turbomachines		3			20	80	100
7ME5A	Operations Management		3			20	80	100
7ME6.1A	Micro and Nano Manufacturing		3			20	80	100
7ME6.2A	Robotics							
7ME6.3A	CNC Machines and Programming							
	Practicals and Sessionals							
7ME7A	Thermal Engineering Lab-II		Lab courses		3	60	40	100
7ME8A	FEM Lab				3	60	40	100
7METR	Practical Training & Industrial visit				2		100	100
7MEPR	Project-1				2	50		50
7MEDC	Discipline & Extra Curricular Activity							50
	Total		18	2	10			1000
SEMESTER VIII	8	8	Hrs. / Week			*IA*	*Exam*	Total
Subject Code	Title		L	T	P			
8ME1A	Computer Integrated Manufacturing Systems		3		Theory Subjects	20	80	100
8ME2A	Laws for Engineers		3			20	80	100
8ME3A	Power Generation		3	1		20	80	100
8ME4.1A	Product Development and Launching		3			20	80	100
8ME4.2A	Computational Fluid Dynamics							
8ME4.3A	Total Quality Management							
	Practicals and Sessionals							
8ME5A	CAM Lab		Lab courses		2	45	30	75
8ME6A	CAD Lab				3	60	40	100
8ME7A	Industrial Engineering Lab - II				2	45	30	75
8MEPR	Project-2				4	120	80	200
8MESM	Seminar				2	60	40	100
8MEDC	Discipline & Extra Curricular Activity							50
	Total		12	1	13			1000

Syllabus of

UNDERGRADUATE DEGREE COURSE

Mechanical Engineering

Rajasthan Technical University, Kota

Effective from session: 2018 – 2019

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

2nd Year - III Semester: B.Tech. (Mechanical Engineering)

3ME2-01: ADVANCE ENGINEERING MATHEMATICS-I

Credit: 3 **Max. Marks: 150 (IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Numerical Methods – 1:** Finite differences, Relation between operators, Interpolation using Newton's forward and backward difference formulae. Gauss's forward and backward interpolation formulae. Stirling's Formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae. Numerical Differentiation, Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules.	**10**
2	**Numerical Methods – 2:** Numerical solution of ordinary differential equations: Taylor's series, Euler and modified Euler's methods. Runge- Kutta method of fourth order for solving first and second order equations. Milne's and Adam's predicator-corrector methods. Solution of polynomial and transcendental equations-Bisection method, Newton-Raphson method and Regula-Falsi method.	**8**
3	**Laplace Transform:** Definition and existence of Laplace transform, Properties of Laplace Transform and formulae, Unit Step function, Dirac Delta function, Heaviside function, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem. Evaluation of integrals by Laplace transform, solving ODEs by Laplace transforms method.	**10**
4	**Fourier Transform:** Fourier Complex, Sine and Cosine transform, properties and formulae, inverse Fourier transforms, Convolution theorem, application of Fourier transforms to partial ordinary differential equation (One dimensional heat and wave equations only).	**7**
5	**Z-Transform:** Definition, properties and formulae, Convolution theorem, inverse Z-transform, application of Z-transform to difference equation.	**5**
	Total	**40**

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

2nd Year - III Semester: B.Tech. (Mechanical Engineering)

3ME1-02/4ME1-02: TECHNICAL COMMUNICATION

Credit: 2 **Max. Marks: 100 (IA:20, ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	**Introduction to Technical Communication-** Definition of technical communication, Aspects of technical communication, forms of technical communication, importance of technical communication, technical communication skills (Listening, speaking, writing, reading writing), linguistic ability, style in technical communication.	4
2	**Comprehension of Technical Materials/Texts and Information Design & development-** Reading of technical texts, Reading and comprehending instructions and technical manuals, Interpreting and summarizing technical texts, Note-making. Introduction of different kinds of technical documents, Information collection, factors affecting information and document design, Strategies for organization, Information design and writing for print and online media.	6
3	**Technical Writing, Grammar and Editing**- Technical writing process, forms of technical discourse, Writing, drafts and revising, Basics of grammar, common error in writing and speaking, Study of advanced grammar, Editing strategies to achieve appropriate technical style, Introduction to advanced technical communication. Planning, drafting and writing Official Notes, Letters, E-mail, Resume, Job Application, Minutes of Meetings.	8
4	**Advanced Technical Writing**- Technical Reports, types of technical reports, Characteristics and formats and structure of technical reports. Technical Project Proposals, types of technical proposals, Characteristics and formats and structure of technical proposals. Technical Articles, types of technical articles, Writing strategies, structure and formats of technical articles.	8
	Total	26

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

3ME1-03/4ME1-03 : MANAGERIAL ECONOMICS AND FINANCIAL ACCOUNTING

Credit: 2 **Max. Marks: 100 (IA:20, ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN		Hours
1	**Basic economic concepts-** Meaning, nature and scope of economics, deductive vs inductive methods, static and dynamics, Economic problems: scarcity and choice, circular flow of economic activity, national income-concepts and measurement.	4
2	**Demand and Supply analysis-** Demand-types of demand, determinants of demand, demand function, elasticity of demand, demand forecasting –purpose, determinants and methods, Supply-determinants of supply, supply function, elasticity of supply.	5
3	**Production and Cost analysis-** Theory of production- production function, law of variable proportions, laws of returns to scale, production optimization, least cost combination of inputs, isoquants. Cost concepts-explicit and implicit cost, fixed and variable cost, opportunity cost, sunk costs, cost function, cost curves, cost and output decisions, cost estimation.	5
4	**Market structure and pricing theory**- Perfect competition, Monopoly, Monopolistic competition, Oligopoly.	4
5	**Financial statement analysis-** Balance sheet and related concepts, profit and loss statement and related concepts, financial ratio analysis, cash-flow analysis, funds-flow analysis, comparative financial statement, analysis and interpretation of financial statements, capital budgeting techniques.	8
	TOTAL	26

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

2nd Year - III Semester: B.Tech. (Mechanical Engineering)

3ME3-04: ENGINEERING MECHANICS

Credit: 2 **Max. Marks: 100 (IA:20, ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

Applicable to the students admitted from 2018-19 onwards

SN	Contents	Hours
1	Statics of particles and rigid bodies: Fundamental laws of mechanics, Principle of transmissibility, System of forces, Resultant force, Resolution of force, Moment and Couples, Varignon's theorem, Resolution of a force into a force and a couple, Free body diagram, Equilibrium, Conditions for equilibrium, Lami's theorem. Plane trusses: Types of structures, Trusses, Support Conditions, Types of Loadings, Classification of trusses, Determinacy of trusses, Basic assumptions of truss analysis, Method of joints, Method of sections. Virtual work: Principle of Virtual Work, Active forces and active force diagram, Stability of equilibrium.	5
2	**Centroid & Moment of inertia**: Location of centroid and center of gravity, Moment of inertia, Parallel axis and perpendicular axis theorem, Radius of gyration, M.I of composite section, Polar moment of inertia, M.I of solid bodies. **Lifting machines**: Mechanical advantage, Velocity Ratio, Efficiency of machine, Ideal machine, Ideal effort and ideal load, Reversibility of machine, Law of machine, Lifting machines; System of pulleys, Simple wheel and axle, Wheel and differential axle, Weston's differential pulley block, Worm and worm wheel, Single purchase winch crab, Double purchase winch crab, Screw jack, Differential screw jack.	5
3	**Friction**: Types of Friction, Laws of friction, Angle of friction, Angle of repose, Ladder, Wedge, Belt Friction. **Belt and Rope drive**: Types of belts, Types of belt drives, Velocity ratio, Effect of slip on Velocity ratio, Crowing of pulleys, Length of belt, Ratio of tensions in flat belt drive, Power transmission by belt drives, Advantage and disadvantages of V-Belt over Flat Belt.	5
4	**Kinematics of particles and rigid bodies**: Velocity, Acceleration, Types of Motion, Equations of Motion, Rectangular components of velocity and acceleration, Angular velocity and Angular acceleration, Radial and transverse velocities and accelerations, Projectiles motion on plane and Inclined Plane, Relative Motion. **Kinetics of particles and rigid bodies**: Newton's second law, Equation of motion in rectangular coordinate, Equation of motion in radial and transverse components, Equation of motion in plane for a rigid body, D'Alembert principle.	5
5	**Work, Energy and power**: Work of a force, weight, spring force and couple, Power, Efficiency, Energy, Kinetic energy of rigid body, Principle of work and energy, Conservative and Non-conservative Force, Conservation of energy. Office of Dean Academic Affairs Rajasthan Technical University, Kota	6

	Impulse and momentum: Linear and angular momentum, Linear and angular impulse, Principle of momentum for a particle and rigid body, Principle of linear impulse and momentum for a particle and rigid body, Principle of angular momentum and Impulse, Conservation of angular momentum, Angular momentum of rigid body, Principle of impulse and momentum for a rigid body, Central impact, Oblique impact, System of variable mass, Rocket.	
	TOTAL	**26**

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

3ME3-04: ENGINEERING MECHANICS

Credit: 2 **Max. Marks: 100 (IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

Applicable to the students admitted in 2017-18 only

SN	Contents	Hours
1	**Statics of particles and rigid bodies:** Fundamental laws of mechanics, Principle of transmissibility, System of forces, Resultant force, Resolution of force, Moment and Couples, Varignon's theorem, Resolution of a force into a force and a couple, Free body diagram, Equilibrium, Conditions for equilibrium, Lami's theorem. **Plane trusses:** Types of structures, Trusses, Support Conditions, Types of Loadings, Classification of trusses, Determinacy of trusses, Basic assumptions of truss analysis, Method of joints, Method of sections. Virtual work: Principle of Virtual Work, Active forces and active force diagram, Stability of equilibrium.	5
2	**Centroid & Moment of inertia**: Location of centroid and center of gravity, Moment of inertia, Parallel axis and perpendicular axis theorem, Radius of gyration, M.I of composite section, Polar moment of inertia, M.I of solid bodies. **Lifting machines**: Mechanical advantage, Velocity Ratio, Efficiency of machine, Ideal machine, Ideal effort and ideal load, Reversibility of machine, Law of machine, Lifting machines; System of pulleys, Simple wheel and axle, Wheel and differential axle, Weston's differential pulley block, Worm and worm wheel, Single purchase winch crab, Double purchase winch crab, Screw jack, Differential screw jack.	5
3	**Friction**: Types of Friction, Laws of friction, Angle of friction, Angle of repose, Ladder, Wedge, Belt Friction. **Belt and Rope drive**: Types of belts, Types of belt drives, Velocity ratio, Effect of slip on Velocity ratio, Crowing of pulleys, Length of belt, Ratio of tensions in flat belt drive, Power transmission by belt drives, Advantage and disadvantages of V-Belt over Flat Belt.	5
4	**Kinematics:** Fundamentals of rectilinear motion and curvilinear motion, applications of general equations, Projectiles motion on plane and on inclined plane, Concept of Relative motion. **Dynamics:** Principles of dynamics, D'Alembert's principle, conservation of momentum and energy, Work and Energy and impulse momentum methods, central impact, oblique impact, system of variable mass.	6
5	**Vibrations:** Introduction to vibrations, Free vibrations of particles, Simple, compound and torsional pendulum, Energy Method.	5
	TOTAL	**26**

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

3ME4-05 : ENGINEERING THERMODYNAMICS

Credit: 3 **Max. Marks: 150 (IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Basic Concepts and definitions of Thermodynamics**: System, Surroundings, Property, Energy, Thermodynamic Equilibrium, Process, work and modes of work.	2
	Zeroth and First Law of Thermodynamics: Zeroth of Thermodynamics**,** Temperature scale, First law of thermodynamics, First law analysis of some elementary processes. Steady and unsteady flow energy equations.	5
2	**Second Law of Thermodynamics:** Heat engine, Heat pump and refrigerator, Second law of thermodynamics, Equivalence of the Kelvin-Plank and Clausius statements. Reversible and Irreversible Processes, Carnot engine, Efficiency of a Carnot engine, Carnot principle, thermodynamic temperature scale, Clausis Inequality.	4
	Entropy: Entropy, Calculation of Entropy change, Principle of entropy increase. Temperature-Entropy diagram, Second law analysis of a control volume.	3
	Availability: Available energy, Loss in available energy, Availability Function, Irreversibility.	3
3	**Thermodynamic Properties of Fluids:** Pure substance, Concept of Phase, Graphical representation of p-v-T data, Properties of steam. Steam tables, Mollier chart	4
	Ideal Gas and Real Gas: Ideal gas, Real gas, Internal energy, enthalpy and specific heats of an ideal gas, equations of state, Dalton's law of partial pressures, Gibbs Dalton law, Thermodynamic properties of gas mixtures.	4
4	**Thermodynamic Relations:** Thermodynamic variables, Independent and dependent variables, Maxwell's thermodynamic relations, Thermodynamic relations involving entropy, Thermodynamic relations involving enthalpy and internal energy, Joule-Thomson coefficient, Clapeyron equation.	4
	Power Cycles: Otto cycle, Diesel cycle, Dual cycle, Brayton cycle and Ericsson cycle.	4
5	**Vapour power cycle:** Rankine cycle, effect of operating conditions on its efficiency, properties of ideal working fluid in vapour power cycle	3
	Reheat cycle, regenerative cycle, bleeding extraction cycle, feed water heating co-generation cycle.	3
	TOTAL	39

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

2nd Year - III Semester: B.Tech. (Mechanical Engineering)

3ME4-06 : MATERIAL SCIENCE AND ENGINEERING

Credit: 3 **Max. Marks: 150 (IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	Hours
1	Crystal structure – BCC, FCC and HCP, unit cell, crystallographic planes and directions, miller indices. Crystal imperfections, point, line, surface and volume defects.	4
	Frank Reed source of dislocation, Elastic & plastic modes of deformation, Bauschinger's effect, slip & twinning, strain hardening, cold/hot working recovery, re-crystallization and grain growth.	4
2	Classification of Engineering Materials: Solidification of metals and of some typical alloys, mechanism of crystallization (I) nuclear formation (ii) crystal growth, general principles of phase transformation in alloys, phase rule and equilibrium diagrams, equilibrium diagram of binary system having complete mutual solubility in liquid state and limited solubility in solid state, binary isomorphous alloy system, Hume-Rothery rule , binary system with limited solid solubility of terminal phase and in which solubility decreases with temperature and also alloy with a peritectic transformation, equilibrium diagram of a system whose components are subject to allotropic change.	5
	Iron carbon equilibrium diagram, phase transformation in the iron carbon diagram, eutectic, peritectic, eutectoid and peritectoid reactions and microstructures.	3
3	Isothermal transformation diagrams –cooling curves superimposed on Isothermal Transformation diagram, critical cooling rate. (i) Formation of Austenite from Pearlite (ii) Transformation of Austenite into Pearlite.	4
	Full annealing, stress relief, spheroidizing – normalizing, hardening and tempering of steel. Hardenability, Jominey end quench test – Austempering, martempering. Case hardening, carburising, nitriding, cyaniding, carbonitriding. Flame and Induction hardening.	4
4	Non-Metallic Materials- Polymers – types of polymer, commodity and engineering polymers – Properties and applications of PE, PP, PS, PVC, PMMA, PET, PC, PA, ABS, PI, PAI, PPO,PPS, PEEK, PTFE Polymers. Urea and Phenol formaldehydes.	4
	Constitution of alloys: Solid solutions - substitutional and interstitial. Ferrous and Non Ferrous Metals- Effect of alloying additions on steel (Mn, Si, Cr, Mo, V, Ti & W) - stainless and tool steels – HSLA steel.	4
5	Mechanical Properties and Testing: Types of fracture, testing of materials under tension, compression and shear loads – hardness tests (Brinell, Vickers and Rockwell) Impact test Izod and charpy, fatigue and creep test.	4

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	Classification of steels and cast iron constitution and properties. BIS standards. Engineering Ceramics – Properties and applications of Al2O3, SiC, Si3N4, PSZ etc. Fiber and particulate reinforced composites and resin plastics. Introduction to Nano materials- Nano structured materials. Nano clusters & Nano crystals.	**3**
	TOTAL	**39**

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RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

2nd Year - III Semester: B.Tech. (Mechanical Engineering)

3ME4-07 : MECHANICS OF SOLIDS

Credit: 4 **Max. Marks: 200 (IA:40, ETE:160)**

3L+1T+0P **End Term Exam: 3 Hours**

S.No	CONTENTS	Hours
1	**Stress and Strain:** Elementary definition of stress and strain, stress-strain relationship, elastic, plastic and visco-elastic behavior of common materials in tension and compression test, stress-strain curves, Hooke's law, Poisson's ratio, elastic constants and their relations for an isotropic hookean material, anisotropic and orthotropic materials.	3
	Tension, compression, shearing stress and strain, thermal stresses, composite bars, equations of static equilibrium, concept of free body diagram. Strain energy due to axial loading.	5
2	**Members Subjected to Flexural Loads:** Theory of simple bending, bending moment and shear force diagrams for different types of static loading and support conditions on beams.	4
	bending stresses, section modulus and transverse shear stress distribution in circular, hollow circular, I, Box, T, angle sections etc. Strain energy due to bending.	5
3	**Principal Planes, Stresses and Strains:** Members subjected to combined axial, bending and torsional loads, maximum normal and shear stresses, concept of equivalent bending and equivalent twisting moments, Mohr's circle of stress and strain.	5
	Theories of Elastic Failures: The necessity for a theory, different theories, significance and comparison, applications.	2
4	**Torsion:** Torsional shear stress in solid, hollow and stepped circular shafts, angular deflection and power transmission capacity. Strain energy due to torsional loads.	4
	Stability of Equilibrium: Instability and elastic stability, long and short columns, ideal strut, Euler's formula for crippling load for columns of different ends, concept of equivalent length, eccentric loading, Rankine formulae and other empirical relations.	3
5	**Transverse Deflection of Beams:** Relation between deflection, bending moment, shear force and load, transverse deflection of beams and shaft under static loading, area moment method, direct integration method.	6
	Thin-walled Pressure Vessels: Stresses in cylindrical and spherical vessels	2
	TOTAL	**39**

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3ME4-21 : MACHINE DRAWING PRACTICE

Credit: 1.5 **Max. Marks: 75 (IA:45, ETE:30)**

0L+0T+3P

SN	CONTENTS
1.	Assembly drawing with sectioning and bill of materials of the following: Lathe tail stock, shaper tool head, swivel machine vice etc (1 drawing sheet of any assembly)
2.	Detailed part drawings from assembly drawing indicating fits, tolerances and surface finish symbols by referring BIS codes: Check-valve, Junction Valve etc (1 drawing sheet)
3.	Computer Aided Drafting: Introduction to different features of the CAD Software (AutoCAD/ProE/ Creo/Solidworks). At least one drawing problem related to a. 2-D Drafting. b. 3-D Modeling. c. 3-D Advanced Modeling. d. Assembly modeling. e. Feature Modification and Manipulation f. Detailing. g. Surface Modeling

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3ME4-22 : MATERIALS TESTING LAB

Credit: 1.5 **Max. Marks: 75 (IA:45, ETE:30)**

0L+0T+3P

SN	
1	(a) Study of various crystals structures through models BCC, FCC, HCP, tetrahedral and octahedral voids. Material identification of, say, 50 common items kept in a box.
2	Specimen preparation for metallographic examination /micro structural examination-cutting, grinding, polishing, etching.
3	Comparative study of microstructures of different given specimens (mild steel, gray C.I., brass, copper etc.)
4	Heat treatment experiments such as annealing, normalizing, quenching, case hardening and comparison of hardness before and after.
5	Study of Microstructure and hardness of steel at different rates of cooling. Microstructure examination of white cast iron.
6	To perform Tensile/Compressive/Shear/torsion test on a given material and to determine its various mechanical properties under tensile/compression/Shear/torsional loading
7	To determine Rockwell/ Vickers/Brinell hardness of a given material
8	To perform Impact test on a given material and to determine its resilience.
9	To study and perform Fatigue test on a given material and to determine fatigue strength of the material
10	To perform Bending test and to determine the Young's Modulus of Elasticity via deflection of beam.
11	Creep testing on creep testing machine

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3ME4-23 : BASIC MECHANICAL ENGINEERING LAB

Credit: 1.5 **Max. Marks: 75 (IA:45, ETE:30)**

0L+0T+3P

SN	
1	Exposure to a wide range of applications of mechanical engineering through a variety of activities, including hands-on assembly and disassembly of machines, such as, bicycle, sewing machine, pumps, engines, air-conditioners, machine-tools, amongst others; observational study of complex systems via cut sections, visits, videos and computer simulations; design of simple machines/systems including specifications formulation; visits to industries.
2	Note: Student will be required to submit written report indicating the learning achieved by Hands on assembly/Disassembly.

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3ME4-24: PROGRAMMING USING MATLAB

Credit: 1.5 **Max. Marks: 75 (IA:45, ETE:30)**
0L+0T+3P

SN	
1	1. Basics of MATLAB computer programming 2. Use of formulae and inbuilt functions 3. MATLAB scripts and functions (m-files) 4. Loops and nested loops 5. Array, vector and matrices 6. Plotting functions and vector plots 7. Solving differential equations using MATLAB 8. Reading and writing data, file handling 9. Using MATLAB toolboxes 10. MATLAB graphic functions

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Syllabus of

UNDERGRADUATE DEGREE COURSE

Mechanical Engineering

Rajasthan Technical University, Kota

Effective from session: 2018 – 2019

4ME2-01: DATA ANALYTICS

Credit: 2 **Max. Marks: 100 (IA:20, ETE:80)**

2L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	Introduction to Multivariate Statistics-Degree of Relationship among Variables-Review of Univariate and Bivariate Statistics-Screening Data Prior to Analysis-Missing Data, Outliers, Normality, Linearity, and Homoscedasticity.	4
3	Multiple Regression- Linear and Nonlinear techniques- Backward Forward-Stepwise- Hierarchical regression-Testing interactions (2way interaction) - Analysis of Variance and Covariance (ANOVA & ANCOVA) - Multivariate Analysis of Variance and Covariance (MANOVA & MANCOVA).	6
4	Logistic regression: Regression with binary dependent variable - Simple Discriminant Analysis- Multiple Discriminant analysis Assessing classification accuracy- Conjoint analysis (Full profile method).	5
5	Principal Component Analysis -Factor Analysis- Orthogonal and Oblique Rotation-Factor Score Estimation-Multidimensional Scaling-Perceptual Map-Cluster Analysis (Hierarchical Vs Nonhierarchical Clustering).	5
6	Latent Variable Models an Introduction to Factor, Path, and Structural Equation Analysis- Time series data analysis (ARIMA model) – Decision tree analysis (CHAID, CART) - Introduction to Big Data Management.	5
	TOTAL	26

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4ME1-03/3ME1-03 : MANAGERIAL ECONOMICS AND FINANCIAL ACCOUNTING

Credit: 2 **Max. Marks: 100 (IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN		Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Basic economic concepts-** Meaning, nature and scope of economics, deductive vs inductive methods, static and dynamics, Economic problems: scarcity and choice, circular flow of economic activity, national income-concepts and measurement.	3
3	**Demand and Supply analysis-** Demand-types of demand, determinants of demand, demand function, elasticity of demand, demand forecasting –purpose, determinants and methods, Supply-determinants of supply, supply function, elasticity of supply.	5
4	**Production and Cost analysis-** Theory of production- production function, law of variable proportions, laws of returns to scale, production optimization, least cost combination of inputs, isoquants. Cost concepts-explicit and implicit cost, fixed and variable cost, opportunity cost, sunk costs, cost function, cost curves, cost and output decisions, cost estimation.	5
5	**Market structure and pricing theory**- Perfect competition, Monopoly, Monopolistic competition, Oligopoly.	4
6	**Financial statement analysis-** Balance sheet and related concepts, profit and loss statement and related concepts, financial ratio analysis, cash-flow analysis, funds-flow analysis, comparative financial statement, analysis and interpretation of financial statements, capital budgeting techniques.	8
	TOTAL	26

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4ME1-02/3ME1-02: TECHNICAL COMMUNICATION

Credit: 2 **Max. Marks: 100 (IA:20, ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Introduction to Technical Communication-** Definition of technical communication, Aspects of technical communication, forms of technical communication, importance of technical communication, technical communication skills (Listening, speaking, writing, reading writing), linguistic ability, style in technical communication.	3
3	**Comprehension of Technical Materials/Texts and Information Design & development-** Reading of technical texts, Reading and comprehending instructions and technical manuals, Interpreting and summarizing technical texts, Note-making. Introduction of different kinds of technical documents, Information collection, factors affecting information and document design, Strategies for organization, Information design and writing for print and online media.	6
4	**Technical Writing, Grammar and Editing**- Technical writing process, forms of technical discourse, Writing, drafts and revising, Basics of grammar, common error in writing and speaking, Study of advanced grammar, Editing strategies to achieve appropriate technical style, Introduction to advanced technical communication. Planning, drafting and writing Official Notes, Letters, E-mail, Resume, Job Application, Minutes of Meetings.	8
5	**Advanced Technical Writing**- Technical Reports, types of technical reports, Characteristics and formats and structure of technical reports. Technical Project Proposals, types of technical proposals, Characteristics and formats and structure of technical proposals. Technical Articles, types of technical articles, Writing strategies, structure and formats of technical articles.	8
	Total	26

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4ME3-04: DIGITAL ELECTRONICS

Credit: 2 **Max. Marks: 100 (IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Semiconductor Devices and Applications:** Introduction to P-N junction Diode and V-I characteristics, Half wave and Full-wave rectifiers, capacitor filter. Zener diode and its characteristics, Zener diode as voltage regulator. Regulated power supply IC based on 78XX and 79XX series, Introduction to BJT, its input-output and transfer characteristics, BJT as a single stage CE amplifier, frequency response and bandwidth.	4
3	**Operational amplifier and its applications**: Introduction to operational amplifiers, Op-amp input modes and parameters, Op-amp in open loop configuration, op-amp with negative feedback, study of practical op-amp IC 741, inverting and non-inverting amplifier applications: summing and difference amplifier, unity gain buffer, comparator, integrator and differentiator.	5
4	**Timing Circuits and Oscillators:** RC-timing circuits, IC 555 and its applications as astable and mono-stable multi-vibrators, positive feedback, Barkhausen's criteria for oscillation, R-C phase shift and Wein bridge oscillator.	5
5	**Digital Electronics Fundamentals**: Difference between analog and digital signals, Boolean algebra, Basic and Universal Gates, Symbols, Truth tables, logic expressions, Logic simplification using K- map, Logic ICs, half and full adder/subtractor, multiplexers, de-multiplexers, flip-flops, shift registers, counters, Block diagram of microprocessor/microcontroller and their applications.	6
6	**Electronic Communication Systems**: The elements of communication system, IEEE frequency spectrum, Transmission media: wired and wireless, need of modulation, AM and FM modulation schemes, Mobile communication systems: cellular concept and block diagram of GSM system.	5
	TOTAL	26

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4ME4-05: FLUID MECHANICS AND FLUID MACHINES

Credit: 4 **Max. Marks: 200 (IA:40, ETE:160)**

3L+1T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Fluid Properties:** Units and dimensions- Properties of fluids- mass density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapor pressure, surface tension and capillarity.	2
	Fluid Statics and Flow Characteristics: Basic equation of fluid statics, Manometers, Force on plane areas and curved surfaces, center of pressure, Buoyant force, Stability of floating and submerged bodies. Flow characteristics – concept of control volume - application of continuity equation, energy equation and momentum equation.	5
3	**Flow Through Circular Conduits:** Hydraulic and energy gradient - Laminar flow through circular conduits and circular annuli-Boundary layer concepts – types of boundary layer thickness – Darcy Weisbach equation –friction factor- Moody diagram-minor losses – Flow through pipes in series and parallel.	8
4	**Dimensional Analysis:** Need for dimensional analysis – methods of dimensional analysis – Similitude –types of similitude - Dimensionless parameters- application of dimensionless parameters – Model analysis.	8
5	**Pumps:** Impact of jets - Euler's equation - Theory of roto-dynamic machines – various efficiencies– velocity components at entry and exit of the rotor- velocity triangles - Centrifugal pumps– working principle - work done by the impeller - performance curves - Reciprocating pump- working principle – Rotary pumps –classification.	8
6	**Turbines:** Classification of turbines – heads and efficiencies – velocity triangles. Axial, radial and mixed flow turbines. Pelton wheel, Francis turbine and Kaplan turbines- working principles - work done by water on the runner – draft tube. Specific speed - unit quantities – performance curves for turbines – governing of turbines.	7
	TOTAL	39

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4ME4-06: MANUFACTURING PROCESSES

Credit: 3 **Max. Marks: 150 (IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	General Classification and Introduction to Manufacturing processes. **Foundry Technology**: Casting: Definition and major classification; Casting materials, Patterns: types, material and pattern allowances. Moulding sands; composition, preparation, properties and testing; Grain fineness; moisture content, clay content and permeability test. Core & core prints; Gating system: types, pouring basin, sprue, runner and risers; Melting, pouring and solidification.	3
	Principles and method of floor mould casting, shell mould casting, pit mould and loam mould casting; centrifugal casting, investment casting; Permanent mould casting. Die casting; Slush casting. Casting defects; types, causes and remedy	5
3	**Forming Processes**: Classification; Hot working and cold working; principle, advantages, disadvantages and applications.	3
	Forging: Classification, drop forging and press forging methods and use; Forging dies; types, materials.	4
	Rolling: Characteristics and applications of hot rolling and cold rolling;	3
4	Extrusion; Work materials and products; Press tool works; Basic principles, system, operations and applications. Shearing; Parting, notching, trimming, nibbling, blanking and piercing,	4
	Drawing: wire drawing, tube drawing and deep drawing.	3
5	**Metal Joining Processes**: Welding, Brazing and soldering, classification of welding process, Principle, characteristics and applications of gas welding, thermit welding, electrical arc welding; Submerged arc welding; TIG and MIG welding; Resistance welding; Spot welding; Butt welding; Seam welding; Projection welding.	6
	Principles and process details of Forge welding; Friction welding; Diffusion welding; Ultrasonic welding. Explosive welding. Welding defects; Types, causes, effects and remedy. Electrodes and Electrode Coatings	3
6	**Powder Metallurgy**: Properties of Powder processed materials, Powder manufacturing, mechanical pulverization, sintering, Electrolytic Process, chemical reduction, atomization, properties of metal powders, compacting of powders sintering, advantages and applications of Powder metallurgy.	4
	TOTAL	39

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4ME4-07: THEORY OF MACHINES

Credit: 4 **Max. Marks: 200 (IA:40, ETE:160)**
3L+1T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	Introduction to mechanism: Basic concept of machines, links, kinematic pair, kinematic chain and mechanism. Inversions of kinematic chains: four bar chain mechanisms, quick return mechanisms, inversions of double slider crank mechanisms.	4
	Velocity and acceleration in mechanism: Velocity and acceleration polygons, relative velocity and instantaneous centre method	3
3	Friction devices: Types and laws of friction. Pivots and collars. Power screws such as lead screw of the lathe.	3
	Clutches: Single and multi-plate clutches. Brakes: Band, block and band and block brakes.	4
4	Gears: Laws of gearing, gears terminology; tooth form; interference, undercutting and minimum number of teeth on pinion. Rack and pinion, Spur, helical, basic introduction of bevel, worm and worm gears.	6
	Gear Trains: Simple, compound and epicyclic gear trains.	3
5	Cams: Type of cams; displacement, velocity and acceleration curves for different cam followers; consideration of pressure angle and wear.	4
	Gyroscope: Principles of gyroscopic couple, effect of gyroscopic couple and centrifugal force on vehicles taking a turn, stabilization of ship.	4
6	Balancing: Balancing of rotating masses in same and different planes, balancing of reciprocating masses, swaying couple, hammer blow and tractive effort.	7
	TOTAL	39

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4ME3-21: DIGITAL ELECTRONICS LAB

Credit: 1.5 **Max. Marks: 75 (IA:45, ETE:30)**
0L+0T+3P

SN	
1	To verify the truth tables of basic logic gates: AND, OR, NOR, NAND, NOR. Also to verify the truth table of Ex-OR, Ex-NOR (For 2, 3 & 4 inputs using gates with 2, 3, & 4 inputs).
2	To verify the truth table of OR, AND, NOR, Ex-OR. Ex-NOR realized using NAND & NOR gates.
3	To realize an SOP and POS expression.
4	To realize Half adder/ Subtractor & Full Adder/ Subtractor using NAND & NOR gates and to verify their truth tables.
5	To realize a 4-bit ripple adder/ Subtractor using basic half adder/ Subtractor & basic Full Adder/ Subtractor.
6	To verify the truth table of 4-to-l multiplexer and l-to-4 demultiplexer. Realize the multiplexer using basic gates only. Also to construct and 8-to-1 multiplexer and l-to-8 demultiplexer using blocks of 4-to-1 multiplexer and 1-to-4 demulriplexer.
7	Design & Realize a combinational circuit that will accept a 2421 BCD code and drive a TIL -3 I 2 seven-segment display.
8	Using basic logic gates, realize the R-S, J-K and D-flip flops with and without clock signal and verify their truth table.
9	Construct a divide by 2, 4 & 8 asynchronous counter. Construct a 4-bit binary counter and ring counter for a particular output pattern using D flip flop.
10	Perform input/output operations on parallel in/parallel out and Serial in/Serial out registers using clock. Also exercise loading only one of multiple values into the register using multiplexer.

Note: As far as possible, the experiments shall be performed on bread board. However experiment Nos. l-4 are to be performed on bread board only

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4ME4-22: FLUID MECHANICS LAB

Credit: 1.5 **Max. Marks: 75 (IA:45, ETE:30)**
0L+0T+3P

SN	
1	Determination of Meta-centric height of a given body.
2	Determination of Cd, Cv & Cc for given orifice.
3	Calibration of contracted Rectangular Notch and / Triangular Notch and determination of flow rate.
4	Determination of velocity of water by Pitot tube.
5	Verification of Bernoulli's theorem.
6	Calibration and flow rate determination using Venturimeter & Orifice meter and Nozzle meter
7	Determination of head loss in given length of pipe.
8	Determination of the Reynold's number for laminar, turbulent and transient flow in pipe.
9	Determination of Coefficient for minor losses in pipes.
10	To study the velocity distribution in a pipe and also to compute the discharge by integrating the velocity profile.
11	To study the boundary layer velocity profile over a flat plate and to determine the boundary layer thickness.
12	Conducting experiments and drawing the characteristic curves of centrifugal pump/submergible pump.
13	Conducting experiments and drawing the characteristic curves of reciprocating pump.
14	Conducting experiments and drawing the characteristic curves of Pelton wheel.
15	Conducting experiments and drawing the characteristics curves of Francis turbine.
16	Conducting experiments and drawing the characteristic curves of Kaplan turbine.

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4ME4-23: PRODUCTION PRACTICE LAB

Credit: 1.5 **Max. Marks: 75 (IA:45, ETE:30)**
0L+0T+3P

SN	
	Turning Shop
1	To study lathe machine construction and various parts including attachments, lathe tools cutting speed, feed and depth of cut.
2	To perform step turning, knurling and chamfering on lathe machine as per drawing.
3	To cut multi-start Square/Metric threads on lathe machine.
4	Boring using a boring bar in a centre lathe and cut BSW/Metric internal threads on lathe machine.
5	To perform taper turning using compound rest.
	Machine shop
1	To study the milling machine, milling cutters, indexing heads and indexing methods and to prepare a gear on milling machine.
2	To machine a hexagonal /octagonal nut using indexing head on milling machine.
3	To study of single point cutting tool geometry and to grind the tool as per given tool geometry.
4	To study shaper machine, its mechanism and calculate quick return ratio. To prepare a job on shaper from given mild steel rod.
5	Cylindrical grinding using grinding attachment in a centre lathe
	Demonstration and study
1	Demonstration for job by eccentric turning on lathe machine.
2	Study of capstan lathe and its tooling and prepare a tool layout & job as per given drawing.
3	Demonstration on milling machine for generation of plane surfaces and use of end milling cutters.
4	Grinding of milling cutters and drills.
	Foundry Shop
1	To prepare mould of a given pattern requiring core and to cast it in aluminium.
2	To perform moisture test and clay content test.
3	To perform permeability test
4	A.F.S. Sieve analysis test.
5	Strength Test (compressive, Tensile, Shear Transverse etc. in green and dry conditions) and Hardness Test (Mould and Core).
	Welding Shop
1	Hands-on practice on spot welding.

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4ME4-24: THEORY OF MACHINES LAB

Credit: 1.5 **Max. Marks: 75 (IA:45, ETE:30)**
0L+0T+3P

SN	
1	To study inversions of four bar chain and slider crank mechanism and their practical applications.
2	To study Steering Mechanisms: Davis and Ackerman.
3	Study of quick return mechanism and its practical applications.
4	Study of inversion of Double slider chain: Oldham Coupling, Scotch Yoke and Elliptical Trammel.
5	Study of various cam-follower arrangements. To plot displacement v/s angle of rotation curve for various cams
6	To determine co-efficient of friction using two roller oscillating arrangement.
7	Study of various types of dynamometers, Brakes and Clutches.
8	Study of differential gear box.
9	To verify the torque relation for gyroscope.
10	To perform wheel balancing. To perform static and dynamic balancing on balancing set up.
11	Study of a lathe gear box, sliding mesh automobile gear box, planetary gear box.

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Syllabus of

UNDERGRADUATE DEGREE COURSE

B.Tech. V Semester

Mechanical Engineering

Rajasthan Technical University, Kota

Effective from session: 2019 – 2020

5ME3-01: MECHATRONIC SYSTEMS

Credit: 2 **Max. Marks: 100(IA: 20, ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Overview of Mechatronics: Historical perspective, Definition, Applications, Block diagram of Mechatronic system, Functions of Mechatronics Systems, Systems Engineering, Verification Vs Validation, Benefits of mechatronics in manufacturing.	2
	Electrical and Electronic Systems: Electrical circuits and Kirchhoff's laws, Network Theorems and AC circuit Analysis, Transformers, Analog Devices, Signal Conditioning, Digital Electronics, Data Acquisition systems.	3
3	Modeling, Analysis and Control of Physical Systems: Basics of System Modeling: LTI and LTV systems, Need for modeling, Types of modeling, Steps in modeling, Building blocks of models, Modelling of one and two degrees of freedom systems, Modeling of Electro-mechanical systems, Mechanical Systems, Fluid systems, Thermal systems; Dynamic Responses, System Transfer Functions, State Space Analysis and System Properties, Stability Analysis using Root Locus Method, Stability Analysis using Bode Plots, PID Controllers (with and without Time Delay)	5
4	Sensors and Actuators: Static characteristics of sensors and actuators, Position, Displacement and Proximity Sensors, Force and torque sensors, Pressure sensors, Flow sensors, Temperature sensors, Acceleration sensors, Level sensors, Light sensors, Smart material sensors, Micro and Nano sensors, Selection criteria for sensors, Actuators: Electrical Actuators (Solenoids, Relays, Diodes, Thyristors, Triacs, BJT, FET, DC motor, Servo motor, BLDC motor, AC motor, Stepper motors), Hydraulic and Pneumatic actuators, **Design of Hydraulic and Pneumatic circuits, Piezoelectric actuators, Shape memory alloys.**	7
5	Microprocessors, Microcontrollers and Programmable Logic Controllers: Logic Concepts and Design, System Interfaces, Communication and Computer Networks, Fault Analysis in Mechatronic Systems, Synchronous and Asynchronous Sequential Systems, Architecture, **Microcontrollers.**	3
6	Programmable Logic Controllers (PLCs): Architecture, Number Systems Basics of PLC Programming, Logics, Timers and Counters, Application on real time industrial automation systems.	4
	Case Studies: Design of pick and place robot, Car engine management system, Automated manufacturing system, Automatic camera, Automatic parking system, Safety devices and systems.	3
	TOTAL	28

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

5ME4-02: HEAT TRANSFER

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	HOURS
1	Introduction: Objective, scope and outcome of the course.	1
2	Introduction: Heat transfer processes, conduction and radiation. Fourier's law of heat conduction, thermal conductivity, thermal conductivity of solids, liquids and gases, effect of temperature on thermal conductivity. Newton's law of cooling, definition of overall heat transfer coefficient. General parameters influence the value of heat transfer coefficient.	4
	Conduction: General 3-Dimensoinal conduction equation in Cartesian, cylindrical and spherical coordinates; different kinds of boundary conditions; nature of differential equations; one dimensional heat conduction with and without heat generation; electrical analogy; heat conduction through composite walls; critical thickness of insulation	3
3	Heat transfer from extended surfaces: Governing differential equation of fin, fin efficiency and effectiveness for different boundary conditions.	3
	Unsteady state heat conduction for slab, cylinder and sphere, Heisler chart.	2
	Convection: Review of Navier – Stokes and energy equation, hydrodynamic and thermal boundary layers; laminar boundary layer equations; forced convection appropriate non dimensional members; effect of Prandtl number; empirical relations for flow over a flat plate and flow through pipes.	4
4	Natural convection: Dimensional analysis, Grashoff number, boundary layers in external flows (flow over a flat plate only), boundary layer equations and their solutions, heat transfer correlations.	4
	Heat transfer with change of phase: Nature of vaporization phenomena; different regimes of boiling heat transfer; correlations for saturated liquid vaporization; condensation on flat plates; correlation of experimental results, drop wise condensation.	4
5	Heat exchanger: Types of heat exchangers, arithmetic and logarithmic mean temperature differences, heat transfer coefficient for parallel, counter and cross flow type heat exchanger; effectiveness of heat exchanger, N.T.U. method, fouling factor. Constructional and manufacturing aspects of Heat Exchangers.	8
6	Thermal Radiation: Plank distribution law, Krichoff's law; radiation properties, diffuse radiations; Lambert's law. Radiation intensity, heat exchange between two black bodies heat exchanger between gray bodies. Shape factor; electrical analogy; reradiating surfaces heat transfer in presence of reradiating surfaces.	8
	TOTAL	**41**

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5ME4-03: MANUFACTURING TECHNOLOGY

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Classification of metal removal process and machines: Geometry of single point cutting tool and tool angles, tool nomenclature in ASA, ORS. Concept of orthogonal and oblique cutting.	5
	Type of chips, Mechanics of metal cutting; interrelationships between cutting force, shear angle, strain and strain rate. Thermal aspects of machining and measurement of chip tool interface temperature.	5
3	Concept of machinability, machinability index, factors affecting machinability, Different mechanism of tool wear. Types of tool wear (crater, flank etc), Concept of tool life.	5
	Taylor's tool life equation. Introduction to economics of machining. Cutting fluids: Types, properties, selection and application methods.	5
4	Basic machine tools: Constructional configuration, estimation of machining time on lathe, drilling, shaping, milling, grinding, Gear cutting on milling, Gear hobbling.	5
	Special Purpose Machine Tools: Automatic lathes, capstan and turret lathe machines, operational planning and turret tool layout, sequence of operations.	5
5	Introduction to Grinding and different methods of grinding, Abrasives; natural and synthetic, manufacturing and selection of grinding wheels, Wheel specifications. Honing, lapping, super-finishing.	5
6	High Velocity Forming Methods: Definition; Hydraulic forming, Explosive forming, Electro-hydraulic forming, Magnetic pulse forming.	5
	TOTAL	41

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Syllabus

3rd Year - V Semester: B.Tech. : Mechanical Engineering

5ME4-04: DESIGN OF MACHINE ELEMENTS – I

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Materials: Mechanical Properties and IS coding of various materials, Selection of material from properties and economic aspects.	3
	Manufacturing Considerations in Design: Standardization, Interchangeability, limits, fits tolerances and surface roughness, BIS codes, Design consideration for cast, forged and machined parts. Design for assembly.	4
3	Design for Strength: Modes of failure, Strength and Stiffness considerations, Allowable stresses, factor of safety, Stress concentration: causes and mitigation, fatigue failures.	4
	Design of Members subjected to direct stress: pin, cotter and keyed joints.	5
4	Design of Members in Bending: Beams, levers and laminated springs. Design for stiffness of beam: Use of maximum deflection formula for various end conditions for beam design.	7
5	Design of Members in Torsion Shaft and Keys: Design for strength, rigidity. Solid and hollow shafts. Shafts under combined loading. Sunk keys.	5
	Couplings: Design of muff coupling, flanged couplings: rigid and flexible.	3
6	Design of Threaded fasteners: Bolt of uniform strength, Preloading of bolts: Effect of initial tension and applied loads, Eccentric loading.	4
	Power screws like lead screw, screw jack.	2
	Design of members which are curved like crane hook, body of C-clamp, machine frame etc.	3
	TOTAL	41

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Syllabus

3rd Year - V Semester: B.Tech. : Mechanical Engineering

5ME4-05: PRINCIPLES OF MANAGEMENT

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Basic concepts of management: Definition – Need and Scope – Different schools of management thought – Behavioural, Scientific, Systems, and Contingency	2
	Contribution of Management Thinkers: Kautilya, Taylor, Fayol, Peter Drucker and C.K. Prahlad.	4
3	Functions of Management: Planning: Essentials of Planning and Managing by Objectives; Strategies, Policies and Planning Premises; Decision making.	2
	Organizing The Nature of organizing, Entrepreneuring, and Reengineering; Organizational Structure, Departmentation; Line/staff authority, empowerment, and decentralization; Effective organizing and organization culture;	3
4	Staffing Human resource Management and Selection; Performance Appraisal and Career Strategy; managing change through Manager and Organization Development.	2
5	Leading Human Factors and Motivation; Leadership: Committees, Terms, and Group Decision making; Communication.	3
	Controlling The system and process of controlling; Control Techniques and Information Technology; Productivity, Operations Management and Total Quality Management.	2
6	Management practices of: Dhirubhai Ambani, Narayan Murthy, Premji, Ratan Tata, Steve Jobs, Bill Gates.	4
	Studying organizational structures of any 10 companies and classifying them into different types of organizations which are studied above and justifying why such structures are chosen by those organizations.	2
	Preparing the leadership profiles of any 5 business leaders and studying their leadership qualities.	3
	TOTAL	**28**

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Syllabus

3rd Year - V Semester: B.Tech. : Mechanical Engineering

5ME5-11: STEAM ENGINEERING

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Steam generators: Classification of Boilers, water and fire tube boilers, High pressure boilers, Advantages of high pressure Boilers, Natural and forced circulation boilers, Water wall.	4
	Steam drum internal, steam super heaters, Economizers, air preheater, induced, forced and balanced draught boilers, Fluidized bed boilers.	4
3	Definition and type of nozzle and diffuser equation of continuity, sonic velocity, mach no. and stagnation properties, the steady flow energy equation for nozzles, momentum energy equation for flow through steam nozzles nozzle efficiency, effect of friction, nozzle for uniform pressure drop, throat pressure for maximum discharge or chock flow, critical pressure ratio, design of nozzle and diffuser.	8
4	Steam Turbines: Principle and working of steam turbines, type of turbines, compounding for pressure and velocity. Overview and difference of various type of turbine, different types of governing of turbines.	3
	Impulse turbine: The effect of blade friction on velocity diagram. Force, work and power, Blade or diagram efficiency, Gross stage efficiency, steam speed to blade, speed ratio for optimum performance, turbine performance at various loads.	5
5	Impulse reaction turbine: Velocity diagram and work done, degree of reaction, Parson turbine, blade efficiency, gross stage efficiency comparison of enthalpy drop in various stages, size of blades in impulse reaction turbines for various stages of impulse reaction and impulse turbine.	5
	Regenerative Feed Heating Cycles: Introduction, Ideal regenerative feed heating cycle, Regenerative heating cycles and their representation on T-s and h-s Diagram, Representation of actual process on T-s and h-s Diagram Regenerative cycles, types of feed heating arrangements, Optimum feed water temperature and saving in Heat Rate. direct contact and surface heaters.	4
6	Reheating of steam: Practical reheating and Non- reheating cycles, advantage and disadvantages of reheating, reheat regenerative cycle, regenerative water extraction cycles.	4
	Process heat and by product power cycle, pass out turbine, Binary vapour cycle. Condensers.	3
	TOTAL	41

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Syllabus

3rd Year - V Semester: B.Tech. : Mechanical Engineering

5ME4-12: AUTOMOBILE ENGINEERING

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Frame & Body: Layout of chassis, types of chassis frames and bodies, their constructional features and materials.	3
	Clutches: single plate, multi-plate, cone clutch, semi centrifugal, electromagnetic, vacuum and hydraulic clutches. Fluid coupling. Brakes: Classification and function; Mechanical, hydraulic, vacuum air and self engineering brakes; Brake shoes and lining materials.	5
3	Gear Boxes: Sliding mesh, constant mesh, synchromesh and epicyclic gear boxes, Automatic transmission system; Hydraulic torque converter;	4
	Drives: Overdrive, Propeller shaft, Universal joints, Differential; Rear axle drives. Hotchkiss and torque tube drives; Rear axle types; Front wheel and All wheel drive.	4
4	Wheels and Tyres: Tyre types, Tyre construction; Tyre inflation pressure, Tyre wear and their causes; Re-treading of the tyre,	2
	Steering system: steering gear boxes, Steering linkages, Steering mechanism, Under and Over steering. Steering Geometry, Effect of camber, caster, king pin inclination, toe in and toe out; Power steering; Integral and linkage types.	3
	Suspension system: objective and requirements, Suspension spring, front and rear suspension systems, Independent suspension system Shock absorbers.	3
5	Automotive Electrical System: Battery construction, Charging and testing, battery types, Starting and Battery Charging System: Starter motor construction, types of drive, Alternator construction, regulation and rectification.	4
	Ignition System: Magneto and coil ignition systems, System components and requirements, Automotive lighting: Wiring systems Electrical instruments; head lamp, electric horn, fuel level indicator.	4
6	Automotive Air Conditioning: Introduction, Loads, Air conditioning system Components, Refrigerants, Fault Diagnosis.	4
	Automotive Safety: Safety requirements, Safety Devices, Air bags, belts, radio ranging, NVS (Night Vision System) GPS (Global Positioning System)	4
	TOTAL	**41**

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Syllabus

3rd Year - V Semester: B.Tech. : Mechanical Engineering

5ME5-13: NON DESTRUCTIVE EVALUATION AND TESTING

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**ACOUSTICAL METHODS: Ultrasonic testing-** Generation of ultrasonic waves, Horizontal and shear waves, Near field and far field acoustic wave description, Ultrasonic probes- Straight beam, direct contact type, Angle beam, Transmission/reflection type, and delay line transducers, acoustic coupling and media.	5
	ULTRASONIC TESTS: Transmission and pulse echo methods, A-scan, B-scan, C-scan, F- scan and P-scan modes, Flaw sizing in ultrasonic inspection: AVG, Amplitude, Transmission, TOFD, Satellite pulse, Multi-modal transducer, zonal method using focused beam. Flow location methods, Signal processing in Ultrasonic NDT; Mimics, spurious echo's and noise. Ultrasonic flaw evaluation.	5
3	**ELECTRO-MAGNETIC METHODS**- magnetic particle inspection-introduction to electrical impedance, principles of eddy current testing, flaw detection using eddy currents.	6
4	**RADIOGRAPHIC METHODS**: Introduction to x-ray radiography, the radiographic process, X-ray and Gamma ray sources, Geometric principles, Factors governing exposure, radio graphic screens, scattered radiation, arithmetic of exposure, radiographic image quality and detail visibility, industrial X-ray films.	6
	X-RAY RADIOGRAPHY PROCESES: Fundamentals of processing techniques, process control, the processing room, special processing techniques, paper radiography, sensitometric characteristics of X-ray films, film graininess signal to noise ratio in radiographs. The photographic latent image, radiation protection.	6
5	**OPTICAL METHODS**: holography**-** Principles and practices of Optical holography, acoustical, microwave, x-ray and electron beam holography techniques.	6
6	**APPLICATIONS:** NDT in flaw analysis of Pressure vessels, piping NDT in Castings, Welded constructions, etc., Case studies.	6
	TOTAL	41

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5ME3-21: MECHATRONICS LAB.

Credit: 1 **Max. Marks: 50(IA:30, ETE:20)**

0L+0T+2P **End Term Exam: 2 Hours**

SN	NAME OF EXPERIMENT
1	Using Transducers Kit :- • Characteristics of LVDT • Principle & Characteristics of Strain Gauge • Characteristics of Summing Amplifier • Characteristics of Reflective Opto Transducer
2	Mobile Robot • Program for Operating Buzzer Beep • Program for Operating Motion control • Program for Operating Direction control • Program for Operating White line follower for the given arena
3	PLC PROGRAMMING • Ladder programming on Logic gates ,Timers & counters • Ladder Programming for digital & Analogy sensors • Ladder programming for Traffic Light control, Water level control and Lift control Modules
4	MATLAB Programming • Sample programmes on Mat lab • Simulation and analysis of PID controller using SIMULINK
	Important Note: It is mandatory for every student to undertake a Mini project. Mini project shall be a group activity. A group shall consist of maximum five students. Final evaluation of sessional component shall include 30% weight age to mini project. • Mini project can be integration of sensor, actuator and transduction units for various home and office applications.

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5ME4-22: HEAT TRANSFER LAB.

Credit: 1 **Max. Marks: 50(IA:30, ETE:20)**
0L+0T+2P **End Term Exam: 2 Hours**

SN	NAME OF EXPERIMENT
1	To Determine Thermal Conductivity of Insulating Powders.
2	To Determine Thermal Conductivity of a Good Conductor of Heat (Metal Rod).
3	To determine the transfer Rate and Temperature Distribution for a Pin Fin.
4	To Measure the Emissivity of the Test plate Surface.
5	To Determine Stefan Boltzmann Constant of Radiation Heat Transfer.
6	To Determine the Surface Heat Transfer Coefficient For Heated Vertical Cylinder in Natural Convection.
7	Determination of Heat Transfer Coefficient in Drop Wise and Film Wise condensation.
8	To Determine Critical Heat Flux in Saturated Pool Boiling.
9	To Study and Compare LMTD and Effectiveness in Parallel and Counter Flow Heat Exchangers.
10	To Find the Heat transfer Coefficient in Forced Convection in a tube.
11	To study the rates of heat transfer for different materials and geometries
12	To understand the importance and validity of engineering assumptions through the lumped heat capacity method.
	Important Note: It is mandatory for every student to undertake a Mini project. Mini project shall be a group activity. A group shall consist of maximum five students. Final evaluation sessional component shall include 30% weight age to mini project. • Heat exchanger design for different applications, designing for thermal insulation, Use of relevant BIS codes for designing.

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5ME4-23: PRODUCTION ENGINEERING LAB.

Credit: 1 **Max. Marks: 50(IA:30, ETE:20)**
0L+0T+2P **End Term Exam: 2 Hours**

SN	NAME OF EXPERIMENT
1	Study of various measuring tools like dial gauge, micrometer, vernier caliper and telescopic gauges.
2	Measurement of angle and width of a V-groove by using bevel protector..
3	(a) To measure a gap by using slip gauges (b) To compare & access the method of small-bore measurement with the aid of spheres.
4	Measurement of angle by using sine bar.
5	(a) Measurement of gear tooth thickness by using gear tooth vernier caliper. (b) To check accuracy of gear profile with the help of profile projector.
6	To determine the effective diameter of external thread by using three- wire method.
7	To measure flatness and surface defects in the given test piece with the help of monochromatic check light and optical flat.
8	To check the accuracy of a ground, machined and lapped surface - (a) Flat surface (b) Cylindrical surface.
9	Find out Chip reduction co-efficient (reciprocal of chip thickness ratio) during single point turning.
10	Forces measurements during orthogonal turning.
11	Torque and Thrust measurement during drilling.
12	Forces measurement during plain milling operation.
13	Measurement of Chip tool Interface temperature during turning using thermocouple technique.
	Important Note: It is mandatory for every student to undertake a Mini project. Mini project shall be a group activity. A group shall consist of maximum five students. Final evaluation shall include 30% weight age to mini project. • Fabrication of an assembly in which parts shall be machined and standard parts shall be procured.

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5ME4-24: MACHINE DESIGN PRACTICE - I

Credit: 1 **Max. Marks: 50(IA:30, ETE:20)**

0L+0T+2P **End Term Exam: 2 Hours**

SN	Sessional Work
1	Material selection and relevant BIS nomenclature
2	Selecting fit and assigning tolerances
3	Examples of Production considerations
4	Problems on:
	(a) Knuckle & Cotter joints
	(b) Torque: Keyed joints and shaft couplings
	(c) Design of screw fastening
	(d) Bending: Beams, Levers etc.
	(e) Combined stresses: Shafts, brackets, eccentric loading.
	Important Note: It is mandatory for every student to undertake a Mini project. Mini project shall be a group activity. A group shall consist of maximum five students. Final evaluation shall include 30% weight age to mini project. • Design and analysis of simple mechanical systems/products

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Syllabus of

UNDERGRADUATE DEGREE COURSE

B.Tech. VI Semester

Mechanical Engineering



Rajasthan Technical University, Kota

Effective from session: 2019 – 2020

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Syllabus

3rd Year - VI Semester: B.Tech. : Mechanical Engineering

6ME3-01: MEASUREMENT and METROLOGY

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Concept of measurement: General concept of measurement, Need for measurement, Generalized measuring system, Units, Standards, Sensitivity, Readability, Range of accuracy, Precision, Accuracy Vs precision, Uncertainty.	3
	Repeatability and reproducibility, Errors in measurement, Types of error, Systematic and random error, Calibration, Interchangeability.	3
3	Linear and angular measurements: Linear measuring instruments: Vernier caliper, Micrometer, Interval measurements:- Slip gauges, Checking of slip gauges for surface quality, Optical flat, Application of limit gauges	3
	Comparators:- Mechanical comparators, Electrical comparator, Optical comparator, Pneumatic comparator;	2
	Sine bar, Use of sine bar, Limitations of sine bars, Sources of error in sine bars, Bevel protractor, Applications of bevel protractor.	3
4	Form measurement: Introduction, Screw thread measurement, Thread gauges, Measurement of gears: Gear errors.	2
	Surface finish measurement:-Introduction, Elements of surface texture, Analysis of surface finish, Methods of measuring surface finish, Straightness measurement, Flatness testing, Roundness measurements	3
5	Coordinate measuring machine (CMM):-Types of CMM, Features of CMM, Computer based inspection,	2
	Measurement of power, flow and temperature related properties Measurement of force, Accelerometer, Load cells, Bourdon tube. Torque measurement: Torque measurement using strain gauges, Torque measurement using torsion bars, Mechanical dynamometers.	3
6	Measurement of flow: Variable area meters – rotameter, Hot wire anemometer, Pitot tube. Temperature measurement, Bimetallic strip, Thermocouples (Thermo electric effects), Thermistors, Pyrometers	3
	TOTAL	**28**

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Syllabus

3rd Year - VI Semester: B.Tech. : Mechanical Engineering

6ME4-02: COMPUTER INTEGRATED MANUFACTURING SYSTEMS (CIMS)

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Introduction to CIM: Overview of Production Systems, the product cycle, Automation in Production Systems, computer's role in manufacturing, sources and types of data used in manufacturing. The Beginning of CAM: Historical Background,	2
	Numerical Control (NC): Basic components of an NC system, coordinate system and motions control systems. Computer Numerical Control (CNC): features of CNC, machine control unit, CNC software. Direct Numerical Control and Distributed Numerical Control. Applications, advantages and disadvantages of NC. Adaptive control of machining system.	3
3	NC Part programming: Manual and computer assisted part programming, Part programming with APT. NC part programming using CAD/CAM software. NC cutter path verification.	8
4	Computer Aided Process Planning: Traditional Process Planning, Retrieval process planning system, Generative Process Planning, Machinability data systems, computer generated time standards.	4
	Group Technology: Introduction, part families, part classification and coding, coding system and machining cells.	4
5	Computer Aided Production Management Systems: Introduction to computer aided PPC, Introduction to computer aided inventory management, manufacturing resource planning (MRPII), computer process monitoring and shop floor control, computer process control.	6
	Computer Aided Quality Control; Computer in quality control, contact inspection methods, Non contact inspection methods, optical and non optical computer aided testing.	3
6	Computer Aided Material Handling; Computer control on material handling, conveying, picking. Ware house control, computerized material handling for automated inspection and assembly.	3
	Computer Integrated Manufacturing Systems: Introduction, types special manufacturing systems, flexible manufacturing systems (FMS).	5
	Collaborative Engineering; Introduction, Faster Design throughput, Web based design, Changing design approaches, extended enterprises, concurrent engineering, Agile and lean manufacturing.	3
	TOTAL	**41**

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3rd Year - VI Semester: B.Tech. : Mechanical Engineering

6ME4-03: MECHANICAL VIBRATIONS

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Introduction to Sound: Frequency dependent human response to sound, Sound pressure dependent human response, Relationship among sound power, sound intensity and sound pressure level.	2
	Introduction to Noise: Auditory and Non auditory effects of Noise, Major sources of the noise, Industrial noise sources, Industrial noise control strategies.	3
	Introduction to Vibration: Importance and scope of vibrations, terminology and classification, Concept of Degrees of freedom, Harmonic motion, vectorial representation, complex number representation, addition.	3
3	Undamped Single Degree of Freedom System: Derivation of equation of motion for one dimensional longitudinal, transverse and torsional vibrations without damping using Newton's second law, D' Alembert's principle and Principle of conservation of energy, Compound pendulum and centre of percussion.	3
	Damped vibrations of single degree of freedom systems: Viscous damping, under-damped, critically damped and over-damped systems, Logarithmic decrement.	3
	Vibration characteristics of Coulomb damped system and Vibration characteristics of Hysteretic damped systems.	2
3	Forced Vibrations of Single Degree of Freedom Systems: Forced vibration with constant harmonic excitation, Steady state and transient parts, Frequency response curves and phase angle plot, Forced vibration due to excitation of support.	4
	Vibration Isolation and Transmissibility: Force transmissibility, Motion transmissibility, Forced vibration with rotating and reciprocating unbalance, Materials used in vibration isolation.	4
5	System with Two Degrees of Freedom: principle mode of vibration, Mode shapes, Undamped forced vibrations of two degrees of freedom system with harmonic excitation, Vibration Absorber, Undamped dynamic vibration absorber and centrifugal pendulum absorber	5
	Critical Speed of Shaft: Critical speed of a light shaft without damping, critical speed of shaft having multiple discs, secondary critical speed.	3
6	Many Degrees of Freedom Systems (Exact analysis): Equation of Motion, The matrix method, Eigen Values and Eigen Vectors, Method of influence Coefficients and Maxwell's reciprocal theorem. Torsional vibrations of multi rotor system, vibrations of geared system, Generalized coordinates and coordinate coupling Many Degrees of Freedom Systems (approximate methods): Rayleigh's, Dunkerley's, Stodola's and Holzer's methods	5
	Vibrations of continuous systems: Transverse vibration of a string, Longitudinal vibration of a bar, Torsional vibration of a shaft.	3
	TOTAL	**41**

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Syllabus

3rd Year - VI Semester: B.Tech. : Mechanical Engineering

6ME4-04: DESIGN OF MACHINE ELEMENTS- II

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Fatigue Considerations in Design: Variable load, loading pattern, endurance stresses, Influence of size, surface finish, notch sensitivity and stress concentration.	3
	Goodman line, Soderberg line, Design of machine members subjected to combined, steady and alternating stresses.	3
	Design for finite life, Design of Shafts under Variable Stresses, Bolts subjected to variable stresses.	2
3	Design of IC Engine components: Piston, Cylinder, Connecting Rod and Crank Shaft.	8
4	Design of helical compression, tension, torsional springs, springs under variable stresses.	4
	Design of belt, rope and pulley drive system,	4
5	Design of gear teeth: Lewis and Buckingham equations, wear and dynamic load considerations.	4
	Design and force analysis of spur, helical, bevel and worm gears, Bearing reactions due to gear tooth forces.	4
6	Design of Sliding and Journal Bearing: Methods of lubrication, hydrodynamic, hydrostatic, boundary etc. Minimum film thickness and thermal equilibrium.	4
	Selection of anti-friction bearings for different loads and load cycles, Mounting of the bearings, Method of lubrication.	4
	TOTAL	**41**

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6ME4-05: QUALITY MANAGEMENT

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	The meaning of Quality and quality improvement dimensions of quality, history of quality methodology, quality control, Quality of design and quality of conformance, Quality policy and objectives, Economics of quality.	5
	Modeling process quality: Describing variation, frequency distribution, continuous and discrete, probability distributions, pattern of variation, Inferences about process quality: sampling distributions and estimation of process parameters. Analysis of variance.	4
3	Statistical Quality Control: Concept of SQC, Chance and assignable causes of variation, statistical basis of control chart, basic principles, choice of control limits, sample size and sampling frequency, analysis of patterns on control charts. The magnificent seven.	4
	Control chart for variables,: X-bar and R charts, X-bar and S charts, control chart for individual measurement. Application of variable control charts.	4
4	Control chart for attributes: control chart for fraction non conforming P- chart, np-chart, c-chart and u-chart. Demerit systems, choice between attribute and variable control chart. SPC for short production runs. Process capability analysis using histogram and probability plot, capability ratios and concept of six sigma.	7
5	Quality Assurance: Concept, advantages, field complaints, quality rating, quality audit.	2
	Acceptance Sampling: Fundamental concepts in acceptance sampling, operating characteristics curve. Acceptance sampling plans, single, double and multiple sampling plans, LTPD, AOQL, AOQ.	4
	Introduction to Quality systems like ISO 9000 and ISO 14000.	2
6	Reliability and Life Testing- Failure models of components, definition of reliability, MTBF, Failure rate, common failure rate curve, types of failure, reliability evaluation in simple cases of exponential failures in series, paralleled and series-parallel device configurations, Redundancy and improvement factors evaluations. Introduction to Availability and Maintainability	4
	Introduction to Taguchi Method of Design of Experiments, Quality loss function.	4
	TOTAL	**41**

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6ME5-11: REFRIGERATION AND AIR CONDITIONING

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Introduction: Refrigeration and second law of Thermodynamics, Refrigeration effect and unit of Refrigeration, Heat pump, reversed Carnot cycle. Vapour Compression Refrigeration System: Analysis of simple vapour compression Refrigeration cycle by p-h and T-S diagram. Effect of operating conditions	5
	Multiple Evaporator and compressor system: Application, air compressor system, Individual compressor, compound compression, cascade system. Application, air compressor systems, individual compressor, compound compression, cascade system.	3
3	Gas Cycle Refrigeration: Limitation of Carnot cycle with gas, reversed Brayton cycle, Brayton cycle with regenerative heat exchanger.	4
	Air cycle for air craft: Necessity of cooling of air craft, Basic cycle, boot strap, regenerative type air craft refrigeration cycle.	4
4	Other refrigeration systems (description only): Vapour absorption refrigeration system, Electrolux refrigerator, Lithium Bromide - Water system, Water vapour refrigeration system, Vortex tube refrigeration system, thermo electric refrigeration system.	4
	Refrigerants: Classification, Nomenclature, selection of Refrigerants, global warming potential of CFC Refrigerants. Refrigeration Equipments: Compressor, condenser, evaporator, expansion devices, types & working.	4
5	Psychrometry: Psychrometric properties, psychometric relations, pyschrormetric charts, psychrometric processes, cooling coils, By-pass factor, Apparatus Dew point temperature and air washers.	5
	Human Comfort: Mechanism of body heat losses, factors affecting human comfort, effective temperature, comfort chart.	3
6	Cooling load calculations: Internal heat gain, system heat gain, RSHF, ERSHF, GSHF, cooling load estimation, heating load estimation, psychrometric calculation for cooling.	5
	Selection of air conditioning: Apparatus for cooling and dehumidification, Air conditioning system, year round air conditioning.	3
	TOTAL	**41**

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Rajasthan Technical University, Kota

6ME5-12: NON CONVENTIONAL MACHINING METHODS

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Introduction and classification of advanced machining process, consideration in process selection, difference between traditional and non-traditional process, Hybrid process.	4
	Abrasive finishing processes: AFM, MAF (for Plain and cylindrical surfaces).	4
3	Mechanical advanced machining process: Introduction, Mechanics of metal removal, process principle, Advantages, disadvantages and applications of AJM, USM, WJC.	6
4	Thermo electric advanced machining process: Introduction, Principle, process parameters, advantages, disadvantages and applications about EDM, EDG,	4
	LBM, PAM, EBM	6
5	Electrochemical and chemical advanced machining process: ECM, ECG, ESD, Chemical machining,	6
	Anode shape prediction and tool design for ECM process. Tool (cathode) design for ECM Process.	4
6	Introduction to Micro and nanomachining,	5
	TOTAL	40

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

6ME5-13: MICRO ELECTRO AND MECHANICAL SYSTEMS (MEMS) and MICROSYSTEMS

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Over view of MEMS and Microsystems: Microelectromechanical Systems (MEMS) and Microsystems, Typical MEMS and Microsystem products, Evaluation of Microfabrication, Microsystem and microelectronics, the multidisciplinary nature of microsystem design and manufacture, Microsystems and miniaturization, Application of Microsystems in the automotive industry, applications of Microsystems in other industries.	2
	Working Principles of Microsystems: Introduction, Microsensors, Microactuation, MEMS with Microactuators, Microaccelerometers, Microfluidics.	3
3	Engineering Science for Microsystem Design and Fabrication: Introduction, atomic structure of matter, ions and ionization, moleculat theory of matter and intermolecular forces, doping of semiconductors, the diffusion process, plasma physics, electrochemistry, quantum physics.	4
	Engineering Mechanics for Microsystem design: Introduction, static bending of thin plates, mechanical vibration, thermomechanics, fracture mechanics, thin-film mechanics, overview of finite element stress analysis.	4
4	Thermofluid Engineering and Microsystem design: Introduction, overview of the basics of fluid mechanics in Macro and mesoscales, Basic equations in continuum fluid dyanimics, laminar fluid flow in circular conduits, computational fluid dynamics, Incompressible fluid flow in microconduits, fluid flow in submicrometer and nanoscale, overview of heat conduction in solids, heat conduction in multilayered thin films, heat conduction in solids in submicrometer scale.	5
	Scaling laws in Miniaurization: Introduction to scaling, scaling in geometry, scaling in rigid-body dynamics, scaling in electrostatic forces, scaling in electromagnetic forces, scaling in electricity, scaling in fluid mechanics, scaling in heat transfer.	5
5	Materials for MEMS and Microsystems: Introduction, substrate and wafers, active substrate materials, silicon as a substrate material, silicon compounds, silicon piezoresistors, gallium arsenide, quartz, piezoelectric crystals, polymers, packaging materials.	5
	Microsystem Fabrication Processes: Introduction, Photolithography, Ion implantation, diffusion, oxidation, chemical vapor deposition, physical vapor deposition- sputtering, deposition by epitaxy, etching.	6
6	Overview of Micromanufacturing: Introduction, bulk micromanufacturing, surface micromachining, LIGA.	3
	Microsystem Design: Introduction, design consideration, process design, mechanical design, mechanical design using finite element method, design of a silicon die for a micropressure sensor, design of microfluidic network systems, design case: capillary electrophoresis network system.	3
	TOTAL	**41**

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6ME4-21: CIMS LAB.

Credit: 1.5 **Max. Marks: 75(IA:45, ETE:30)**

0L+0T+3P **End Term Exam: 3 Hours**

SN	NAME OF EXPERIMENT
1	To prepare part programming for plain turning operation.
2	To prepare part program for turning operations using turning cycle.
3	To prepare part program for threading operation.
4	To prepare part program for gear cutting using mill cycle.
5	To prepare part program for multiple drilling in X and Z axis using drilling cycle.
	Important Note: It is mandatory for every student to undertake a Mini project. Mini project shall be a group activity. A group shall consist of maximum five students. Final evaluation shall include 30% weight age to mini project. • Engraving of students' name, manufacturing of a part.

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RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Syllabus

3rd Year - VI Semester: B.Tech. : Mechanical Engineering

6ME4-22: VIBRATION LAB.

Credit: 1.5 **Max. Marks: 75(IA:45, ETE:30)**

0L+0T+3P **End Term Exam: 3 Hours**

SN	NAME OF EXPERIMENT
1	To verify relation T = 2π (l/g) for a simple pendulum.
2	To determine radius of gyration of compound pendulum.
3	To determine the radius of gyration of given bar by using bifilar suspension.
4	To determine natural frequency of a spring mass system.
5	Equivalent spring mass system.
6	To determine natural frequency of free torsional vibrations of single rotor system. i. Horizontal rotor ii. Vertical rotor
7	To verify the Dunkerley's rule.
8	Performing the experiment to find out damping co-efficient in case of free damped torsional vibration
9	To conduct experiment of trifler suspension.
10	Harmonic excitation of cantilever beam using electro-dynamic shaker and determination of resonant frequencies.
11	Study of Vibration measuring instruments.
12	Perform study of the following using Virtual Lab http://www.vlab.co.in/
13	Forced Vibration of a Cantilever Beam with a Lumped Mass at Free End: To calculate the natural freq and damping ratio for forced vibration of a single DOF cantilever beam system, experimentally; and compare the results with theoretical values.
14	Harmonicaly Excited Forced Vibration of a Single DOF System: To analyze the forced vibration response of a single DOF system at diff damping ratio and frequency ratio.
15	Perform study of the following using Virtual Lab http://www.vlab.co.in/
16	Forced Vibration of a Cantilever Beam with a Lumped Mass at Free End: To calculate the natural freq and damping ratio for forced vibration of a single DOF cantilever beam system, experimentally; and compare the results with theoretical values.
17	Harmonicaly Excited Forced Vibration of a Single DOF System: To analyze the forced vibration response of a single DOF system at diff damping ratio and frequency ratio.
	Important Note: It is mandatory for every student to undertake a Mini project. Mini project shall be a group activity. A group shall consist of maximum five students. Final evaluation shall include 30% weight age to mini project. • Design of vibration system, measurement of vibration, FFT analysis using MATLAB

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RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Syllabus

3rd Year - VI Semester: B.Tech. : Mechanical Engineering

6ME4-23: MACHINE DESIGN PRACTICE – II

Credit: 1.5 **Max. Marks: 75(IA:45, ETE:30)**

0L+0T+3P **End Term Exam: 3 Hours**

SN	SESSIONAL WORK
	Problems on:
	Use data hand book by Mahadevan and Reddy
1	Fatigue loading.
2	Helical compression, tension and torsional springs design.
3	Curved Beams.
4	Preloaded bolts and bolts subjected to variable stresses.
5	Belt, Rope and Chain drive system.
6	Gear Design.
7	Sliding contact bearing design.
8	Anti-friction bearing selection
	Important Note: It is mandatory for every student to undertake a Mini project. Mini project shall be a group activity. A group shall consist of maximum five students. Final evaluation shall include 30% weight age to mini project. • Design of assembly (mechanical systems) using various BIS codes/data book

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RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Syllabus

3rd Year - VI Semester: B.Tech. : Mechanical Engineering

6ME4-24: THERMAL ENGINEERING LAB-1

Credit: 1.5 **Max. Marks: 75(IA:45, ETE:30)**

0L+0T+3P **End Term Exam: 3 Hours**

SN	Name Of Experiment
1	Study of working of four stroke petrol engine and four stroke diesel engine with the help of cut section models
2	Study of working of two stroke petrol and two stroke diesel engine with the help of cut section models.
3	To draw valve timing diagram for a single cylinder diesel engine.
4	Study of various types of boilers.
5	Study of various types of mountings and accessories.
6	Demonstration of steering system and measurement of steering geometry angles and their impact on vehicle performance.
7	Study of braking system with specific reference to types of braking system, master cylinder, brake shoes.
8	Study of transmission system including clutches, gear box assembly and differential box
	Important Note: • Study also includes Assembly and disassembly of above systems • It is mandatory for every student to present a term paper. Term paper shall be a group activity. A group shall consist of maximum two students. Final evaluation shall include 30% weight age to term paper. Term paper shall cover study or survey of new technologies in above systems.

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11	Study of Vibration measuring instruments.	
12	Perform study of the following using Virtual Lab http://www.vlab.co.in/	
13	Forced Vibration of a Cantilever Beam with a Lumped Mass at Free End: To calculate the natural frequency and damping ratio for forced vibration of a single DOF cantilever beam system, experimentally; and compare the results with theoretical values.	
14	Harmonicaly Excited Forced Vibration of a Single DOF System: To analyze the forced vibration response of a single DOF system at different damping ratio and frequency ratio.	
15	Perform study of the following using Virtual Lab http://www.vlab.co.in/	
16	Forced Vibration of a Cantilever Beam with a Lumped Mass at Free End: To calculate the natural frequency and damping ratio for forced vibration of a single DOF cantilever beam system, experimentally; and compare the results with theoretical values.	
17	Harmonicaly Excited Forced Vibration of a Single DOF System: To analyze the forced vibration response of a single DOF system at different damping ratio and frequency ratio.	

7ME1A: FINITE ELEMENT METHODS

B.Tech. (Mechanical) 7th semester **Max. Marks: 100**
3L+0T **Exam Hours: 3**

UNIT	CONTENTS	CONTACT HOURS
I	Introduction to FEM and its applicability, Review of :Matrix algebra, Gauss elimination method, Uniqueness of solution, Banded symmetric matrix and bandwidth.	**4**
	Structure analysis: Two-force member element, Local stiffness matrix, coordinate transformation, Assembly, Global stiffness matrix, imposition of Boundary conditions, Properties of stiffness matrix	**4**
II	One-dimensional Finite Element Analysis: Basics of structural mechanics, stress and strain tensor, constitutive relation, Principle of minimum Potential, General steps of FEM, Finite element model concept / Discretization, Derivation of finite elements, equations using potential energy approach for linear and quadratic 1-D bar element,	**5**
	shape functions and their properties, Assembly, Boundary conditions, Computation of stress and strain.	**3**
III	Two Dimensional Finite Element Analysis: Finite element formulation using three nodded triangular (CST) element , Plane stress and Plain strain problems,	**4**
	Shape functions, node numbering and connectivity, Assembly, Boundary conditions, Isoparametric formulation of 1-D bar elements,	**2**
	Numerical integration using gauss quadrature formula, computation of stress and strain.	**2**
IV	Finite Element Formulation from Governing Differential Equation: Method of Weighted Residuals, Collocation, Sub domain method, Least Square method and Galerkin's method,	**5**
	Application to one dimensional problems, one-dimensional heat transfer, etc. introduction to variational formulation (Ritz Method.)	**3**
V	Higher Order Elements: Lagrange's interpolation formula for one and two independent variable, Convergence of solution, compatibility, element continuity, static condensation, p and h methods of mesh refinement, Aspect ratio and element shape,	**5**
	Application of FEM, Advantages of FEM, Introduction to concept of element mass matrix in dynamic analysis.	**3**
	TOTAL	**40**

TEXT BOOK		
1	Seshu P.,"Text Book of Finite Element Analysis", Prentice Hall India	2003
REFERENCE BOOKS		
SN	**Name of Authors /Books /Publisher**	**Year of Pub.**
1	Dixit, U. S., "Finite Element Methods for Engineers" Cengage Learning	2003
2	Finite Element Procedure in Engineering Analysis, Bathe K.J., Prentice Hall India.	2001
3	An Introduction to the Finite Element Method, Reddy J.N., Tata McGraw-Hill, New Delhi	1993
4	Concepts & Applications of Finite Element Analysis, Cook and Plesha, Willey India New Delhi.	2007
5	Introduction to Finite Elements in Engineering, Chandupatla and Belegundu, Prentice Hall India.	1999

7ME2A: REFRIGERATION AND AIR CONDITIONING

B.Tech. (Mechanical) 7th Semester **Max. Marks: 100**

3L+1T **Exam Hours: 3**

UNIT	CONTENTS	CONTACT HOURS
I	**Introduction:** Refrigeration and second law of Thermodynamics, Refrigeration effect and unit of Refrigeration, Heat pump, reversed Carnot cycle. **Vapour Compression Refrigeration System:** Analysis of simple vapour compression Refrigeration cycle by p-h and T-S diagram. Effect of operating conditions	5
	Multiple Evaporator and compressor system: Application, air compressor system, Individual compressor, compound compression, cascade system. Application, air compressor systems, individual compressor, compound compression, cascade system.	3
II	**Gas Cycle Refrigeration:** Limitation of Carnot cycle with gas, reversed Brayton cycle, Brayton cycle with regenerative heat exchanger.	4
	Air cycle for air craft: Necessity of cooling of air craft, Basic cycle, boot strap, regenerative type air craft refrigeration cycle.	4
III	**Other refrigeration systems** (description only): Vapour absorption refrigeration system, Electrolux refrigerator, Lithium Bromide - Water system, Water vapour refrigeration system, Vortex tube refrigeration system, thermo electric refrigeration system.	4
	Refrigerants: Classification, Nomenclature, selection of Refrigerants, global warming potential of CFC Refrigerants. Refrigeration Equipments: Compressor, condenser, evaporator, expansion devices, types & working.	4
IV	**Psychrometry:** Psychrometric properties, psychometric relations, pyschrormetric charts, psychrometric processes, cooling coils, By-pass factor, Apparatus Dew point temperature and air washers.	5
	Human Comfort: Mechanism of body heat losses, factors affecting human comfort, effective temperature, comfort chart.	3
V	**Cooling load calculations:** Internal heat gain, system heat gain, RSHF, ERSHF, GSHF, cooling load estimation, heating load estimation, psychrometric calculation for cooling.	5
	Selection of air conditioning: Apparatus for cooling and dehumidification, Air conditioning system, year round air conditioning.	3
	TOTAL	**40**

TEXT BOOK		
1	Arora, C.P., Refrigeration and Air Conditioning, Tata McGraw Hill	
REFERENCE BOOKS		
SN	**Name of Authors /Books /Publisher**	**Year of Pub.**
1	Stoecker W.F., "Refrigeration & Air Conditioning" McGraw Hill Publication.	**2000**
2	Andrew D. Althouse., "Modern Refrigeration & Air Conditioning" GoodHeart-Willcox Co.	**2002**
3	Jorden & Priester, Refrigeration & Air Conditioning, Prentice Hall of India.	**2003**
4	Roy J. Dossat, Principal of Refrigeration, Pearson Education, New Delhi.	**2014**
5	Edward G. Pita, Air Conditioning Principles and Systems, Pearson Education, New Delhi.	**2003**
6	Jain V.K., Refrigeration & Air Conditioning, Tata McGraw Hill New Delhi.	2004

7ME3A: OPERATIONS RESEARCH

B.Tech. (Mechanical) 7th semester **Max. Marks: 100**
3L+1T **Exam Hours: 3**

UNIT	CONTENTS	CONTACT HOURS
I	**Overview of Operations Research**	**1**
	Linear Programming: Applications and model formulation, Graphical method, Simplex method, duality and Sensitivity analysis.	**4**
	Transportation Model and Assignment Model including travelling salesman problem.	**4**
II	**Integer Linear Programming:** Enumeration and cutting Plane solution concept, Gomory's all integer cutting plane method, Branch and Bound Algorithms, applications of zero-one integer programming.	**5**
	Replacement Models: Capital equipment replacement with time, group replacement of items subjected to total failure.	**3**
III	**Queuing Theory**: Analysis of the following queues with Poisson pattern of arrival and exponentially distributed service times, Single channel queue with infinite customer population, Multichannel queue with infinite customer population,	**3**
	Competitive Situations and Solutions: Game theory, two person zero sum game, saddle point, minimax (maximin) method of optimal strategies, value of the game. Solution of games with saddle points, dominance principle. Rectangular games without saddle point – mixed strategy, approximate solution, and simplified analysis for other competitive situations. Application of linear programming	**4**
IV	Theory of Decision making: Decision making under certainty, risk and uncertainty. Decision trees.	**5**
	Deterministic Inventory control models: functional role of inventory, inventory costs, model building, Single item inventory control model without shortages, with shortage and quantity discount. Inventory control model with uncertain demand, service level, safety stock, P and Q systems, two bin system. Single period model. Selective Inventory control techniques.	**4**
V	**Probabilistic Inventory control models:** Instantanoues demand without setup cost and with setup cost, Continuous demand without setup cost	**4**
	Simulation: Need of simulation, advantages and disadvantages of simulation method of simulation. Generation of Random numbers, Generation of Normal Random numbers. Use of random numbers for	**4**

	system simulation. , Monte Carlo simulation, simulation language ARENA, Application of simulation for solving queuing Inventory Maintenance, Scheduling and other industrial problems	
	TOTAL	**40**

TEXT BOOK		
1	Operations Research, Ravindran, Phillips and Solberg, Wiley India.	
REFERENCE BOOKS		
SN	**Name of Authors /Books /Publisher**	**Year of Pub.**
1	Introduction to Operations Research, Hillier F.S. and Lieberman G.J., CBS Publishers.	
2	Operations Research, Taha H.A., Pearson Education	
3	Linear Programming and Network Flows, Bazaraa, Jarvis and Sherali, Wiley India.	
4	Principles of Operations Research, Wagner H.M., Prentice Hall of India.	
5	Operations Research, Gupta and Heera, S. Chand Publications.	

7ME4A: TURBOMACHINES

B.Tech. (Mechanical) 7th Semester **Max. Marks: 100**
3L+0T **Exam Hours: 3**

UNIT	CONTENTS	CONTACT HOURS
I	**Basic Concepts of Turbo Machines:** Definition & classification of Turbo machine, Basic laws and governing equations: continuity equation, steady flow energy equation(1st law of thermodynamics),2nd law of thermodynamics applied to turbo machines, Newton's 2nd law of motion applied to turbomachines - Euler's pump equation and Euler's turbine equation	**4**
	Dimensional analysis applied to hydraulic machines, power coefficient, flow coefficient, head coefficient, non-dimensional specific speed, Range of specific speeds for various turbo machines, Dimensional analysis applied to compressible flow machines, pressure ratio as a Function of temperature ratio, mass flow rate parameter and speed parameter	**4**
II	**Centrifugal Compressors and Fans:** Components and description, velocity iagrams, slip factor, energy transfer, power input factor, stage pressure rise and loading coefficient, pressure coefficient, degree of reaction, Centrifugal compressor characteristic, surging, rotating Stall and Choking	**3**
	Axial Flow Compressors and Fans: Basic constructional features, Advantages of axial flow compressors, working principle, velocity triangle, elementary theory, stage work, work done factor, stage loading, degree of reaction; vortex theory, simple design calculations, introduction to blade design, cascade test, compressibility effects, operating characteristics	**3**
	Reciprocating Compressors: Basic constructional features, working principle, work done calculation, single and double acting compressors	**2**
III	**Centrifugal Pumps:** Main parts, work done and velocity triangles, slip and slip factor, pump losses and efficiencies, minimum starting speed, net positive suction head, performance curve.	**3**
	Axial Flow Pumps: Description, velocity triangles, work done on the fluid, energy transfer, axial pump characteristics, cavitation.	**3**
	Reciprocating Pumps: Classification, component and working, single acting and double acting, discharge, work done and power required, coefficient of discharge, indicator diagram, slip, effect of friction and	**2**

	acceleration, theory of air vessels.	
IV	**Gas power cycles**: Ideal and practical gas turbine cycle, heat exchange cycle, reheat cycle, intercooled cycle, Comparison of various cycles.	**4**
	Thermodynamic Cycles: Advantages, disadvantages and performance characteristics of Ram jet engine, pulse jet engine, turbo prop engine, turbo jet engine, turbo fan engine, Calculation of specific thrust and efficiency	**4**
V	**Gas Turbines:** impulse and reaction type gas turbines, Velocity triangles and calculation of work done, efficiency etc.	**8**
	TOTAL	**40**

TEXT BOOK		
1	Gas turbines, V. Ganesan, Tata McGraw-Hill	
2	Subramanya, K., Hydraulic Machine, Tata McGraw Hill	2013
REFERENCE BOOKS		
SN	**Name of Authors /Books /Publisher**	**Year of Pub.**
1	Principle of Turbo Machinery, Turton R.K., Springer Publication	**1994**
2	Fundamentals of Turbo Machinery, William W., John Wiley and Sons.	**2008**
3	Turbo Machinery Basic Theory and Application, Logan E.J.	**1981**
4	Principles of Turbo Machinery, Shepherd Dennis G., Mac Millan Publisher, New York.	1956
5	TurboMachines, A Valan Arasu, Vikas Publishing House Pvt. Ltd.	**2009**
7	Gas turbine theory, Cohen and Saravanamutto, Pearson Educational Publication	**2009**
8	Hydraulic Machine: Turbines and Pumps, Nazarov N.T., Springer New York.	**2003**
9	Gas Turbine Theory, Cohen and Roger, Pearson Education.	
10	Hydraulic Machinery, Jagdish Lal, Metropolitan Books.	

7ME5A: OPERATIONS MANAGEMENT

B.Tech. (Mechanical) 8th semester **Max. Marks: 100**
3L+0T **Exam Hours: 3**

UNIT	CONTENTS	CONTACT HOURS
I	Introduction to operations management (OM), the scope of OM; Historical evolution of OM; Trends in business; the management process. Operations Strategy, Competitiveness and Productivity	**3**
	Demand Forecasting: components of forecasting demand, Approaches to forecasting: forecasts based on judgment and opinion, Time series data. Associative forecasting techniques, Accuracy and control of forecasts, Selection of forecasting technique.	**4**
II	Product and Service design, Process selection, Process types, Product and process matrix, Process analysis.	**3**
	Capacity Planning: Defining and measuring capacity, determinants of effective capacity, capacity strategy, steps in capacity planning process, determining capacity requirements, Capacity alternatives, Evaluation of alternatives; Cost-Volume analysis.	**2**
III	Facility Location: Need for location decisions, factors affecting location, qualitative and quantitative techniques of location. Facilities layout: Product, Process, Fixed position, combination and cellular layouts; Designing product and process layout, line balancing. Material Handling	**4**
	Planning levels: long range, Intermediate range and Short range	**4**

	planning, Aggregate planning: Objective, Strategies, and techniques of aggregate planning. Master scheduling; Bill of materials, MRP; inputs processing and outputs, and overview of MRPII , use of MRP to assist in planning capacity requirements, Introduction to ERP	
IV	Production Control: Capacity control and priority control, production control functions; Routing, scheduling, dispatching, expediting and follow up. Techniques of production control in job shop production, batch production and mass production systems. sequencing: priority rules, sequencing jobs through two work centers, scheduling services	**4**
	Introduction to Just-in-time (JIT) and Lean Operations: JIT production, JIT scheduling, synchronous production, Lean operations system	**4**
V	Supply Chain Management (SCM): Need of SCM, Bullwhip effect, Elements of SCM, Logistics steps in creating effective supply chain, Purchasing and supplied management.	**3**
	Project Management: Nature of projects, project life cycle, Work breakdown structure, PERT and CPM, Time-Cost trade-offs: Crashing. Resource allocation, leveling	**5**
	TOTAL	**40**

TEXT BOOK		
1	Stevenson, Operations Management, Tata McGraw Hill.	2009
REFERENCE BOOKS		
SN	**Name of Authors /Books /Publisher**	**Year of Pub.**
1	Roberta S. Russell, Bernard W. Taylor, Operations Management, John Wiley & Sons	2010
2	Joseph S. Martinich, Production And Operations Management, John Wiley & Sons	2008
3	S.N. Chary, Production and Operations Management, Tata McGraw Hill	2009
4	Norman Gaither, Greg Frazier, Operations Management, Thomson Learning	2002
5		

7ME6.1A MICRO AND NANO MANUFACTURING

B.Tech. (Mechanical) 7th semester **Max. Marks: 100**
3L+0T **Exam Hours: 3**

UNIT	CONTENTS	CONTACT HOURS
I	Nanoscale Cutting:- Introduction, Material representation and microstructure, Atomic interaction; Nonomachining:- Introduction, Nanometric machining, Theoretical basis of machining;	**4**
	Meso-micromcahining:- Introduction, size effects in micromachining, mechanism for large plastic flow, origin of the size effect, Meso-machining processes. Product quality in micromachining, Burr formation in micromachining operations.	**4**
II	Microturning:- Characteristic features and applications, Microturning tools and tooling systems, Machine tools for microturning	**2**
	Microdrilling: Characteristic features and applications, Microdrills and tooling systems, Machine tools for microdrilling Micromilling:- Characteristic features and applications, Micromills and	**2**

	tooling systems, Machine tools for micromilling,	
	Micro machining high aspect ratio microstructures, micromolding, micromolding processes, micromolding tools, micromold design, micromolding applications, limitations of micromolding.	**3**
III	**Microgrinding and Ultra-precision Processes:** Introduction, Micro and nanogrinding, Nanogrinding apparatus, Nanogrinding procedures, Nanogrinding tools, Preparation of nanogrinding wheels, Bonding systems, Vitrified bonding	**4**
	Non-Conventional Processes: Laser Micromachining:- Introduction, Fundamentals of lasers, Stimulated emission, Types of lasers, Laser microfabrication, Nanosecond pulse microfabrication, Shielding gas, Effects of nanosecond pulsed microfabrication, Picosecond pulse microfabrication, Femtosecond pulse microfabrication, Laser nanofabrication.	**4**
IV	**Diamond Tools in Micromachining:** Introduction, Diamond technology, Hot Filament CVD (HFCVD), Preparation of substrate, Selection of substrate material, Pre-treatment of substrate, Modified HFCVD process.	**4**
	Deposition on complex substrates, Diamond deposition on metallic (molybdenum) wire, Deposition on WC-Co microtools, Diamond deposition on tungsten carbide, (WC-Co) microtool, Performance of diamond-coated microtool	**4**
V	**Evaluation of Subsurface Damage in Nano and Micromachining:** Introduction, Destructive evaluation technologies, Cross-sectional microscopy, Preferential etching, Angle lapping/angle polishing, X-ray diffraction, Micro-Raman spectroscopy.	**4**
	Applications of Nano and Micromachining in Industry: Introduction, Typical machining methods, Diamond turning, Shaper/planner machining, Applications in optical manufacturing, Aspheric lens, Fresnel lens, Microstructured components, Semiconductor wafer production.	**5**
	TOTAL	**40**

TEXT BOOK		
1	Micro and Nano manufacturing by Marks J. Jackson springer	2008
REFERENCE BOOKS		
SN	**Name of Authors /Books /Publisher**	**Year of Pub.**
1	J. Paulo Davim, Mark J. Jackson, Nano and Micromachining ISTE Ltd John Wiley & Sons, Inc.	2009

7ME6.2A: ROBOTICS

B.Tech. (Mechanical) 7th semester **Max. Marks: 100**
3L+0T **Exam Hours: 3**

UNIT	CONTENTS	CONTACT HOURS
I	**Introduction to Robotics:** Evolution of Robots and Robotics, Laws of Robotics, What is and What is not a Robot, Progressive Advancement in Robots.	**3**
	Robot Anatomy, Human Arm Characteristics, Design and Control Issues, Manipulation and Control, Sensors and Vision, Programming Robots, The Future Prospects, Notations.	**5**
II	**Robot End Effectors:** Classification of end effectors, drive system for grippers, Mechanical, Magnetic, Vaccum, Adhesive grippers, Hooks,	**4**

	Scoops, Miscellaneous devices, Gripper force analysis and Design, Active and Passive Gripeers	
	Coordinate Frames, Mapping and Transforms: Coordinate Frames, Description of Objects in Space, Transformation of Vectors, Inverting a Homogeneous Transform, Fundamental Rotation Matrices.	**4**
III	**Symbolic Modeling of Robots:** Direct Kinematic Model, Mechanical Structure and Notations, Description of Links and Joints, Kinematic Modeling of the Manipulator,	**3**
	Denavit – Hartenberg Notation, Kinematic Relationship between Adjacent Links, Manipulator Transformation Matrix. Introduction to Inverse Kinematic model, Solvability of Inverse Kinematics model, Solution techniques.	**5**
IV	**Robotic Sensors:** The Meaning of Sensing, Sensors in Robotics, Kinds of Sensors used in Robotics, Choosing the right sensors	**3**
	Robotic vision: Introduction to Robotic Vision, Industrial Applications of Vision-Controlled Robotic Systems, Process of Imaging, Architecture of Robotic Vision Systems, Image Acquisition, Image Representation and Image Processing	**5**
V	**Robot Applications:** Industrial Applications, Material Handling, Processing Applications, Assembly Applications, Inspection Application, Principles for Robot Application and Application Planning, Justification of Robots, Robot Safety, Non-Industrial Applications.	**4**
	Robot Programming: Robot languages, Classification of Robot language, Computer control and robot software, VAL system and language	**4**
	TOTAL	**40**

TEXT BOOK		
1	Mittal R.K., Nagarath, I.K., Robotics and Control, Tata Mc Graw Hill,	**2007**
REFERENCE BOOKS		
SN	**Name of Authors /Books /Publisher**	**Year of Pub.**
1	Deb S.R., Robotics Technology and Flexible Automation, Tata McGraw Hill	**2010**
2	Ghoshal, A., Robotics Fundamental Concepts and Analysis, Oxford University Press	**2010**
3	Craig JJ, Introduction to Robotics, Mechanics and Control, Addison-Wesley, 2nd Ed.	**2004**
4	Fu, K.S., Gonzales, R.C. and Lee, C.S.G., Robotics: Control, Sensing, Vision and Intelligence, McGraw Hill	**1987**
5	Groover, M. P., Wiess, M., Nagel, R. N. and Odery, N. G. Industrial Robotics- Technology, Programming and Applications, McGraw Hill Inc. Singapore	**2000**
9		

7ME6.3A: CNC MACHINES AND PROGRAMMING

B.Tech. (Mechanical) 7th semester **Max. Marks: 100**
3L+0T **Exam Hours: 3**

UNIT	**CONTENTS**	**CONTACT HOURS**
I	Introduction: Definition of NC, Applications of NC ,Historical Developments in Automation, Classification of NC Systems, Comparison of NC and Conventional Machines, Advantages of NC	**8**
II	NC Hardware: Architecture of NC Systems, Design Considerations, Mechanical Elements, Structure, Guideways and Slides, Guideway Elements, Transmission Systems, Spindle Unit, Coolant system, Lubrication System, Tool and work Changing Mechanisms, Electrical	**8**

	Elements, Drives, Sensors, Control Loops, Computing Elements/ Firmware, Interpolators	
III	NC Software: Introduction, Manual Part Programming, Computer-Assisted Part Programming, Language Based , Geometric Modeling Based, Automatic Part Program Generation,	**8**
IV	CAPP Systems , 5 Axis Programming, Post-Processing, Programming Robots and CMMs	**4**
	NC Simulation, Kinematic simulation, Volumetric simulation, Applications of Volumetric NC Simulation, Verification	**4**
V	Advanced Topics:, Adaptive Control, Off-line adaptive control, Various optimisation criteria, Hardware Based AC, Software Based AC, Tooling and Instruments for NC Special Considerations in High Speed Cutting (HSC) and Die Sinking, Rapid Product Development, CAM, FMS, CIM	**8**
	TOTAL	**40**

TEXT BOOK		
1	Krar S. and Gill A., CNC: Technology and Programming, McGraw Hill	1990
REFERENCE BOOKS		
SN	**Name of Authors /Books /Publisher**	**Year of Pub.**
1	Koren Y., Computer Control of Manufacturing Systems, Tata McGraw Hill.	1983
2	Pressman R.S. and Williams J.E., Numerical Control and Computer-Aided Manufacturing, John Wiley & Sons	1977,
3	Jones B.L., Introduction to Computer Numerical Control, John Wiley & Sons.	1986
4	Kral I.H., , Numerical Control Programming in APT, Prentice-Hall	1986
5	Chang C.H. and Melkanoff M.A., ,NC Machine Programming and Software Design, Prentice-Hall	1986

7ME7A: THERMAL ENGINEERING LAB-II

B.Tech. (Mechanical) 7th Semester **Max. Marks: 100**
0L+0T+3P **Exam Hours: 3**

SN	**LABORATORY WORK/NAME OF EXPERIMENT**	**CONTACT HOURS**
1	To perform constant speed load test on a single cylinder diesel engine and to plot performance curves: indicated thermal efficiency, brake thermal efficiency, mechanical efficiency Vs. Brake power, and heat balance sheet.	
2	To estimate the Indicated Power, Friction Power and Mechanical Efficiency of a multi-cylinder Petrol Engine. (Morse Test)	
3	Analysis of engine exhaust gases using Orsat apparatus / gas analyzer.	
4	To study refrigeration cycle, determination of coefficient of performance of cycle and tonnage capacity of refrigeration unit.	
5	To determine the COP and tonnage capacity of a Mechanical heat pump.	
6	To study various controls used in Refrigeration and Air conditioning system.	
7	Determination of dryness fraction of steam.	
8	Study and Performance of Simple Steam Turbine	
9	Performance characteristics of Pelton wheel turbine.	
10	Performance characteristics of Francis turbine.	
11	Performance characteristics of Kaplan turbine.	
12	Performance characteristics of variable speed centrifugal pump.	
13	Performance characteristics of rated speed centrifugal pump.	

7ME8A: FINITE ELEMENT LAB.

B.Tech. (Mechanical) 7th Semester **Max. Marks: 100**
0L+0T+3P **Exam Hours: 3**

SN	LABORATORY WORK/NAME OF EXPERIMENT	CONTACT HOURS
1	Laboratory work for the solution of solid mechanics problems, heat transfer problems, and free vibration problems **A: by using FE packages such as NASTRAN/ ANSYS/ SIMULIA/ ABAQUS**	
2	Introduction of GUI of the software in the above mentioned areas realistic problems.	
3	Analysis of beams and frames (bending and torsion problems)	
4	Plane stress and plane strain analysis problems	
5	Problems leading to analysis of axisymmetric solids	
6	Problems leading to analysis of three dimensional solids (a) Heat transfer problems (b) Modal analysis problem	
	B: by writing own code for finite element analysis using MATLAB for:	
7	Plane stress and plane strain analysis problems	
8	Modal Analysis problem	

8ME1A: COMPUTER INTEGRATED MANUFACTURING SYSTEMS

B.Tech. (Mechanical) 8th semester **Max. Marks: 100**
3L+0T **Exam Hours: 3**

UNIT	CONTENTS	CONTACT HOURS
I	**Introduction to CIM:** Overview of Production Systems, the product cycle, Automation in Production Systems, computer's role in manufacturing, sources and types of data used in manufacturing. The Beginning of CAM: Historical Background,	2
	Numerical Control (NC): Basic components of an NC system, coordinate system and motions control systems. Computer Numerical Control (CNC): features of CNC, machine control unit, CNC software. Direct Numerical Control and Distributed Numerical Control. Applications, advantages and disadvantages of NC. Adaptive control of machining system.	3
II	NC Part programming: Manual and computer assisted part programming, Part programming with APT. NC part programming using CAD/CAM software. NC cutter path verification.	8
III	Computer Aided Process Planning: Traditional Process Planning, Retrieval process planning system, Generative Process Planning, Machinability data systems, computer generated time standards.	4
	Group Technology: Introduction, part families, part classification and coding, coding system and machining cells.	4
IV	Computer Aided Production Management Systems: Introduction to computer aided PPC, Introduction to computer aided inventory management, manufacturing resource planning (MRPII), computer process monitoring and shop floor control, computer process control.	6
	Computer Aided Quality Control; Computer in quality control, contact inspection methods, Non contact inspection methods, optical and non optical computer aided testing.	2
V	Computer Aided Material Handling; Computer control on material handling, conveying, picking. Ware house control, computerized material handling for automated inspection and assembly.	

	Computer Integrated Manufacturing Systems: Introduction, types special manufacturing systems, flexible manufacturing systems (FMS).	**5**
	Collaborative Engineering; Introduction, Faster Design throughput, Web based design, Changing design approaches, extended enterprises, concurrent engineering, Agile and lean manufacturing.	**3**
	TOTAL	**40**

TEXT BOOK		
1	Mikell P. Groover, , Automation, Production Systems, and Computer-Integrated Manufacturing, 3rd ed., Pearson/Prentice Hall,	2008
REFERENCE BOOKS		
SN	**Name of Authors /Books /Publisher**	**Year of Pub.**
1	James A. Rehg and Henry W. Kraebber, 2005, Computer-Integrated Manufacturing, 3rd ed., Pearson/Prentice Hall,	
2	Nanua Singh, 1996, Systems Approach to Computer-Integrated Design and Manufacturing, John Willey & Sons.	
3	Computer Aided Manufacturing, Chang, Wysk and Wang, Pearson Education	
4	CAD/CAM: Principles and Applications, P.N. Rao, McGraw Hill	
5	Computer Control of Manufacturing Systems,Y. Koren, McGraw Hill	
6	Computer aided Manufacturing, Rao, Tiwari and Kundra, Tata McGraw Hill.	
7	Computer Numerical Control: Machining and Turning Centres, Quesada and Jeyepoovan, Pearson Education	

8ME2A: LAWS FOR ENGINEERS

B.Tech. (Mechanical) 8th semester **Max. Marks: 100**
3L+0T **Exam Hours: 3**

UNIT	**CONTENTS**	**CONTACT HOURS**
	Constitutional Law*:* The Preamble; Fundamental Rights; Directive principles of State policy; Fundamental Duties; Emergency provisions – kinds, legal requirements and legal effects.	**5**
I	**General Principles of Contract under Indian Contract Act, 1872:** General principles of contract – Sec. 1 to 75 of Indian Contract Act and including Government as contracting party, Kinds of government contracts and dispute settlement, Standard form contracts; nature, advantages, unilateral character, principles of protection against possibility of exploitation, judicial approach to such contracts, exemption clauses, clash between two standard form contracts.	**4**
II	**Introduction to Human Rights:** Theoretical foundation, Historical development of human rights; Human Rights in Indian tradition and Western tradition; Covenant on Civil & Political Rights 1966 including Optional Protocol – I (Individual Complaint Mechanism) & Optional Protocol – II (Abolition of Death Penalty); Covenant on Economic, Social and Cultural Rights 1966 including Optional Protocol – I (2002);	**4**
	Enforcement of Human Rights in India including Supreme Court, High Courts, Statutory Commissions – NHRC, NCW, NCM, NC-SC/ST etc.	**4**
	Labour Laws: Industrial Disputes Act, 1947; Collective bargaining; Industrial Employment (Standing Orders) Act, 1946; Workmen"s Compensation Act, 1923.	**3**
III	**Right to Information Act, 2005:** Evolution and concept; Practice and procedures; Official Secret Act, 1923; Indian Evidence Act, 1872;	**3**

	Information Technology – legislation and procedures, Cyber crimes – issues and investigations.	
	Law relating to Intellectual property: Introduction–meaning of intellectual property, main forms of IP, Copyright, Trademarks, Patents and Designs, Secrets; International instruments on IP – Berne convention, Rome convention, TRIPS, Paris convention and international organizations relating IPRs, WTO etc;	**4**
IV	Law relating to Copyright in India, Meaning of copyright – literary, dramatics and musical works, sound records and cinematographic films, computer programs, Ownership of copyrights, Criteria of infringement, Piracy in Internet – Remedies and procedures in India;	**1**
	Law relating to Trademarks under Trademark Act, 1999 including Rationale of protection of trademarks as Commercial aspect and Consumer rights, Trademarks, registration, procedures, Distinction between trademark and property mark, Doctrine of deceptive similarity, Passing off an infringement and remedies;	**2**
	Law relating to Patents under Patents Act, 1970, Patentable inventions with special reference to biotechnology products, Patent protection for computer programs, Process of obtaining patent –application, examination, opposition and sealing of patents, Patent cooperation treaty and grounds for opposition, Rights and obligations of patentee, Duration of patents – law and policy considerations, Infringement and related remedies.	**3**
V	**Corporate Law**: Meaning of corporation; Law relating to companies, public and private (Companies Act, 1956) general provisions; Law and multinational companies – International norms for control, FEMA 1999, Corporate liability, civil and criminal.	**4**
	Election provisions under Indian Constitution (Art.324–329): Representation of Peoples Act and Prevention of Corruption Act, 1988; Superintendence, directions and control of elections to be vested in Election Commission; Election to the house of people and to the legislative assemblies of States to be on the basis of adult suffrage. Candidate electoral rights.	**3**
	TOTAL	**40**

REFERENCE BOOKS		
SN	**Name of Authors /Books /Publisher**	**Year of Pub.**
1	D.D. Basu, Shorter Constitution of India, Prentice Hall of India	1996
2	M.P. Jain, Indian Constitutional Law, Wadhwa & Co.	2005
3	S.K. Awasthi & R.P. Kataria, Law relating to Protection of Human Rights, Orient Publishing	2006
4	S.K. Kapur, Human Rights under International Law and Indian Law, Central Law Agency	2001
5	Avtarsingh, Law of Contract, Eastern Book Co	2002
6	Wadhera , Intellectual Property Rights, Universal Law Publishing Co	2004
7	T. Ramappa, Intellectual Property Rights Law in India, Asia Law House	2010
8	O.P. Malhotra, Law of Industrial Disputes, N.M. Tripathi Publishers	

8ME3A: POWER GENERATION

B.Tech. (Mechanical) 8th Semester **Max. Marks: 100**
3L+1T **Exam Hours: 3**

UNIT	**CONTENTS**	**CONTACT HOURS**
I	**Introduction to economics of power generation:** Load duration	**7**

	curves, location of power plants, power plant economics.	
II	**Analysis of Steam Power Plants (SPP):** Components of steam power plants, Effect of variations, variation of steam condition on thermal efficiency of steam power plant. Typical layout of SPP. Efficiencies in a SPP.	**9**
III	**Analysis of Hydroelectric Power Plants (HEPP):** Components of HEPP, Typical layout of HEPP, Performance of turbines and comparison.	**4**
	Analysis of Diesel and Gas Turbine Power Plants: General layout of Diesel and Gas Turbine power plants, Performance of Diesel and Gas Turbine power plants, comparison with other types of power plants.	**4**
IV	**Wind Energy:** Wind energy potential measurement, general theories of wind machines, basic laws and concepts of aerodynamics, aerofoil design; wind mill and wind electric generator. Description and performance of the horizontal–axis wind machines. Description and performance of the vertical–axis wind machines. The generation of electricity by wind machines,	**8**
V	**Solar radiation:** its measurement and prediction. Flat plate collectors, liquid and air type. Theory of flat plate collectors, advanced collectors, optical design of concentrators, selective coatings, solar water heating, thermal storage. Conversion of heat into mechanical energy. Solar cells, photovoltaic effect, performance of a solar cell, P-V material, performance of solar cells, P-V modules. Solar P-V plants, Economies of solar photovoltaic's.	**8**
		40

TEXT BOOK		
1	P.K.Nag, Power Plant Engineering, Tata McGraw Hill	2008
REFERENCE BOOKS		
SN	**Name of Authors /Books /Publisher**	**Year of Pub.**
1	Hau E., Wind Turbines: Fundamentals, Technologies, Application and Economics, Springer	**2000**
2	Mathew S.,Wind Energy: Fundamentals, Resource Analysis and Economic s, Springer	2006
3	Burton T. Sharpe D. Jenkins N. and Bossanyi E.,Wind Energy Handbook, John Wiley	2001
4	Jiandong T. (et al.) , Mini Hydropower, John Wiley	
5	Duffie J. A. and Beckman W. A. ,Solar Engineering of Thermal Processes, John Wiley	1997
6	Goswami D. Y. Kreith F. and Kreider J. F. Principles of Solar Engineering, Taylor and Francis	2006
7	Garg H. P. and Prakash S.Solar Energy: Fundamental and Application, Ta ta McGraw Hill	1999
8	Green M.,Third Generation Photovoltaics: Advance Solar Energy, Springer	1997
9	Tiwari G. N.,Solar Energy: Fundamentals, Design, Modeling and Applicati ons, Narosa	2005
10	Johnson G. L.Wind Energy Systems (Electronic Edition), Prentice Hall	2002
11	Wagner H. and Mathur J. Introduction to Hydro energy Systems : Basics, Technology and Operation, Springer	2006
12	Nayak J. K. and Sukhatme S.P. Solar Energy: Principles of Thermal Colle ction and Storage, Tata McGraw Hill	2011
13	Solanki C. S. Solar Photovoltaics: Fundamentals, Technologies and Applications, Prentice Hall India	2006
14	F.T.Morse, D.Van.Nostran, Power Plant Engineering, Newyork,	2009
15	Johnson G. L.Wind Energy Systems (Electronic Edition), Prentice Hall	1953

16	Wagner H. and Mathur J. Introduction to Hydro energy Systems : Basics, Technology and Operation, Springer	2006
17	M.M.EI- Wakil, Power Plant Technology, McGraw Hill	1984

8ME4.1A: PRODUCT DEVELOPMENT AND LAUNCHING

B.Tech. (Mechanical) 8th semester **Max. Marks: 100**
3L+0T **Exam Hours: 3**

UNIT	CONTENTS	CONTACT HOURS
I	**Importance of New Product:** Definition-importance-Development Process, Importance of new product for growth of enterprise, Definition of product and new product,	**2**
	Responsibility for new product development, Demands on product development team, Classification of products from new product development point of view- Need based/Market pull products, Tech. push, Platform based, Process based and customized products,	**3**
	New product development process and organization, Generic product development process for Market Pull Products, Modification of this process for other types of products.	**3**
II	**Need Analysis:** Problem Formulation Establishing economic existence of need, Need Identification and Analysis, Engineering Statement of Problem, Establishing Target Specification.	**8**
III	**Generation of Alternatives and Concept Selection:** Concept generation- a creative process, Creativity, Road Elects to creative thinking-Fear of criticism and Psychological set,	**4**
	Tools of creativity like brain storming, Analogy, Inversion etc., Creative thinking Process, Concept feasibility and Concept Selection, Establishing Engineering Specification of Products.	**4**
IV	**Preliminary and Detailed Design:** Design Review Preliminary design-Identification of subsystems, Subsystem specifications, Compatibility, Detailed design of subsystems, component design,	**6**
	Preparation of assembly drawings, Review of product design from point of view of Manufacturing, Ergonomics and aesthetics.	**2**
V	**Management of New Product:** Development and Launch New Product Management's Challenges, Maintaining focus, Promotion of Right Culture, Management of Creativity, Top Management attention, Design Team Staffing and Organization, Setting key mile stone, Identification of Risk Areas, Project Execution and Evaluation Product Launch Strategies,	**8**
	TOTAL	**40**

TEXT BOOK		
1	Product Design and Manufacturing, Chitale and Gupta. McGraw Hill.	
REFERENCE BOOKS		
SN	**Name of Authors /Books /Publisher**	**Year of Pub.**
1	Product Design and Development, Ulrich and Eppinger, McGraw Hill	**2003**
2	Project Management in New Product Development, Barkley B.T., Tata McGraw Hill.	**2008**
3	Product Management, Anandan C., McGraw Hill.	**2009**
4	Engineering Design Methods, Cross, Nigel, John Wiley and Sons.	**1995**
5	Product Design and Manufacture, Lindbeck, J.R., Prentice Hall of India.	**1995**

8ME4.2: COMPUTATIONAL FLUID DYNAMICS

B.Tech. (Mechanical) 8th semester **Max. Marks: 100**
3L+0T **Exam Hours: 3**

UNIT	CONTENTS	CONTACT HOURS
I	**Introduction to Computational Fluid Dynamics and Principles of Conservation**: Conservation of mass, linear momentum: Navier-Stokes equation, Conservation of Energy, General scalar transport equation, Reynolds transport theorem,	4
	Classification of Partial Differential Equations and Physical Behaviour: Elliptic, parabolic and hyperbolic partial differential equations	2
	Approximate Solutions of Differential Equations: Error Minimization Principles, Approximate solutions of differential equations, variational approach, Weighted residual approach: trial function and weighting function, Essential and natural boundary conditions, Least square method, Galerkin's method, Rayleigh-Ritz method	4
II	**Fundamentals of Discretization:** Pre-processing, Solution, Post-processing, Finite Element Method, Finite difference method, Well posed boundary value problem, Conservativeness, Boundedness, Transportiveness, Finite volume method (FVM), 1-D steady state heat conduction without and with constant source term	3
	Finite Volume Method: FV Discretization of a 1-D steady state diffusion type problem, Composite material with position dependent thermal conductivity, Source term linearization, Implementation of boundary conditions, 1-D unsteady state diffusion problems: implicit, fully explicit and Crank-Nicholson scheme	4
III	**Solution of Systems of Linear Algebraic Equations:** Solution techniques for systems of linear algebraic equations: Elimination, Iteration and Gradient Search method, L-U decomposition technique, Tridiagonal matrix algorithm (TDMA): Thomas algorithm	4
	Iteration methods: Generalized analysis of the iterative methods, Sufficient condition for convergence, Scarborough criteria of for convergence Relaxation methods, Preferential characteristics of iterative methods, Multigrid method, Line by line TDMA, Alternating direction implicit method, Gradient search methods: Steepest descent method, Conjugate gradient method	4
IV	**Discretization of Convection-Diffusion Equations: A Finite Volume Approach:** Central difference scheme, Upwind scheme, Exponential scheme and Hybrid scheme, Power law scheme, Generalized convection-diffusion formulation, The concept of false diffusion, QUICK scheme.	5
	Discretization of Navier Stokes Equations: Discretization of the Momentum Equation: Stream Function-Vorticity approach and Primitive variable approach, Staggered grid and Collocated grid, SIMPLE Algorithm, SIMPLER Algorithm	3
V	**Introduction to Turbulence Modeling:** Vorticity transport equation, Homogeneous turbulence and isotropic turbulence, Reynolds average Navier stokes (RANS) equation, Necessity of turbulence modeling, Turbulence model: Eddy viscosity, Mixing length, The κ-ε model, RNG κ-ε model, κ-ω model, Reynolds stress model (RSM),Large eddy Simulation (LES),Direct numerical simulation (DNS)	4
	The basic structure of a CFD code: Pre-processor, Solver and Post-processor, User-defined-subroutines, Solution to some basic problems in heat transfer and fluid flow	3
	TOTAL	**40**

TEXT BOOK	

1	Computational Fluid Dynamics, John Anderson, McGraw Hill Publication	
REFERENCE BOOKS		
SN	**Name of Authors /Books /Publisher**	**Year of Pub.**
1	Computational Fluid Dynamics, Jiynan Tu, Butter Worth Henman.	**1998**
2	Computational Fluid and Heat Transfer, Anderson & Tannehill, Taylor & Francis Publication.	**1997**
3	Computational Methods for Fluid Dynamics, Joel H. Ferziger, Springer Publication.	**2009**
4	Computational Heat Transfer, Jaluria Y., Taylor and Francis Publication.	**1996**
5	Computational Heat Transfer and Fluid Flow, Murlidhar and T. Sunder Rajan, Narosa Publications	**2011**

8ME4.3A: TOTAL QUALITY MANAGEMENT

B.Tech. (Mechanical) 8th semester **Max. Marks: 100**
3L+0T **Exam Hours: 3**

UNIT	CONTENTS	CONTACT HOURS
I	Introduction to TQM: Definition, Basic approach, Guru's of TQM, TQM framework, benefits.	**2**
	Leadership: Characteristics of Quality Leadership, Leadership Concepts, The 7 Habits of Highly Effective People, The Deming Philosophy, The Role of TQM Leaders, Quality Council, Core Values, Concepts, and Framework, Quality Statements, Strategic Planning Communications, Decision Making.	**3**
	Customer Satisfaction: Introduction, Customer Perception of Quality, Feedback, Using Customer Complaints, Service Quality, Translating Needs into Requirements, Customer Retention.	**3**
II	Continuous Process Improvement: Introduction, Process, The Juran Trilogy, Improvement Strategies, Types of Problems PDSA Cycle, Problem-Solving Method, DMAIC, Kaizen, Reengineering.	**3**
	Supplier Partnership: Principles of Customer/Supplier Relationship Partnering, Sourcing Supplier, Selection ,Supplier Certification Supplier Rating, Relationship Development.	**2**
	Performance Measures: Basic Concepts, Strategy, performance measure presentation, Cost of Quality, Malcolm Baldrige and Rajiv Gandhi National Quality Award, Balanced Score Card	**3**
III	Lean Enterprise: Historical Review, Lean Fundamentals, Value Stream Map, Implementing Lean, Benefits.	**3**
	Six Sigma: Statistical Aspects, Improvement Methodology, Organizational Structure Benefits.	**3**
	Benchmarking: Benchmarking Defined, Reasons to Benchmark, Process, deciding what to benchmark, Pitfalls and Criticisms.	**2**
IV	Quality Management Systems: Benefits of ISO Registration, ISO Series of Standards, Sector-specific Standards, ISO 9001 Requirements, Implementation, Documentation, Writing the Documents, Internal Audits, Registration.	**2**
	Environmental Management Systems: ISO 14000 Series Standards, Concepts of ISO 14001, ISO 14001, Requirements, Benefits, Integrating QMS and EMS. Other EMS Systems, Relationship to Health and Safety	**2**
	Quality Function Deployment: The QFD Team, Benefits, the voice of the Customer, Organization of Information, House of Quality, Building a House of Quality, QFD Process.	**2**
	Total Productive Maintenance: The Plan, Learning the New Philosophy, Promoting the Philosophy, Training, Improvement Needs, Goal,	**2**

	Developing Plans, Autonomous Work Groups	
V	Management Tools: Forced Field Analysis, Nominal Group Technique, Affinity Diagram, Interrelationship Digraph, Tree Diagram, Matrix Diagram, Prioritization Matrices, Process Decision Program Chart, Activity Network Diagram	2
	Experimental Design: Introduction, Basic Statistics, Hypothesis, t Test F Test. One Factor at a Time Orthogonal Design, Point and Interval Estimate, Two Factors Full Factorials.	3
	Taguchi's Quality Engineering: Introduction, Loss Function, Orthogonal Arrays, Signal-to-Noise Ratio, Parameter Design, Tolerance Design, Case study	3
	TOTAL	**40**

TEXT BOOK		
1	D. H. Besterfield, G. H Besterfield, Hemant Urdhwareshe, Total Quality Management: Revised Third Edition, Pearson Higher Education	2013
REFERENCE BOOKS		
SN	**Name of Authors /Books /Publisher**	**Year of Pub.**
1	Total Quality Management: text with cases, John S Oakland, Butterworth-Heinemann	2003
2	Total Quality Management for Engineers, Zaire, M., Wood Head Publishing Ltd.	1991
3	Total Quality Control, Feigenbaum. Armand V., McGraw Hill	1991
4	The Management and Control of Quality,(5th Edition), James R.Evans and William M.Lidsay, South-Western (Thomson Learning)	2002
5		

8ME5A: CAM LAB.

B.Tech. (Mechanical) 8th Semester **Max. Marks: 75**
0L+0T+2P **Exam Hours: 2**

SN	NAME OF EXPERIMENT	CONTACT HOURS
1	To prepare part programming for plain turning operation.	
2	To prepare part programming for turning operation in absolute mode.	
3	To prepare part program in inch mode for plain turning operation.	
4	To prepare part program for taper turning operation.	
5	To prepare part program for turning operations using turning cycle.	
6	To prepare part program for threading operation.	
7	To prepare part program for slot milling operation.	
8	To prepare part program for gear cutting operation.	
9	To prepare part program for gear cutting using mill cycle.	
10	To prepare part program for drilling operation.	
11	To prepare part program for multiple drilling operation in Z-axis.	
12	To prepare part program for multiple drilling in X-axis.	
13	To prepare part program for multiple drilling in X and Z axis using drilling cycle.	

8ME6A: CAD LAB.

B.Tech. (Mechanical) 8th Semester **Max. Marks: 100**
0L+0T+3P **Exam Hours: 3**

SN	NAME OF EXPERIMENT	CONTACT

		HOURS
1	Introduction and different features of the CAD Software.	
2	2-D Drafting.	
3	3-D Modeling.	
4	3-D Advanced Modeling.	
5	Assembly modeling.	
6	Feature Modification and Manipulation	
7	Detailing.	
8	Sheet Metal Operations.	
9	Surface Modeling	
10	One Dimensional problems of Finite Element Method Note: (These exercises may be performed by any of the following Advanced CAD Software such as Pro E /Unigraphics/ AotoCAD Inventor)	

8ME7A: INDUSTRIAL ENGINEERING LAB-II

B.Tech. (Mechanical) 8th Semester **Max. Marks: 75**

0L+0T+2P **Exam Hours: 2**

SN	NAME OF EXPERIMENT	CONTACT HOURS
1	Determination of time standard for a given job using stopwatch time-study.	
2	Preparation of flow process chart, operation process chart and man-machine charts for an existing setup and development of an improved process.	
3	Study of existing layout of a workstation with respect to controls and displays and suggesting improved design from ergonomic viewpoint.	
4	To carry out a work sampling study.	
5	To conduct process capability study for a machine in the workshop.	
6	To design a sampling scheme based on OC curve.	
7	To conduct Shewart's experiments on known population	
8	Generation of random numbers for system simulation such as facility planning, job shop scheduling etc.	