POORNIMA
COLLEGE OF ENGINEERING
Affiliated to RTU, Kota - Approved by AICTE & UGC under 2(f) - NAAC A+ Accredited

Department of Electronics & Communication Engineering

COVER PAGE

Name of faculty	Dr. Meetu Nag
Class	III year. IV Sem
Branch	Electronics and Communication Engineering
Course Code	4EC3-6
Course Name	EMI
Session	2023-2024

POORNIMA
COLLEGE OF ENGINEERING

BLOWN UP SYLLABUS

Campus: PCE	Course: B.Tech	Class:2nd year	Date:
Name of Faculty: Dr. Meetu Nag		Name of Subject: Electronic Measurement and Instrumentation	Code: 4EC3-06

S.No.	Topic as per Syllabus	BLOWN UP TOPICS
1)	**Unit-I Theory of Errors**	
	(1.1) Introduction	(1.1.1)Performance Characteristic (1.1.2)Accuracy (1.1.3)Precision (1.1.4)Error (1.1.5)Uncertainty (1.1.6) Repeatability (1.1.7)Reproducibility
	(1.2) Accuracy & Precision	(1.2.1)Definition (1.2.2)Examples (1.2.3)Measuring parameters (1.2.4)Significant Figures
	(1.3) Repeatability	(1.3.1)Introduction (1.3.2)Comparison between Repeatability and Reproducibility (1.3.3) Examples
	(1.4) Limits Of Errors	(1.4.1)Introduction (1.4.2)Types of Errors (1.4.3) Limiting Error (1.4.4)Relative limiting Error
	(1.5) Systematic and Random Errors	(1.5.1)Instrumental Error (1.5.2)Environmental Error (1.5.3)Observational Error (1.5.4) Remedies

POORNIMA
COLLEGE OF ENGINEERING

BLOWN UP SYLLABUS

Campus: PCE	Course: B.Tech	Class:2nd year	Date:
Name of Faculty: Dr. Meetu Nag		Name of Subject: Electronic Measurement and Instrumentation	Code: 4EC3-06

S.No.	Topic as per Syllabus	BLOWN UP TOPICS
1)	**Unit-I Theory of Errors**	
	(1.1) Introduction	(1.1.1)Performance Characteristic (1.1.2)Accuracy (1.1.3)Precision (1.1.4)Error (1.1.5)Uncertainty (1.1.6) Repeatability (1.1.7)Reproducibility
	(1.2) Accuracy & Precision	(1.2.1)Definition (1.2.2)Examples (1.2.3)Measuring parameters (1.2.4)Significant Figures
	(1.3) Repeatability	(1.3.1)Introduction (1.3.2)Comparison between Repeatability and Reproducibility (1.3.3) Examples
	(1.4) Limits Of Errors	(1.4.1)Introduction (1.4.2)Types of Errors (1.4.3) Limiting Error (1.4.4)Relative limiting Error
	(1.5) Systematic and Random Errors	(1.5.1)Instrumental Error (1.5.2)Environmental Error (1.5.3)Observational Error (1.5.4) Remedies

	(1.6) Modeling of errors	(1.6.1)Introduction
	(1.7) Probable Errors	(1.7.1)Normal Distribution of Errors (1.7.2)Probable Error Calculations
	(1.8) Standard Deviation	(1.8.1)Deviation (1.8.2)Arithmetic Mean (1.8.3)Standard Deviation
	(1.9) Gaussian Error Analysis	(1.9.1)Introduction (1.9.2)Gaussian Curve (1.9.3)Limiting Error (1.9.4)Relative Limiting Error
	(1.10) Combination of Errors	(1.10.1)Sum of Quantities (1.10.2)Product of Quantities (1.10.3)Difference of Quantities (1.10.4)Quotient of Quantities
	Conclusion	
2)	**UNIT-II Electronic Instruments for Measuring Basic Parameters**	
	(2.1) Introduction	(2.1.1) Basic Introduction about Electronic Instruments
	(2.2)Electronic Voltmeters	(2.2.1)Introduction (2.2.2)Principle (2.2.3)Working (2.2.4)Advantages and limitations (2.2.5)Applications
	(2.3) Electronic Multi meters	(2.3.1)Introduction (2.3.2)Principle (2.3.3)Working (2.3.4)Advantages and limitations (2.3.5)Applications
	(2.4) Digital Voltmeter	(2.4.1)General Chart eristic (2.4.2)Types (2.4.2.1)Ramp type

		(2.4.2.2)Integrating type (2.4.2.3)Continues balance type (2.4.2.4)Successive approximation type
	Component Measuring Instruments:	
	(2.5) Introduction	(2.5.1)Introduction about the different measuring parameters (2.5.2) Advantages and limitations (2.5.3)Applications (2.5.4) Range
	(2.6) Q-meter	(2.6.1)Basic circuit (2.6.2)Measuring methods (2.6.2.1)Direct (2.6.2.2)Series (2.6.2.3) Parallel (2.6.3)sources of error
	(2.7) Vector Impedance Meter	(2.7.1)Basic principle (2.7.2)Block diagram (2.7.3)Error occurred
	(2.8) RF Power & Voltage Measurement	(2.8.1)Basic principle (2.8.2)Block diagram (2.8.3)Error occurred (2.8.4)Advantages and limitations (2.8.5)Applications
	(2.9) Shielding and grounding	(2.9.1) Introduction to Shielding and Grounding (2.9.2) Difference b/w Ear-thing and Grounding
	Conclusion	
3)	**UNIT-III Oscilloscopes**	
	Introduction	
	(3.1)Cathode Ray Tube(CRT)	(3.1.1) Introduction (3.1.2) Principle (3.1.3) Working (3.1.4) Internal structure (3.1.5) Electron Gun (3.1.5.1)Electrostatic focusing (3.1.5.2) Electrostatic deflection
	(3.2) Basic CRO circuits	(3.2.1) CRO systems

	(3.2.1.1) Vertical Deflection (3.2.1.2) Horizontal Deflection (3.2.2) Synchronization (3.2.2.1) Sources (3.2.3) Intensity modulation (3.2.4) Observation of waveform
(3.3) CRO probes	(3.3.1) Direct probes (3.3.2) Isolation probes (3.3.3) Detector probes
(3.4) Measurement of phase and frequency and time delay	(3.4.1) Lissajous patterns (3.4.2)Mathematical calculation to calculate the frequency andphase with the help of given pattern
(3.5) Multi Beam oscilloscopes	(3.5.1)Introduction (3.5.2) Dual beam CRO Block Diagram (3.5.3)Requirement (3.5.4)Limitation
(3.6) Multi Trace oscilloscopes	(3.6.1) Introduction (3.6.2) Dual Trace CRO Block Diagram (3.6.3)Requirement (3.6.4) Limitation
(3.7)Sampling oscillators	(3.7.1) Block diagram (3.7.2)Waveform generation (3.7.2.1)Delayed sweep
(3.8)Storage oscillators	(3.8.1)Analog storage (3.8.1.1)Principle of secondary emission (3.8.1.2)Variable persistent storage (3.8.1.3)Bi-stable storage oscilloscope (3.8.1.4)Fast storage Oscilloscope (3.8.2)Digital storage oscilloscopes (3.8.2.1)Principle of operation (3.8.2.2)Waveform regeneration
Conclusion	

4)

UNIT IV

Signal Generation

Introduction

(4.1) Sine wave Generator	(4.1.1)Principle (4.1.2)Construction (4.1.3)Working (4.1.4)Waveform Generation (4.1.5)Application
(4.2) Frequency Synthesis and Signal Generation	(4.2.1) Introduction (4.2.2)Types of synthesis (4.2.3) Logic of PLL (4.2.4)Application and advantages as compared to direct Synthesizer
(4.3)Sweep Frequency Generator	(4.3.1) Introduction (4.3.2) Meaning of Sweep (4.3.3) Basic Principle (4.3.4) Usage in CRO
(4.4) Wave analyzer	**(4.4.1)Introduction** **(4.4.2)Types of Wave Analyzer** **(4.4.3) Application**
(4.5) Frequency Selective Wave Analyzer	(4.5.1) Basic wave analyzer (4.5.2)Block Diagram (4.5.3)Basic Working (4.5.4) Limitation
(4.6) Heterodyne Wave Analyzer	(4.6.1) Block Diagram (4.6.2)Basic Working (4.6.3) Comparison with Frequency Selective Wave Analyzer
(4.7) Harmonic Distortion Analyzer	(4.7.1)Block Diagram (4.7.2)Basic Working (4.7.3) Types of HAD (4.7.4) Mathematical Approach to calculate the Harmonic Distortion
(4.8) Spectrum Wave Analyzer	(4.8.1)Basic Spectrum Analyzer (4.8.1.1)Block Diagram

		(4.8.1.2)Basic Working (4.8.2)Spectral Displays (4.8.3)Spectra Of Different Signals (4.8.3.1) Continuous Wave Signals (4.8.3.2) Amplitude Modulation (4.8.3.3) Frequency Modulation (4.8.3.4) Phase Modulation
5)	**UNIT V:-Transducers** **Introduction**	
	(5.1) Classification	(5.1)Definition (5.2)Classification of transducer (5.2.1)Based on Principle of Transaction (5.2.2)As Primary & Secondary (5.2.3)As Active & Passive (5.2.4)As Analog & Digital (5.2.5)As Transducers & Inverse Transducers
	(5.2) Resistance Temperature Transducer	(5.2.1)Selection Criteria (5.2.2) Characteristics (5.2.3) Construction (5.2.4) Working Principle (5.2.5) Application
	(5.3) Thermocouple	(5.3.1) Selection Criteria (5.3.2) Characteristics (5.3.3) Construction (5.3.4) Working Principle (5.3.5) Application
	(5.4) Thermistors	(5.4.1) Construction (5.4.2) Resistance-Temperature Characteristics (5.4.3) Voltage-Current & Current-Time Characteristics (5.4.4) Salient Features (5.4.5) Application
	(5.5) Linear Variable Differential Transformer	(5.5.1) Construction & Working (5.5.2) Advantages & Disadvantages (5.5.3) Application

	(5.6) Rotary Variable Differential Transformer	(5.6.1) Characteristics (5.6.2) Construction (5.6.3)Applications
	(5.7) Strain gauge	(5.7.1)Theory of strain gauge (5.7.2)Types of strain gauge (5.7.2.1)Unbounded metal strain gauge (5.7.2.2)Bonded wire strain gauge (5.7.2.3)Bonded metal foil strain gauge (5.7.2.4)semi conductor strain gauge
	(5.8) Bourden Tubes and Bellows	(5.8.1) Introduction of various pressure summing device (5.8.2) Construction of Bourden Tube (5.8.3) Construction of Bellows (5.8.4)Application
	(5.9) Piezoelectric transducers	(5.9.1)Modes of operation of crystals (5.9.2) Properties of crystals (5.9.3) Loading effects and frequency response (5.9.4) Applications
	(5.10) Seismic Accelerometer	(5.10.1) Principle (5.10.2) Functional Diagram (5.10.3) Working (5.10.4) Applications
	(5.11) Tacho-generator	(5.11.1) Principle (5.11.2) Specification (5.11.3) Functional Diagram (5.11.4) Working (5.11.5) Applications
	(5.12) Load Cell	(5.12.1) Principle (5.12.2) Specification (5.12.3) Functional Diagram (5.12.4) Working (5.12.50 Applications

	(5.13)Ultrasonic Flow Meter	(5.13.1) Principle (5.13.2)Specification (5.13.3) Functional Diagram (5.13.4) Working (5.13.5) Applications

POORNIMA COLLEGE OF ENGINEERING

DEPARTMENT OF ELECTRONICS AND COMMUNICATION,2023-24 II Year IV SEM

Minha Escola

	1 8:00 - 9:00	2 9:00 - 10:00	3 10:00 - 11:00	LUNCH 11:00 - 11:50	4 11:50 - 12:50	5 12:50 - 1:50	6 1:50 - 2:50
Monday	EM&I 2303 Nag Meetu	Microcontrollers 2303 Shegokar Sheetal	AEM-II 2303 Dave Shuchi		ACL 2308(A) Mudgal Nitesh		ADC 2303 Kumar Durgesh
Tuesday	Microcontrollers 2303 Shegokar Sheetal	AEM-II 2303 Dave Shuchi	AC 2303 Mudgal Nitesh		ADC 2303 Kumar Durgesh	EM&I 2303 Nag Meetu	TC 2303 Shah Shalini
Wednesday	ADC 2303 Kumar Durgesh	TC 2303 Shah Shalini	AEM-II 2303 Dave Shuchi		AC 2303 Mudgal Nitesh	EM&I 2303 Nag Meetu	Microcontrollers 2303 Shegokar Sheetal
Thursday	AC 2303 Mudgal Nitesh	ML 2308(C) Shegokar Sheetal			EM&IL 2308(C) Nag Meetu		AEM-II 2303 Dave Shuchi
Friday	AC 2303 Mudgal Nitesh	EM&I 2303 Nag Meetu	ADC 2303 Kumar Durgesh		Microcontrollers 2303 Shegokar Sheetal	ADCL 2308 Marwal Rajveer	
Saturday							

aSc Timetables

Timetable generated 29-05-2024

OR

Q.4 (a) Describe the working of a sweep frequency generator. What are the sweeper errors? [6+2=8]

(b) Describe the basic circuit of a spectrum analyzer. Explain how the spectra of the following are displayed: [4+4=8]

(i) Amplitude modulated signals

(ii) Frequency modulated signals

UNIT-V

Q.5 (a) Explain the working and characteristics of following temperature transducers.

(i) RTD

(ii) Thermocouple [4+4=8]

(b) Explain the construction of wire wound strain gauges and derive the expression for the gauge factor. [8]

OR

Q.5 (a) Explain the working of ultrasonic flow meters with a suitable diagram. [8]

(b) Explain the working of piezoelectric transducers and draw its electric equivalent circuit. [8]

4E4132

Roll No. _____ Total No of Pages: 4

4E4132

B.Tech. IV-Sem (Main & Back) Exam; June-July 2016

Electronics & Communication

4EC3A Electronic Measurement & Instrumentation

Time: 3 Hours

Maximum Marks: 80

Min. Passing Marks (Main & Back): 26

Min. Passing Marks (Old Back): 24

Instructions to Candidates:-

*Attempt any **five questions**, selecting **one question** from **each unit**. All Questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in form No.205)

1. NIL 2. NIL

UNIT-I

Q.1 (a) Errors in measurements can be classified as – [6+2=8]

(i) Gross errors

(ii) Systematic errors

(iii) Random errors

Explain these errors by giving suitable examples. Discuss the means adopted to minimize these errors.

(b) A 0 – 10 A ammeter has a guaranteed accuracy of 1.5 percent of full scale reading. The current measured by the instrument is 2.5 A. Calculate the limiting values of current and the percentage limiting error. [8]

OR

Q.1 (a) Define the following for Gaussian distribution of data. [2×4=8]

(i) Precision index

(ii) Probable error

(iii) Standard deviation of mean

(iv) Standard deviation of standard deviation

(b) A resistor is measured by Voltmeter - Ammeter methods. The voltmeter reading is 123.4 V on the 250V scale and the ammeter reading is 283.5mA on the 500mA scale. Both meters are guaranteed to be accurate with in ±1 percent of full scale reading. Calculate –

(i) The indicated value of resistance

(ii) The limits within which the result can be guaranteed. [4+4=8]

UNIT-II

Q.2 (a) Describe the functional block diagram of a vector impedance meter. Explain how phase angle measurements are carried out with it. [6+2=8]

(b) The self capacitance of a coil is measured by a Q meter. The circuit is set into resonance by at 2 MHz and the tuning capacitor at 460 PF. The frequency is now adjusted to 4 MHz and resonance conditions are obtained by tuning capacitor at 100 PF. Calculate the value of self capacitance of the coil. [8]

OR

Q.2 (a) Explain the circuit diagram of following types of electronic voltmeters. [4+4=8]

(i) Voltmeters using a series connected diode.

(ii) Voltmeters using a full wave bridge rectifier.

(b) Explain the functioning of an integrating type digital voltmeter. [8]

UNIT-III

Q.3 (a) Derive an expression for vertical deflection of an electron beam in a CRT. [8]

(b) Describe in detail, the construction and working on analog type storage oscilloscope. Explain the principle of secondary emission. [6+2=8]

OR

Q.3 (a) The deflection sensitivity of an oscilloscope is 35 v/cm. If the distance from the deflection plates to the CRT screen is 16 cm, the length of the deflection plates is 2.5 cm, and the distance between the deflection plates is 1.2 cm. What is the acceleration anode voltage? [8]

(b) Describe the following types of oscilloscope:-

(i) Dual trace type

(ii) Dual beam type [4+4=8]

UNIT-IV

Q.4 (a) What is a frequency synthesizer? Describe its circuit in detail. [8]

(b) Describe the working of a harmonic distortion analyzer with a suitable block diagram. [8]

4E 4132

Roll No. _____ [Total No. of Pages : 3]

4E 4132

B.Tech. IV Sem. (Main/Back) Examination, June/July - 2015

Electronics & Communication Engg.

4EC3A Electronic Measurement & Instrumentation

Time : 3 Hours | Maximum Marks : 80

Min. Passing Marks : 26

Instructions to Candidates:

*Attempt any **five** questions, selecting **one** question from **each unit**. All questions carry **equal** marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

Unit - I

1. a) The following eight observations were recorded when measuring a voltage 20.6, 21.4, 22.0, 21.8, 22.6, 22.1 ,21.9, 22.2 volt.
   Find (i) Probable error of one reading
   (ii) Probable error of mean. (8)

   b) Define the following for Gaussian distribution of data:
   (i) Precision index
   (ii) Standard deviation of standard deviation. (8)

OR

1. a) A circuit was tuned for resonance by eight different students and the values of resonant frequency in KHz were recorded as 345, 349, 346, 341, 340, 347, 348, 342. Calculate
   (i) Standard deviation
   (ii) Variance. (8)

   b) Explain the following errors with suitable examples.
   (i) Systematic errors
   (ii) Random errors. (8)

Unit - II

2. a) Explain the block diagram of vector impedance meter and its applications. (8)

   b) How will you measure RF power and voltage ? What are the problems encountered in such measurements. (8)

OR

2. a) A Coil of resistance 8Ω is connected in the Q meter circuit. The resonance occurs at a frequency of 1 MHz with the tuning capacitor set at 87 PF. Calculate the percentage error introduced in the calculated value of Q if a resistance of 0.04Ω is used across the oscillator circuit. (8)

   b) Define the following terms related to the measuring instrument
   (i) Shielding
   (ii) Grounding (8)

Unit - III

3. a) Why is a delay line used in the vertical section of the oscilloscope. (8)

   b) Why are the operating voltage of a cathode ray tube arranged so that the deflection plates are nearly at ground potential. (8)

OR

3. a) Explain the following terms of CRO:
   (i) A stigmation control (8)
   (ii) Sources of synchronization.

   b) Explain the construction and working of following CRO probes:
   (i) Direct probe
   (ii) Isolation probe. (8)

Unit - IV

4. a) Explain the working principle of frequency selective wave analyser with suitable diagram and applications. (8)

   b) What do you mean by distortion factor. How can distortion factor be measured. (8)

OR

4. a) Explain the functioning of sweep frequency generator with the help of neat block diagram. Also, explain its uses in measurement equipments. (8)

   b) Explain the working of heterodyne wave analyzer with suitable diagram. (8)

Unit - V

5. Write short notes on the following:
   (a) Strain gauges (8)
   (b) Piezoelectric Transducers (8)

OR

5. (a) Explain the working principle of ultrasonic flow meters with merits and demerits. (8)

   (b) Draw and explain the characteristics of Thermocouples. Discuss about the 'seeback effect' of Thermocouple. (8)

Q.4. (a) What is a frequency synthesizer? Explain in working with circuit details. [3+5=8]

(b) Explain the principle and working of spectrum analyzer. Discuss its applications. [6+2=8]

UNIT- V

Q.5. (a) Describe the construction, theory and working of thermocouples. Explain the different types of compensations used in the measuring system. [6+4=10]

(b) In a piezoelectric transducer, a flat frequency response within 5% is required. Find the value of minimum frequency in terms of time constant for which it can be used. If the time constant of the transducer is 1.5ms, find the value of minimum frequency. Find the phase shift at this frequency. [6]

OR

Q.5. (a) Why are dummy gauges used? In what way do they affect the output of a strain gauge bridge? [3+5=8]

(b) Write short note on following:

(i) Ultrasonic flow meter.

(ii) Load cells and its applications. [4+4=8]

4E4132

Roll No. _____ Total No of Pages: 4

4E4132

B. Tech. IV Sem. (Main) Exam., June/July-2014

Electronics & Communication Engg.

4EC3A Electronic Measurement & Instrumentation

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 24

Instructions to Candidates:-

*Attempt any **five questions**, selecting **one question** from **each unit**. All Questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination.

1._____ 2._____

UNIT-I

Q.1. (a) Explain the phenomenon of hysteresis in measurement systems. Also explain the terms, 'threshold', 'maximum input hysteresis' 'maximum output hysteresis', 'Dead zone' and backlash with neat diagrams. [3+5=8]

(b) Current was measured during a test as 30.4A, flowing in a resister of 0.105Ω. It was found later that the ammeter reading was low by 1.2 percent and the marked resistance was high by 0.3 percent. Find the true power as a percentage of the power that was originally calculated. [8]

OR

Q.1. (a) Define the following for Gaussian distribution data

(i) Precision index

(ii) Probable error

(iii) Standard deviation of mean

(iv) Standard deviation of standard deviation [4×2=8]

(b) Two resistors R_1 and R_2 are connected in series and then in parallel. The value of resistances are:

$R_1 = 100.0 \pm 0.1\ \Omega$

$R_2 = 50 \pm 0.03\ \Omega$

Calculate the uncertainty in the combined resistance for both series and parallel arrangements. [8]

UNIT-II

).2. (a) Describe the circuit diagram and operation of a true rms reading voltmeter using thermocouples. Explain how these voltmeters are free from waveform errors. [6+2=8]

(b) Explain the operation and functional block diagram of vector impedance meter. Describe how phase angle measurements are carried out with it. [6+2=8]

OR

.2. (a) Describe the methods of measurement of voltage and power at radio frequencies. [8]

(b) Write short note on following:

(i) Q-meter

(ii) Shielding and grounding [4+4=8]

UNIT III

Q.3. (a) Derive an expression for vertical deflection and deflection sensitivity of an electron beam in a CRT. [8]

(b) Explain the following with reference to analog type storage oscilloscope: [4×2=8]

(i) Bistable persistence storage

(ii) Bistable storage

(iii) Fast storage

(iv) Secondary emission

OR

Q.3. (a) Describe the phenomenon of synchronization of vertical input signal to its sweep generator. Explain the need of it. [6+2=8]

(b) Describe the principle of working and circuit details of a sampling oscilloscope. Discuss about delayed sweep. [6+2=8]

UNIT- IV

Q.4. (a) Describe the Working of a sweep frequency generator. What are the sweeper errors? [6+2=8]

(b) Explain the term "total harmonic distortion". Describe the functioning of a total harmonic distortion meter. [2+6=8]

OR

3E1494

Roll No. _____ [Total No. of Pages : 2

3E1494

B.Tech. III Semester (Main/Back) Examination - 2014

Electronics & Comm.

3EC4 Electronics Measurements & Instrumentation

(Common for Main & Back of 3EC4 and 3BM4 (M&B) (Old Back Only))

Time : 3 Hours **Maximum Marks : 80**

Min. Passing Marks : 24

Instructions to Candidates:

*Attempt any **five** questions, selecting **one** question from each **unit**. All questions carry **equal** marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.)*

Unit - I

1. a) What is meant by normal distribution of error. Define probable error. **(8)**

   b) Explain the limiting errors with suitable examples and derive the expression for relative limiting error. **(8)**

OR

1. a) Explain the following with suitable examples.

   i) Standard deviation

   ii) Probable error of the mean **(8)**

   b) Explain the following:

   i) Systematic errors

   ii) Random errors **(8)**

Unit - II

2. a) Explain the block diagram of electronic Multimeters and its applications. **(8)**

   b) Define the following terms **(8)**

   i) Grounding

   ii) Shielding

OR

2. a) Explain the block diagram of full wave bridge rectifier type of electronic voltmeters. **(8)**

   b) Discuss about one method to measure voltage and power at ratio frequencies. **(8)**

Unit - III

3. a) How is the delay line used in vertical section of the oscilloscope. **(8)**

   b) What do you mean of CRO probes. Explain the applications, advantages & disadvantages of CRO probes during measurements. **(8)**

OR

3. a) Explain the construction and working of free running and triggered mode CRO with neat sketches. **(8)**

   b) What do you mean by CRO probe compensation and how is it adjusted. What effects are considered when the compensation is not adjusted properly. **(8)**

Unit - IV

4. a) What do you mean by distortion factor. How can distortion factor be measured. **(8)**

   b) What are various uses of a signal generator in an electronic laboratory. Explain how sine wave is generated in a signal generator. **(8)**

OR

4. Write short notes on the following:-

   a) Frequency selective wave analyser **(8)**

   b) Spectrum analyser. **(8)**

Unit - V

5. a) What are the important features of piezoelectric transducers. Also, explain the charge model of the piezoelectric transducers. **(8)**

   b) Explain the working of resistance wire strain gauge. And obtain an expression for the gauge factor. Give its significance. **(8)**

OR

5. a) Explain the following characteristics of a transducers:

      i) Input

      ii) Output

      iii) Transfer **(8)**

   b) Explain the working principle and applications of Tachogenerators with suitable examples. **(8)**

(c) Explain about a standard ECG.

(d) Explain Electromyograph.

(EC 324)

III/IV B.Tech. DEGREE EXAMINATION,
OCTOBER/NOVEMBER 2009.

Second Semester

Electronics and Communication Engineering

ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

Time : Three hours Maximum : 70 marks

All questions carry equal marks.

Answer Question No.1 compulsorily.

(1 × 14 = 14)

Answer ONE question from each Unit.

(4 × 14 = 56)

1. (a) Define Accuracy.

(b) What is guarantee error ?

(c) Define voltmeter sensitivity.

(d) List various bridges types.

(e) What is Aquadag in CRO?

(f) List the applications of CRO.

(g) Which bridge measures the frequency?

(h) Draw the Ckt diagram of schering bridge.

(i) Draw diagram of RTD.

(j) What is form factor?

(k) What is piezo resistance?

(l) Define Resolution of digital meter.

(m) Applications of spectrum analyzer.

(n) What is the significance of lissajous figures?

UNIT I

2. (a) Define limiting errors, derive the expression for relative limiting error.

(b) Define the terms

(i) Repeatability

(ii) Precision

(iii) Resolution

(iv) Linearity.

Or

(c) With neat sketch explain Maxwell Bridge.

(d) Explain series type ohm meter.

UNIT II

3. (a) Explain rectifier type AC voltmeters.

(b) Describe the Q-meter and give its applications.

Or

(c) Explain spectrum analyzer.

(d) Explain continuous balance type DVM.

UNIT III

4. (a) What are different types of strain gauges and explain semiconductor strain gauges?

(b) Explain linear variable differential transformer.

Or

(c) What is piezo electric effect, and explain piezo electric tranducers?

(d) Explain variable inductance type transducer.

UNIT IV

5. (a) What is DAS? Explain different types of Multiplexing techniques.

(b) Explain digital recording techniques.

Or

UNIT IV

5. (a) Define TDM and FDM and compare them.

(b) Explain EMG with neat sketch.

Or

(c) Explain the elementary principles of Electro cardiograph.

(d) Explain about ERG.

III/IV. B.Tech. DEGREE EXAMINATION,
OCTOBER/NOVEMBER 2009.

First Semester

EC

ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

Time : Three hours Maximum : 70 marks

All questions carry equal marks.
Answer Question No. 1 compulsorily. (1 × 14 = 14)
Answer ONE question from each Unit. (4 × 14 = 56)

1. (a) Define precision.

(b) Define any two types of errors.

(c) Draw the shunt type ohm meter.

(d) Give the specifications of digital multimeter.

(e) What are the different types of AC bridges?

(f) What is piezo electric effect?

(g) Define sensitivity of a strain gauge.

(h) What are the advantages of thermocouples?

(i) Give the applications of DAS.

(j) Define lissajious figures and its importance.

(k) What is delay line?

(l) What is pieto resistance?

(m) Name two types of instrumentation systems.

(n) Sketch normal ECG waveform.

UNIT I

2. (a) Explain the terms

(i) Static sensitivity

(ii) Linearity

(iii) Accuracy

(iv) Repeatability.

(b) A set of independent voltage measurements taken by four observers was recorded as 117. 02 V, 117.11V, 117. 08 V and 117.03V calculate average voltage and source of error.

Or

(c) Explain in detailed about DC voltmeter.

(d) A 1 mA meter movement with an internal resistance $1 k\Omega$ is to be converted into 0-10A ammeter. Calculate the value of shunt resistance required.

UNIT II

3. (a) Explain with neat sketch of a following Digital voltmeter

(i) Ramp type

(ii) Successive approximation type.

(b) Explain the working of a universal counter with neat sketch.

Or

(c) Explain CRO with neat sketch.

(d) Explain DSO with neat sketch.

UNIT III

4. (a) Classify the transducers. Explain them with one example.

(b) Explain wire wound strain gauge and derive expression for gauge factor.

Or

(c) Describe the working of resistance thermometer.

(d) Explain about rotary variable differential transform.

(c) What are the different types of potentiometer and write their merits and demerits.

(d) A helipot is provided with 50 turns per mm the gearing arrangement is such that the motion of the main shaft by one revolution causes 4 revolutions of post shaft. Determine the post resolution in mm.

UNIT IV

5. (a) What is a data acquisition system? Give the lock diagram arrangement of a digital data acquisition system and describe the functions of each component.

(b) How is low-level multiplexing achieved? Explain the working of a multi-channel among multiplexed DAs.

Or

(c) What is a sample and hold circuit? Why is it needed? Explain with circuit diagram.

(d) What are the uses of Data acquisition system?

III/IV B.Tech. DEGREE EXAMINATION,
MARCH/APRIL 2009.

Second Semester

Electronics and Communication Engineering

ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

Time : Three hours Maximum : 70 marks

All questions carry equal marks.

Answer Question No. 1 Compulsorily.

(1 × 14 = 14)

Answer ONE question from each Unit.

(4 × 14 = 56)

1. (a) Define precision and accuracy of an instrument.

(b) What are the different types of errors and explain them.

(c) What is meant by B.W. of a system?

(d) What is piezo-electric effect?

(e) What is meant by Absolute measurement of electrical quantities?

(f) Name the most widely used materials for precision electrical measuring instruments and standard resistor.

(g) How an ammeter can be changed into a voltmeter?

(h) How is CRO superior to ordinary measuring instruments?

(i) Why are strain gauges called the piezo-resistive strain gauges?

(j) What is the use of Data Acquisition System?

(k) What are the limitations of oscilloscope?

(l) Where is LVDT used?

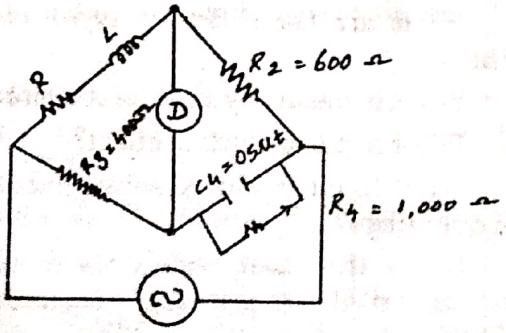
(m) What is graticule?

(n) .Why are repulsion type moving iron instruments more commonly used than the attraction type one?

UNIT I

2. (a) Explain about Maxwell's Inductance and capacitance bridge with a neat diagram.

(b) Determine the value of R & L of the inductor connected in the bridge. If balance has been obtained also determine Q factor of the coil.



Or

(c) Explain about static and dynamic errors of an instrument.

(d) The following values were obtained from the measurement of the values of a resistor 147.2 Ω, 147.4 Ω, 147.9 Ω, 148.1 Ω, 147.1 Ω, 147.5 Ω, 147.6 Ω, 147.4 Ω, 147.6 Ω and 147.5 Ω. Calculate arithmetic mean, average deviation, standard deviation.

UNIT II

3. (a) Explain about block diagram of cathode ray oscilloscope with neat sketch.

(b) What are the differences between storage and sampling oscilloscope?

Or

(c) Explain the harmonic distortion analyzer.

(d) What are the applications of Analyzers with the help of functional block diagram. Explain the working of heterodyne wave analyzer.

UNIT III

4. (a) Explain about Linear Variable Differential Transformer (LVDT) and write their merits, demerits and applications.

(b) The output of an LVDT is 1.25 V at maximum displacement. At a load of 0.75 MΩ the deviation from the linearity is maximum and it is +0.0025 V from a straight line through origin. Determine the linearity at given load.

Or

(d) Write short notes on any FOUR from the following :

(i) Thermistors

(ii) Capacitive transducer

(iii) Potentiometers

(iv) Piezo-electric transducer

(v) Digital transducer

(vi) Shaft Encoder.

UNIT IV

5. (a) What are the elements of a digital data acquisition system? Explain with the help of block diagram.

(b) Explain digital recording techniques.

Or

(c) What are the elementary principles of Electrocardiograph?

(d) Explain the working of Electromyograph.

III/IV B.Tech. DEGREE EXAMINATION, OCTOBER/NOVEMBER 2008.

Second Semester

Electronics and Communication Engineering

ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

Time : Three hours Maximum : 70 marks

Answer Question No. 1 compulsorily. (1 × 14 = 14)

Answer ONE question from each Unit. (4 × 14 = 56)

1. (a) Define Accuracy and Precision.

(b) Define probability error.

(c) What is guarantee error?

(d) Draw the circuit for dc voltmeter.

(e) Define voltmeter sensitivity.

(f) List the various AC Bridges. What are the differences between dc bridge and ac bridge?

(g) What bridge is used for the measurement of unknown capacitance?

(h) What is universal counter?

(i) What is the principle of true RMS voltmeter?

(j) Write the applications of CRO.

(k) Write classification of transducers.

(l) What is piezo-electric effect?

(m) What are the various types of multiplexing techniques?

(n) What is the purpose of ECG and EEG?

UNIT I

2. (a) What are the various types of errors? Explain briefly with some examples.

(b) Explain the statistical analysis of measurement. The following 10 observations were recorded when measuring a voltage :

41.7, 42.0, 41.8, 42.0, 42.1, 41.9, 42.0, 41.9, 42.5 and 41.8 volt. Find

(i) Mean

(ii) The standard deviation.

Or

(c) Describe the construction and working of a series type ohm meter. Write down its design equations.

(d) Explain the principle and operation of Wien's bridge. How it is used for the measurement of frequency? Derive the expression for frequency.

UNIT II

3. (a) Explain the operation of Ac voltmeter using rectifiers.

(b) Write the principle and operation of successive approximation type DVM.

Or

(c) Explain the operation of CRO with neat block diagram.

(d) What is the purpose of Spectrum Analyser and explain its operation?

UNIT III

4. (a) What is a straingauge? What are the various types of strain gauges? Explain about semiconducts strain gauges.

(b) Explain the construction and working of thermocouples. List various advantages.

Or

(c) What is LVDT? What is its working principle? List the advantages and disadvantages of LVDT.

(v) Potentiometric transducer

(vi) Velocity transducer.

Or

(c) Explain the following applications of a thermistor

(i) Temperature measurement

(ii) Temperature control and

(iii) Thermal conductivity measurement.

(d) Describe the construction of a thermocouple device and write the advantages, disadvantages of thermocouples.

UNIT IV

5. (a) What are the elements of a digital data - acquisition system, explain with the help of block diagram.

(b) Explain the digital - to - analog multiplexing techniques, those using several D/A converters and one D/A converters.

Or

(c) Explain the working of EEG.

(d) Explain the working of ECG recording system.

III/IV B.Tech. DEGREE EXAMINATION, MARCH/APRIL 2008.

Second semester

Electronics and Communication Engineering

ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

Time : Three hours Maximum : 70 marks

All questions carry equal marks.

Answer Question No. 1 compulsorily. (1 × 14 = 14)

Answer ONE question from each Unit. (4 × 14 = 56)

1. (a) Define accuracy and error.

(b) Define systematic error.

(c) What is Ayrton shunt?

(d) What is loading effect in dc voltmeter?

(e) What is the significance of three - terminal resistance?

(f) What is meant by calibration of a meter?

(g) List the types of DVM.

(h) Define deflection sensitivity of CRT.

(i) Define gage factor.

(j) Primary and secondary transducers.

(k) What is piezo-electric effect?

(l) Define common - mode rejection.

(m) NRFD, SRQ and NDAC.

(n) What is SINAD meter?

UNIT I

2. (a) Define and explain the following :

(i) Instrumental error

(ii) Limiting error

(iii) Calibration error

(iv) Environmental error

(v) Random error and

(vi) Probable error.

(b) The following values were obtained from the measurement of the values of a resistor : 147.2 Ω, 147.4 Ω, 147.9 Ω, 148.1 Ω, 147.1 Ω, 147.5 Ω. 147.6 Ω, 147.4 Ω, 147.6 Ω and 147.5 Ω Calculate,

(i) The arithmetic mean

(ii) The average deviation

(iii) The standard deviation and

(iv) The probable error of the average.

Or

(c) Explain D'Arsonval movement, derive the expression for "External resistance" causing half scale deflection of shunt - type ohmmeter.

(d) Explain the operation of Maxwell and Hay bridge.

UNIT II

3. (a) Explain the direct, series and parall measurement methods of Q - meter.

(b) Explain the concept of an universal counter with the help of block diagram.

Or

(c) Explain multiple trace and horizontal deflection system of a CRO.

(d) Describe the working of a digital storage oscilloscope with the help of block diagram.

UNIT III

4. (a) Indicating the basic operation and typical application. Classify the transducers.

(b) Write notes on any 'FOUR' from the following :

(i) Capacitive transducer

(ii) Inductive transducer

(iii) LVDT

(iv) Oscillation transducer

UNIT IV

5. (a) Distinguish between RZ and NRZ techniques of digital tape recording.

(b) Explain the various way of Multiplexing.

Or

(c) What is the IEEE 488 bus system and what limits the data rate in IEEE 488 system.

(d) Explain the working of an E.C.G.

(EC 324)

III/IV B.Tech. DEGREE EXAMINATION,
OCTOBER/NOVEMBER 2007.

Second Semester

Electronics and Communication Engineering

ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

Time : Three hours Maximum : 70 marks

All questions carry equal marks.

Answer Question No. 1 compulsorily.

(1 × 14 = 14)

Answer ONE question from each Unit.

(4 × 14 = 56)

1. (a) Define Limiting Errors.

(b) Define standard deviation and variance.

(c) Define Random Error.

(d) Define sensitivity of a voltmeter.

(e) Shunt of an ammeter.

(f) Multiplier of an voltmeter.

(g) Resolution of digital voltmeters.

(h) Purpose of delay line in a CRO.

(i) Post deflection acceleration in CROS.

(j) Active and Passive transducers.

(k) Gauge factor of a strain gauge.

(l) Voltage and Charge sensitivities of piezo – electric transducer.

(m) Seebeck effect.

(n) Digital transducer.

UNIT I

2. (a) Define random and probable errors.

(b) What is the difference between accuracy and precision.

Or

(c) Describe with the circuit diagram the design and working of a series type ohm – meter.

(d) Explain the calibration of dc ammeters and voltmeters with the help of a potentiometer.

UNIT II

3. (a) Explain the working of Electronic Voltmeters, Which use rectifiers.

(b) Describe the circuit diagram and operation of true RMS reading voltmeter using thermocouples.

Or

(c) Describe the working of an integrating type digital voltmeter.

(d) Describe how the following measurements can be made with the use of a CRO

(i) Frequency

(ii) Vertical deflection system.

UNIT III

4. (a) Explain with diagrams the bonded and unbonded types of strain gauges.

(b) Describe the working and construction of resistance thermometers.

Or

(c) Explain the construction and principle of working of a Linear Voltage differential transform (LVDT).

(d) Explain the different principles of working of capacitive transducers.

(EC 324)

III/IV B.Tech. DEGREE EXAMINATION,
APRIL/MAY 2007.

Second Semester

Electronics and Communication Engineering

ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

Time : Three hours Maximum : 70 marks

All questions carry equal marks.

Answer Question No. 1 compulsorily. (1 × 14 = 14)

Answer ONE question from each Unit. (4 × 14 = 56)

1. (a) Gross errors.
   (b) Arithmetic mean.
   (c) Accuracy and precision.
   (d) Disadvantages of Wheatstone's briday.
   (e) Graticules.
   (f) Duty cycle.
   (g) Barkhausen criteria.
   (h) Wagner's earth.

(i) Active and passive transduces.

(j) Gage factor — Define.

(k) Piezo electric effect.

(l) Types of muscles.

(m) Applications of EEE.

(n) Four chambers of heart.

UNIT I

2. (a) List four sources of possible errors in instruments.

(b) Explain the working of a shunt type ohm meter.

Or

(c) Derive the expression for bridge sensitivity for Wheatstone's bridge.

(d) Explain the measurement of a capacitor using schering bridge.

UNIT II

3. (a) Explain the functioning of a true-RMS responding voltmeter.

(b) Explain the method of analog to digital conversion using successive approximation methods.

Or

(c) Describe the vertical deflection system used in a CRO.

(d) How does storage and sampling oscilloscopes differ from the conventional oscilloscopes.

UNIT III

4. (a) Explain the working principle of resistance thermometer. In what temperature range it is used?

(b) Describe the operation of an *LVDT*.

Or

(c) What is piezo-electric effect? Give the equivalent circuit of a piezo-electric transducer. Define g and d coefficient.

(d) Describe the contact or bush type encoders. Explain why gray code is employed in them.

UNIT IV

5. (a) Differentiate TDM and FDM.

(b) Explain the elements of a digital data-acquisition system.

Or

(c) Explain the method of obtaining EMG.

(d) How is an ECG signal obtained? Explain the significance of parameters in the ECG.

UNIT IV

5. (a) Define Time Division Multiplexing and Frequency Division Multiplexing and compare them.

(b) Describe different methods used for digital tape recording. Explain their advantages and disadvantages.

Or

(c) Explain about a standard ECG.

(d) Write notes on electroencephalograph.

III/IV B.Tech. DEGREE EXAMINATION,
OCTOBER 2006.

Second Semester

ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

Time : Three hours Maximum : 70 marks

All questions carry equal marks.

Answer Question No. 1 compulsorily. (1 × 14 = 14)

Answer ONE question from each Unit. (4 × 14 = 56)

1. (a) Define accuracy and precision.
(b) Random errors.
(c) Standard deviation.
(d) Voltmeter sensitivity.
(e) Ayrton shunt.
(f) Multimeter.
(g) Detectors for ac bridges.
(h) Wagner's Earth.
(i) Form factor.

POORNIMA
COLLEGE OF ENGINEERING

DEPLOYMENT

Campus: PCE Course: B. Tech.	Class/Section: 2nd Year	Date: 04/02/2024
Name of Faculty: Dr. Meetu Nag	Name of Subject: Electronic Measurement & Instrumentation	Code: 4EC3-06

S. No.	TOPIC AS PER BLOWNUP SYLLABUS	Lecture No.	Target Date of Coverage	Actual Date of Coverage	Reason For Deviation	Ref. Book
1	**Zero lecture**	L0	19/2/24	19/2/24		
2	**Unit I:- Theory of Errors** **Introduction of Unit** **Introduction of Lecture** **(1.1)Introduction** (1.1.1)Performance Characteristic (1.1.2)Accuracy (1.1.3)Precision (1.1.4)Error (1.1.5)Uncertainty (1.1.6) Repeatibity (1.1.7)Reproducibility **Conclusion of Lecture**	L1	19/2/24	19/2/24		A.K Sawhney J.B. Gupta
3	**Introduction of Lecture** **(1.2)Accuracy & Precision** (1.2.1)Definition (1.2.2)Examples (1.2.3)Measuring parameters (1.2.4)Significant Figures **(1.3)Repeatability** (1.3.1)Introduction (1.3.2)Comparison between Repeatability and Reproducibility (1.3.3) Examples	L2	20/2/24	20/2/24		AK

	Conclusion of Lecture					
4	**Introduction of Lecture** **(1.4)Limits Of Errors,** (1.4.1)Introduction (1.4.2)Types of Errors (1.4.3) Limiting Error (1.4.4)Relative limiting Error **(1.5)Systematic and Random Errors** (1.5.1)Instrumental Error (1.5.2)Environmental Error (1.5.3)Observational Error (1.5.4) Remedies **Conclusion of Lecture**	L3 L4	21/2/24 22/2/24	21/2/24 24/2/24		AK AK
5	**Introduction of Lecture** **(1.6)Modeling of errors** (1.6.1)Introduction **(1.7)Probable Errors** (1.7.1)Normal Distribution of Errors (1.7.2)Probable Error Calculations **(1.8)Standard Deviation** (1.8.1)Deviation (1.8.2)Arithmetic Mean (1.8.3)Standard Deviation **Conclusion of Lecture**	L5 L6	26/2/24 27/2/24	26/2/24 27/2/24		AK AK
6	**Introduction of Lecture** **(1.9)Gaussian Error Analysis** (1.9.1)Introduction (1.9.2)Gaussian Curve (1.9.3)Limiting Error (1.9.4)Relative Limiting Error **(1.10)Combination of Errors** (1.10.1)Sum of Quantities (1.10.2)Product of Quantities (1.10.3)Difference of Quantities (1.10.4)Quotient of Quantities **Conclusion of Lecture**	L7 L8	28/2/24 1/3/24	28/2/24 1/3/24		JB JB

	Conclusion of Unit **Revision of Unit** **Numerical of unit 1**					
7	**UNIT-II:-Electronic Instruments** **Introduction of Unit** **Introduction of Lecture** **(2.1)Introduction** (2.1.1) Basic Introduction about Electronic Instruments **(2.2) Electronic Voltmeters** (2.2.1)Introduction (2.2.2)Principle (2.2.3)Working (2.2.4)Advantages and limitations (2.2.5)Applications **Conclusion of Lecture**	L9	4/3/24	4/3/24		JB
8	**Introduction of Lecture** **(2.3)Electronic Multimeters** (2.3.1)Introduction (2.3.2)Principle (2.3.3)Working (2.3.4)Advantages and limitations (2.3.5)Applications **Conclusion of Lecture**	L10	5/3/24	6/3/24	Change in Timetable	JB
9	**Introduction of Lecture** **(2.4)Digital Voltmeter** (2.4.1)General Chart eristic (2.4.2)Types (2.4.2.1)Ramp type (2.4.2.2)Integrating type (2.4.2.3)Continues balance type (2.4.2.4)Successive approximation type **Conclusion of Lecture**	L11 L12	6/3/24 8/3/24	7/3/24 8/3/24	Change in Tf. Change in Timetable	JB JB

10	**Component Measuring Instruments** **Introduction of Lecture** **(2.5)Introduction** (2.5.1)Introduction about the different measuring parameters (2.5.2) Advantages and limitations (2.5.3)Applications (2.5.4) Range **Conclusion of Lecture**	L13	11/3/24	11/3/24		JB
11	**Introduction of Lecture** **(2.6)Q-meter** (2.6.1)Basic circuit (2.6.2)Measuring methods (2.6.2.1)Direct (2.6.2.2)Series (2.6.2.3) Parallel (2.6.3)sources of error **Conclusion of Lecture**	L14	13/3/24	13/3/24		JB
12	**Introduction of Lecture** **(2.7)Vector Impedance Meter** (2.7.1)Basic principle (2.7.2)Block diagram (2.7.3)Error occurred **Conclusion of Lecture** **Introduction of Lecture** **(2.8)RF Power & Voltage Measurement** (2.8.1)Basic principle (2.8.2)Block diagram (2.8.3)Error occurred (2.8.4)Advantages and limitations (2.8.5)Applications **Conclusion of Lecture**	L15	14/3/24	14/3/24		JB
13	**Introduction of Lecture** **(2.9) Shielding and Grounding** (2.9.1) Introduction to Shielding and Grounding (2.9.2) Difference b/w Ear-thing and Grounding **Conclusion of Lecture**	L16	15/3/24	15/3/24		JB

	Conclusion of Unit **Revision of unit and numerical**					
14	**UNIT-III:-Oscilloscopes** **Introduction of Unit** **Introduction of Lecture** **(3.1)Cathode Ray Tube(CRT)** (3.1.1) Introduction (3.1.2) Principle (3.1.3) Working (3.1.4) Internal structure (3.1.5) Electron Gun (3.1.5.1)Electrostatic focusing (3.1.5.2) Electrostatic deflection **(3.2) Basic CRO Circuits** (3.2.1) CRO systems (3.2.1.1) Vertical Deflection (3.2.1.2) Horizontal Deflection (3.2.2) Synchronization (3.2.2.1) Sources (3.2.3) Intensity modulation (3.2.4) Observation of waveform **Conclusion of Lecture** **Introduction of Lecture** **(3.3)CRO Probes** (3.3.1) Direct probes (3.3.2) Isolation probes (3.3.3) Detector probes **(3.4)Measurement of Phase and Frequency and Time Delay** (3.4.1) Lissajous patterns (3.4.2)Mathematical calculation to calculate the frequency and phase with the help of given pattern **Conclusion of Lecture**	L17 L18 L19 L20	18/3/24	18/3/24		

15	**Introduction of Lecture** **(3.5)Multi Beam Oscilloscopes** (3.5.1)Introduction (3.5.2) Dual beam CRO Block Diagram (3.5.3)Requirement (3.5.4)Limitation **(3.6)Multi Trace Oscilloscopes** (3.6.1) Introduction (3.6.2) Dual Trace CRO Block Diagram (3.6.3)Requirement (3.6.4) Limitation **Conclusion of Lecture** **Introduction of Lecture** **(3.7)Sampling Oscillators** (3.7.1) Block diagram (3.7.2)Waveform generation (3.7.2.1)Delayed sweep **Conclusion of Lecture** **Conclusion of Unit**	L21 L22 L23	22/3/24	22/3/24		
16	**UNIT IV** **Signal Generation and Signal Analysis** **Introduction of Unit** **Introduction of Lecture** **(4.1) Sine wave Generator** (4.1.1)Principle (4.1.2)Construction (4.1.3)Working (4.1.4)Waveform Generation (4.1.5)Application **Conclusion of Lecture** **Introduction of Lecture** **(4.2) Frequency Synthesis and Signal Generation** (4.2.1) Introduction (4.2.2)Types of synthesis (4.2.3) Logic of PLL	L24 L25				

	(4.2.4)Application and advantages as compared to direct Synthesizer **Conclusion of Lecture** **Introduction of Lecture** **(4.3) Sweep Frequency Generator** (4.3.1) Introduction (4.3.2) Meaning of Sweep (4.3.3) Basic Principle (4.3.4) Usage in CRO **(4.4)Wave Analyzer** (4.4.1)Introduction (4.4.2)Types of Wave Analyzer (4.4.3) Application **Conclusion of Lecture**	L26	23/5/24	23/5/24		
17	**Introduction of Lecture** **(4.5)Frequency Selective Wave Analyzer** (4.5.1) Basic wave analyzer (4.5.2)Block Diagram (4.5.3)Basic Working (4.5.4) Limitation **(4.6) Heterodyne Wave Analyzer** (4.6.1) Block Diagram (4.6.2)Basic Working (4.6.3) Comparison with Frequency Selective Wave Analyzer **Conclusion of Lecture** **Introduction of Lecture** **(4.7) Harmonic Distortion Analyzer** (4.7.1)Block Diagram (4.7.2)Basic Working (4.7.3) Types of HAD (4.7.4) Mathematical Approach to calculate the Harmonic Distortion	L27 L28 L29	24/5/24	24/5/24		
18	**(4.8) Spectrum Wave Analyzer** (4.8.1)Basic Spectrum Analyzer (4.8.1.1)Block Diagram	L30				

	(4.8.1.2)Basic Working (4.8.2)Spectral Displays (4.8.3)Spectra Of Different Signals (4.8.3.1) Continuous Wave Signals (4.8.3.2) Amplitude Modulation (4.8.3.3) Frequency Modulation (4.8.3.4) Phase Modulation **Conclusion of Lecture** **Conclusion of Unit** **Revision of Unit**	L31	04/4/24	04/4/24		
19	**UNIT V:-Transducers** **Introduction of Unit** **Introduction of Lecture** **(5.1) Classification** (5.1)Definition (5.2)Classification of transducer (5.2.1)Based on Principle of Transaction (5.2.2)As Primary & Secondary (5.2.3)As Active & Passive (5.2.4)As Analog & Digital (5.2.5)As Transducers & Inverse Transducers **Conclusion of Lecture**	L32	8/4/24	8/4/24		
20	**Introduction of Lecture** **(5.2) Resistance Temperature Transducer** (5.2.1)Selection Criteria (5.2.2) Characteristics (5.2.3) Construction (5.2.4) Working Principle (5.2.5) Application **(5.3) Thermocouple** (5.3.1) Selection Criteria (5.3.2) Characteristics (5.3.3) Construction (5.3.4) Working Principle (5.3.5) Application **Conclusion of Lecture**	L33 L34				

	Introduction of Lecture **(5.4) Thermistors** (5.4.1) Construction (5.4.2) Resistance-Temperature Characteristics (5.4.3) Voltage-Current & Current-Time Characteristics (5.4.4) Salient Features (5.4.5) Application **Conclusion of Lecture**	L35	11/4/24	11/4/24		
21	**Introduction of Lecture** **(5.5) Linear Variable Differential Transformer** (5.5.1) Construction & Working (5.5.2) Advantages & Disadvantages (5.5.3) Application **Conclusion of Lecture** **Introduction of Lecture** **(5.6) Strain Gauge** (5.6.1)Theory of strain gauge (5.6.2)Types of strain gauge (5.6.2.1)Unbounded metal strain gauge (5.6.2.2)Bonded wire strain gauge (5.6.2.3)Bonded metal foil strain gauge (5.6.2.4)Semiconductor strain gauge **Conclusion of Lecture**	L36 L37	12/4/24	13/4/24		
22	**Introduction of Lecture** **(5.7) Bourden Tubes and Bellows** (5.7.1) Introduction of various pressure summing device (5.7.2) Construction of Bourden Tube (5.7.3) Construction of Bellows (5.7.4)Application **Conclusion of Lecture** **Introduction of Lecture**	L38	17/4/24	18/4/24		

	(5.8) Seismic Accelerometer (5.8.1) Principle (5.8.2) Functional Diagram (5.8.3) Working (5.8.4) Application **Conclusion of Lecture**		18/4/24	18/4/24		
23	**Introduction of Lecture** **(5.9) Tacho-generator** (5.9.1) Principle (5.9.2) Specification (5.9.3) Functional Diagram (5.9.4) Working (5.9.5) Application **Conclusion of Lecture** **Introduction of Lecture** **(5.10) Load Cell** (5.10.1) Principle (5.10.2) Specification (5.10.3) Functional Diagram (5.10.4) Working (5.10.5) Applications **Conclusion of Lecture**	L39	25/4/24	25/4/24		
24	**(5.11) Piezoelectric Transducers** (5.11.1) Principle (5.11.2)Specification (5.11.3) Functional Diagram (5.11.4) Working (5.11.5) Applications **Conclusion of Lecture** **Introduction of Lecture** **(5.12)Ultrasonic Flow Meter** (5.12.1) Principle (5.12.2)Specification (5.12.3) Functional Diagram (5.12.4) Working (5.12.5) Applications **Conclusion of Lecture** **Conclusion of Unit**	L40 L41	04/5/24	04/5/24		

POORNIMA
COLLEGE OF ENGINEERING

Name of faculty	**Dr. Meetu Nag**
Class- IV Year	**B.Tech – IV SEM**
Branch	**Electronics & Communication Engineering**
Course Code	**4EC3-06**
Course Name	**Electronics Measurement and Instrumentation**
Session	**2023-2024**

Poornima College of Engineering, Jaipur

NBA Process Implementation Guidelines for Faculty
Course CO-PO, Preparation, Assessment Formats

Academic Session: 2023-2024 **Class: II year** **Semester: IV**
Name of the Faculty: Dr. Meetu Nag
Subject: Electronics Measurement and Instrumentation **Subject Code: 4EC3-06**

This document is meant as guidelines for implementing Outcome based education system as a part of NBA process.

1. Vision & Mission of Department: Statement and Mapping with Institute Mission

Vision of Department

To establish an acknowledged Department of academics in the field of Electronics and Communication Engineering.

Mission of Department

1. To equip the students with strong foundations to enable them for continuing education in the field of Electronics and Communication Engineering.
2. To provide quality education & to make the students entrepreneur and employable.
3. To undertake research and development in the field of Electronics and Communication Engineering.

Mapping of Department Vision with Institute Vision

	Acknowledge Department in Electronics and Communication Field
Skill Based System	✓
Excellence Knowledge in all Sphere of Life	✓

Mapping of Department Mission with Institute Vision

	Strong Foundations to enable them for continuing education	Quality Education &Employable	Research & Development
Skill Based System	✓	✓	✓
Excellence Knowledge in all Sphere of Life	✓	✓	✓

2. Program Educational Objectives (PEOs): Statement and Mappingwith Department Vision & Mission

PEO1: The graduates will be competent enough to apply knowledge and skills to solve the real time problem.

PEO2: Graduates will work as a team in diverse field and gradually move into leadership position.

PEO3: Graduates will understand current professional issues, apply latest technologies and come out with innovative solutions for the betterment of the society.

Mapping PEOs with Department Vision

	Acknowledge Department in Electronics and Communication Field
Knowledge and Skills to solve the real time problem.	✓
Working in team for diverse field and gradually move into leadership position.	✓
Current Professional issues, apply latest technologies and come out with innovative solutions for the betterment of the society.	✓

Mapping PEOs with Department Mission

	Strong Foundations to enable them for continuing education	Quality Education & Employable	Research & Development
Knowledge and Skills to solve the real time problem.	✓	✓	✓
Working in team for diverse field and gradually move into leadership position.	✓	✓	✓
Current Professional issues, apply latest technologies and come out with innovative solutions for the betterment of the society.	✓	✓	✓

3. Program Specific Outcome (PSOs): Statement and Mapping with Department Vision & Mission

Programme Specific Outcomes

PSO1: Graduates possesses the ability to understand and **apply basic knowledge** of core Electronics & Communication Engineering for the **benefit of society.**

PSO2: Graduates will be proficient to apply electronic **modern IT tools** for the **design** and **analysis of complex** electronic systems in furtherance to **research activities.**

PSO3: The ability to be adaptable to the **multidisciplinary** nature at workplace, develop excellent Interpersonal **Skills & Leadership** qualities that benefits the **individual &organization.**

Mapping PSOs with Department Vision

	Acknowledge Department in Electronics and Communication Field
Apply basic knowledge. benefit of society.	✓
Modern IT tools for the **design** and **analysis of complex** electronic systems in furtherance to **research activities.**	✓
Multidisciplinary. Interpersonal **Skills & Leadership** qualities that benefits the **individual & organization.**	✓

Mapping PSOs with Department Mission

	Strong Foundations to enable them for continuing education	Quality Education & Employable	Research & Development
Apply basic knowledge, benefit of society.	✓	✓	✓
Modern IT tools for the **design** and **analysis of complex** electronic systems in furtherance to **research activities.**	✓	✓	✓
Multidisciplinary, Interpersonal **Skills & Leadership** qualities that benefits the **individual & organization.**	✓	✓	

4. Program Outcome (POs): Statement and Mapping with PEO and PSO

Programme Outcomes

PO 1: Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the **solution of complex engineering problems.**

PO 2: Problem Analysis: **Identify, formulate, review research literature**, and **analyze complex engineering problems** reaching substantiated conclusions using first principles of **mathematics, natural sciences, and engineering sciences.**

PO 3: Design/Development of Solutions: **Design solutions for complex engineering problems** and design system components or processes that meet the specified needs with appropriate consideration for the **public health and safety, and the cultural, societal, and environmental considerations.**

PO 4: Conduct Investigations of Complex Problems: Use **research-based knowledge** and **research methods** including **design of experiments**, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5: Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and **modern engineering and IT tools** prediction and modeling to complex engineering activities with an understanding of the limitations.

PO 6: The Engineer and Society: Apply reasoning informed by the contextual knowledge to **assess societal, health, safety, legal and cultural issues** and the consequent responsibilities relevant to the professional engineering practice.

Mapping PSOs with POs

	PO 1: Engineering Knowledge	PO 2: Problem Analysis	PO 3: Design/ Development of Solutions	PO 4: Conduct Investigations of Complex Problems	PO 5: Modern Tool Usage	PO 6: The Engineer and Society	PO 7: Environment and Sustainability	PO 8: Ethics	PO 9: Individual and Team Work:	PO 10: Communication	PO 11: Project Management and Finance	PO 12: Life-Long Learning:
Apply basic knowledge benefit of society.	3	3	2			3				2		
Modern IT tools for the design and analysis of complex electronic systems in furtherance to research activities.		3	3	3	3						3	
Multidisciplinary, Interpersonal Skills & Leadership qualities that benefits the individual & organization.						2	3		3	2	3	3

5. Course Plan (Syllabus):

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

II Year - IV Semester: B.Tech. (Electronics & Communication Engineering)

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

POORNIMA
COLLEGE OF ENGINEERING
Session: 2022 -23 (Even Sem.)

Campus: PCE **Course: B.Tech. (ECE)** **Class/Section: 2nd Year 4th Sem**

Name of Faculty: Dr. Meetu Nag

1) Name of Subject: Electronics Measurement and Instrumentation Code: 4EC3-06

2) Self-Introduction:

a). Name: Dr. Meetu Nag
b). Qualification: PhD
c). Designation: Associate Professor
d). Research Area: MEMS Sensors, Measurement and Instrumentation
e). E-mail Id: meetu.nag@poornima.org

3) Introduction of Students:

a). *Records of students in 12th*

Sr. No.	Average result of 12th	Name of student scored highest marks	Marks 60% above (No. of students)	Marks between 40%-60% (No. of students)	English Medium Students (No.)	Hindi Medium Students (No.)	No. of Hostellers	No. of Day Scholar

b). *Name of 05 best students based on previous results:*

……, ……,

4) Instructional Language: 100%English

5) Introduction to subject: -

(A) Relevance to Branch:

The use of Electronic Measurement and Instrumentation is essential for the successful design, operation, and maintenance of electronic and communication systems. These systems form the backbone of modern society, providing reliable communication networks and enabling the efficient transmission of data. Electronic measurement and instrumentation are used to measure, analyze, and monitor the performance of networks and systems, providing engineers with the data they need to design, optimize, and troubleshoot their systems. Electronic measurement and instrumentation are also used to measure and analyze environmental factors that can affect the performance of electronic and communication systems. This includes measuring temperature,

humidity, electromagnetic interference, and other factors. Electronic measurement and instrumentation are also used to measure and analyze electrical signals, allowing engineers to identify problems or potential issues within the system.

(B) Relevance to Society:

Electronic Measurement and Instrumentation is an essential component of modern society. From the development of medical devices to the use of consumer electronics, these technologies play a major role in our lives. Electronic measurement and instrumentation have revolutionized the way we measure, analyze, and control physical systems. They have enabled us to develop new products and services that have improved the quality of life for many people. Electronic measurement and instrumentation have also been used to identify and manage hazardous materials, control air and water pollution, improve safety in industrial settings, and evaluate the performance of complex systems. As a result, they have become an integral part of our everyday lives.

(C) Relevance to Self: Electronic Measurement and Instrumentation are also important for self. By focusing on personal habits, such as goal setting, focus, and time management, we can gain insight into how we are using our time and resources to achieve our goals. Instrumentation can also be used to measure our stress levels and mood, which can provide insight into how to better manage our personal lives. Additionally, we can use instrumentation to measure our cognitive performance, such as reaction times and accuracy, to identify areas of strength and areas of improvement in our cognitive abilities. Finally, instrumentation can be used to measure our physical activity, diet, and sleep habits to help ensure we are taking the necessary steps to maintain our physical health.

(D) Relation with laboratory:

All the labs are directly linked to this subject. This subjects deals with the measurement and instrumentation that is the key part for any labs. This subjects covers the working of CRO, Signal Generator, Counter, and Successive Approximation Register for measuring Purpose.

(E) Connection with previous year and next year:

In previous semester electronic devices and signal & systems are partially related to this subject. The detailed study of this subject will be very helpful in further related subjects which will come in proceeding years.

6) Syllabus of Rajasthan Technical University, Kota

a). Index Terms/ Key Words: Students have knowledge about Errors, Signal Generators, CRO, Strain Gauges.

b). RTU Syllabus with Name of Subject& Code

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

II Year - IV Semester: B.Tech. (Electronics & Communication Engineering)

4EC3-06: Electronics Measurement & Instrumentation

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

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

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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

7). Books/ Website/Journals & Handbooks/ Association & Institution:

a). Recommended Text & Reference Books and Websites:

S. No.	Title of the book	Author	Publication	Remark (Text/ Reference)	No. of Copies in Library
1	Electronic measurements and Instrumentation	A.K.Sawhney	Dhanpat Rai & Co.	Text	30
2	Electronic Instrumentation	H.S Kalsi	TMH	Text	15
3	Electronic & Electrical Measurements and Instrumentation	J.B. Gupta	2nd Edition Academic Press	Reference	15
4	Modern Electronic Instrumentation and Measurement Techniques	Albert D. Helfrick William D. Cooper	PEARSON Prentice Hall	Reference	20

b). Journals & Handbooks: -

- Measurement and Instrumentation Principles, 3rd Edition, by A.J. Hughes and T.J. Hughes.
- Handbook of Electronic Instrumentation, by A.K. Gupta.
- Journal of Instrumentation and Measurement Technology.

c). Associations and Institutions: -

- Institute of Electrical and Electronics Engineers (IEEE)
- International Measurement Confederation (IMEKO)
- Institute of Measurement and Control (InstMC)
- International Society for Measurement and Control (ISMC)
- International Measurement Confederation Foundation (IMC-F)
- International Measurement System (IMS)
- International Federation of Automatic Control (IFAC)
- International Organization for Standardization (ISO)
- American Society for Precision Engineering (ASPE)
- International Society for Optical Engineering (SPIE)

8). Syllabus Deployment: -

A). Total weeks available for academics (excluding holidays) as per Poornima Foundation calendar-

Semester	VI
No. of Working days available(Approx.)	

No. of Weeks (Approx.)	

- Total weeks available for special activities (as mentioned below)- 02 weeks (Approx.)

Note: Individual faculty must calculate the exact no. of lectures available according to time table etc. after consultation with HOD.

b). Special Activities (To be approved by HOD, Dean & Campus Director & must be mentioned in deployment):

- Open Book Test- Once in a semester
- Quiz (50% Technical & 50% Aptitude)- Once in a semester
- Special Lectures (SPL)- 10% of total no. of lectures including following
  - i. One PPT by the faculty, who is teaching the subject
  - ii. SPL by expert faculty at PGC level
  - iii. SPL by expert from industry/academia (other institution)
- Revision classes:- 1 to 3 turn at the end of semester (Before II Mid Term Exam)
- Solving Important Question Bank- 1 Turn before I & II Mid Term Exam (each) - Total Two turn.

c). Lecture schedule per week

i). University scheme (L+T+P) = 3+1/0+0

ii). PGC scheme (L+T+P) = 4+1/0+0

Sr. No.	Name of Unit	No. of lectures	Broad Area	Degree of difficulty (High/Medium/ Low)	Text/ Reference books
1.	Electronic Instruments for measuring basic parameters	10	Different Measuring Instruments	Medium	1.A.K.Sawhney 2 H.S Kalsi 3. J.B. Gupta
2.	Oscilloscopes	06	Construction Of CRO, Types Of CRO	High	1.A.K.Sawhney 2.H.S Kalsi 3. J.B. Gupta
3.	Signal Generation	06	Signal Analyzer& Generators	Medium	1.A.K.Sawhney 2.H.S Kalsi
4.	Transducers	10	Definition, Types Of Transducer	Medium +Easy	1.A.K.Sawhney 2.H.S Kalsi
5.	Electronic Instruments for measuring basic parameters	10	Different Measuring Instruments	Medium	1.A.K.Sawhney 2 H.S Kalsi 3. J.B. Gupta

d). Introduction & Conclusion: Each subject, unit and topic shall start with introduction & close with conclusion. In case of the subject, it is Zero lecture.

e). Time Distribution in lecture class: -Time allotted: 60 min.

i. First 5 min. should be utilized for paying attention towards students who were absent for last lecture or continuously absent for many days + taking attendance by calling the names of the students and also sharing any new/relevant information.
ii. Actual lecture delivery should be of 50 min.
iii. Last 5 min. should be utilized by recapping/ conclusion of the topic. Providing brief introduction of the coming up lecture and suggesting portion to read.
iv. After completion of any Unit/Chapter a short quiz should be organized.
v. During lecture student should be encouraged to ask the question.

Note: Pl. ensure that each student is having Lecture Note Book. Pl. Write on the black board day and date, name of the teacher, name of sub. with code, unit and lecture no. and topics to be covered at the beginning of each lecture and ensure that students write in lecture note book. Ask students to leave 4/5 pages blank for copying the note from fellow students in case of their absenteeism.

9). Tutorial: - An essential component of Teaching- Learning process in Professional Education.

Objective: - To enhance the recall mechanism.
To promote logical reasoning and thinking of the students.
To interact personally to the students for improve numerical solving ability.

a). *Tutorial processing:* - Tutorial sheet shall be provided to each students

Ist Phase: - It is consisting of questions to be solved in the class assignment session in test mode on perforated sheet given in tutorial notebook and to be collected & kept by respective faculty for review & analysis (20 minutes).

IInd Phase: - Indicating/Initializing the weak issues/ drawback and Evaluating and providing the grade. Making a group with good student for assisting the weak students to explain/solve questions by every student on plain papers given in tutorial note book (20 minutes).

IIIrd Phase: - Solving/ explaining difficulties of lecture class and providing the new home assignment (20 minutes). To be done in tutorial note book.

b). *Home assignment shall comprise of two parts:*

Part (i) Minimum essential questions, which are to be solved and submitted by all with in specified due date.

Part (ii) Other important questions, which may also be solved and submitted for examining and guidance by teacher.

10). Examination Systems:

Sr. No.	Name of the Exam	Max. Marks	% of passing marks	Nature of paper Theory + Numerical	Syllabus coverage (in %)	Conducted by
1.	Ist Mid Term Exam	60	40	T+N	60	PGC
2.	IInd Mid Term Exam	60	40	T+N	40	PGC
3.	University (End) Term Exam	120		T+N	100	RTU

Place: JAIPUR

Dr. Meetu Nag (Associate Professor)
ECE Deptt.

CO 1	Understand the concept of errors and their types in measurement techniques.
CO 2	Comprehend the working and applications of various electronic instruments.
CO 3	Understand the construction and working principle of various oscilloscopes used in measurement.
CO 4	Classify various signal generators and wave analyzers.
CO5	Identify various applications of transducers.

Date: 03/02/2024

Course Outcomes

CO-PO-PSO Mapping: Mapping Levels: 1- Low, 2- Moderate, 3-Strong

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	-	-	-	3	3	-	-
CO2	3	-	2	2	-	-	-	-	-	-	-	3	3	3	3
CO3	3	-	2	2	-	3	-	-	-	-	-	3	3	3	3
CO4	3	-	2	2	-	3	-	-	-	-	-	3	3	3	3
CO5	3	-	2	2	-	-	-	-	-	-	-	3	3	3	3

PO Strongly Mapped:

PO2: Problem Analysis: Identify, Formulate, review research literature and analyze complex engineering problems related to ECE and reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

PSO Strongly Mapped:

PSO1: Graduates possesses the ability to understand and apply basic knowledge of core Electronics & Communication Engineering for the benefit of society.

Rules for CO/LO Attainment Levels: (Targets)

Course Category	Level 3	Level 2	Level 1
A		50-60 % of students getting > 60% marks	

End Term RTU Component: CO Attainment Levels

Course Category	Level 3	Level 2	Level 1
A		40-50 % of students	

		getting > 60% marks	

For the specific CO/LO attainment levels of your respective course please use the above tables as reference according your subject difficulty level and prepare following table.

S. No.	Course Type	Attainment Level=1	Attainment Level=2	Attainment Level=3
1	**Theory Courses** Mid Semester Exams	CO1, CO2, CO3, CO4,CO5	CO1, CO2, CO3, CO4,CO5	CO1, CO2, CO3, CO4,CO5
2	**Theory Courses** University Exam	CO1, CO2, CO3, CO4,CO5	CO1, CO2, CO3, CO4,CO5	CO1, CO2, CO3, CO4,CO5
4	**Practical Courses** –Internal Exams	NA	NA	NA
5	**Practical Courses** -University Exam	NA	NA	NA
6	**Assignments/Unit Test**	CO1, CO2, CO3, CO4,CO5	CO1, CO2, CO3, CO4,CO5	CO1, CO2, CO3, CO4,CO5
7.	**Any other**	NA	NA	NA

CO wise Assessment Activities (as Mentioned in Session Plan):

Activities					
CO	**Quiz**	**Assignment/Tutorial Sheets**	**Class Test**	**Mid 1**	**Mid 2**
CO1	Y	Y	Y	Y	Y
CO2	Y	Y	Y	Y	Y
CO3	Y	Y	Y	Y	Y
CO4	Y	Y	Y	Y	Y
CO5	Y	Y	Y	Y	Y

CO wise Assessment Activities:

CO	PO												Avg.	PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	CO Targets	PSO1	PSO2	PSO 3
CO1	1												1	2		1
CO2	2												2	2		1

CO3	2											2	2		1
CO4		3										3	2		1
CO5		3										3	2		1

Activity wise Assessment Tools:

Sr. No.	Activity	Assessment Method	Tools	Weightage Marks	Recommendation
1.	**Quiz**	Direct	Marks	80	For CO1,2,3,4,5
2.	**Tutorial sheets**	Direct	Marks	80	For CO1,2,3,4,5
3.	**Class Test**	Direct	Marks	80	For CO1,2,3,4,5
4.	**Mid-I**	Direct	Marks	60	For CO1,2,5
5.	**Mid-II**	Direct	Marks	60	For CO1,2,3,4,5