Shri VaishnavVidyapeethVishwavidyalaya, Indore
Shri Vaishnav Institute of Technology and Science
Choice Based Credit System (CBCS) in the Light of NEP-2020
B.Tech. (EC/EE/EI/EX/ECIOT/RA)
(2021-2025)

COURSE CODE	CATE-GORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTEC302	DCC	Network Analysis and Synthesis	60	20	20	30	20	3	1	2	5

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):
The objective of this course is -
1. To make the students capable of analyzing given electrical network composed by passive elements and some active elements.
2. To make the students learn how to synthesize an electrical network from a given impedance/admittance function

Course Outcomes (COs):
After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes:
1. Apply the fundamental concepts in solving and analyzing different Electrical networks.
2. Identify appropriate and relevant technique for solving the Electrical network in different conditions.
3. Apply mathematics in analyzing and synthesizing the networks in time and frequency domain.
4. Analyze the performance of a particular network from its analysis.

Syllabus

UNIT I **9 Hrs.**

Network Theorems: Preliminaries of Electrical elements R, L, C, and circuits; Kirchhoff's laws Basic elements: Voltage and current sources, Linearity of elements, Power and energy in electrical elements. Circuit Analysis Methods: Nodal analysis, Mesh analysis, Circuit Theorems: Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Superposition theorem, Reciprocity theorem.

UNIT II **8 Hrs.**

Transient Analysis: Source free RL and RC circuits, Elementary function unit step, unit ramp, unit impulse function and synthesis from source free parallel and series RLC circuit, complete response of the RLC circuit, lossless LC circuit.

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Board of Studies	Faculty of Studies	Shri Vaishnav Vidyapeeth	Shri Vaishnav Vidyapeeth
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Shri VaishnavVidyapeethVishwavidyalaya, Indore
Shri Vaishnav Institute of Technology and Science
Choice Based Credit System (CBCS) in the Light of NEP-2020
B.Tech. (EC/EE/EI/EX/ECIOT/RA)
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UNIT III **8 Hrs.**

Frequency Domain Analysis: The phasor concept, sinusoidal steady state analysis; Resonance, Network theorem in ac domain. AC circuit power analysis, Laplace transform: Application in circuit analysis, frequency response of simple passive filters.

UNIT IV **9 Hrs.**

Two Port Networks: Z, Y, h and ABCD parameters, analysis of interconnected (magnetically coupled) two port networks. Transfer function, immitance function.

UNIT V **9 Hrs.**

Network Synthesis: Positive real function, Hurwitz polynomial LC, RL, RC, and RLC network synthesis, Foster and Cauer network realization, Brune's method, Synthesis-Coefficient.

Text Books:

1. M.E. Van Valkenburg, "Network Analysis", Pearson Education India, 3rd Edition, 2019.
2. S P Ghosh A K Chakraborty, "Network Analysis &synthesis". Tata McGraw-Hill Education, 7th Edition, 2015.
3. Franklin F. Kuo, "Network analysis and synthesis", Wiley publication, 2nd Edition, 2013.

References:

1. Gordon J. Alexander and Matthew N.O. Sadiku, "Fundamentals of Electric Circuits", McGraw-Hill Education; 5th Edition. 2013.
2. Jack Ellsworth Kemmerly and William H. Hayt, "Engineering Circuit Analysis", McGraw-Hill Education; 8th Edition. 2013.
3. Pen-Min Lin and Raymond A DeCarlo, "Linear Circuit Analysis", Oxford university press, 2nd Edition 2012.
4. http://www.nptelvideos.in/2012/11/networks-and-systems.html.

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Shri Vaishnav Institute of Technology and Science
Choice Based Credit System (CBCS) in the Light of NEP-2020
B.Tech. (EC/EE/EI/EX/ECIOT/RA)
(2021-2025)

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List of Experiments:

1. Introduction of Simulation software Tina-TI.
2. To verify Thevenin's Theorem and Norton's Theorem.
3. To verify Superposition Theorem and Reciprocity Theorem.
4. To verify Maximum Power Transfer Theorem.
5. To determine Open Circuit and Short Circuit parameters of a Two Port Network.
6. To determine A, B, C, D parameters of a Two Port Network.
7. To determine h-parameters of a Two Port Network.
8. To find Frequency Response of RLC Series Circuit RLC parallel Circuit.
9. To determine resonance and 3dB frequencies.
10. To determine charging and discharging times of Capacitors.

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Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
Shri Vaishnav Institute of Technology and Science
Choice Based Credit System (CBCS) in the Light of NEP-2020
B.Tech.(EC/ECIOT /EE/EX/EI/MTX/RA)
(2021-2025)

COURSE CODE	CATE-GORY	COURSE NAME	TEACHING &EVALUATION SCHEME								
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BTEC304	DCC	Electronic Devices and Circuits	60	20	20	30	20	3	1	2	5

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Course Educational Objectives (CEOs):

The objectives of this course are to introduce students with

1. Fundamental electronic devices, e.g. PN junction, BJT, MOSFETs, Op-Amp and Multivibrators.
2. Construction, V-I characteristic, principles of operation, and applications.
3. Standard circuits, and their overall performance.

Course Outcomes (COs):

After completion of this course the students are expected to be able to:

1. Understand the fundamentals of operation of the main semiconductor electronic devices.
2. Analyze the basic parameters of electronic devices, their performance, and limiting factors.
3. Apply the basic principles of electronic device operation for various applications.

Syllabus

UNIT I **9 Hrs.**

PN Junction Diode: PN junction diode in forward and reverse bias, temperature dependence of V-I characteristics, diode resistances, diode junction capacitance, Clipper and clampers, Zener diode as voltage regulator.

Bipolar Junction Transistor: Construction, basic operation, current components and equations, CB, CE and CC configuration, input and output characteristics, Early effect, Region of operations: active, cut-off and saturation region. BJT as an amplifier.

UNIT II **9 Hrs.**

Transistor Biasing Circuits and Analysis: Introduction, various biasing methods: Fixed bias, Self bias, Voltage Divider bias, Collector to base bias, Load-line analysis: DC and AC analysis, Operating Point and Bias Stabilization and Thermal Runaway. Transistor as a switch.

Small Signal Analysis: Small signal Amplifier, Amplifier Bandwidth, Hybrid model, analysis of transistor amplifier using h-parameter, Multistage Amplifier: Cascading amplifier, Boot-strapping Technique, Darlington amplifier, Current Mirror circuits.

Chairperson	Chairperson	Controller of Examinations	Joint Registrar
Board of Studies	Faculty of Studies	Shri Vaishnav Vidyapeeth	Shri Vaishnav Vidyapeeth
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Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
Shri Vaishnav Institute of Technology and Science
Choice Based Credit System (CBCS) in the Light of NEP-2020
B.Tech.(EC/ECIOT /EE/EX/EI/MTX/RA)
(2021-2025)

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BTEC304	DCC	Electronic Devices and Circuits	60	20	20	30	20	3	1	2	5

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UNIT III **9 Hrs.**

FET: Construction, n-channel and p-channel transistors, drain and transfer characteristics, parameters, Equivalent model and voltage gain, analysis of FET in CG, CS and CD configuration. Enhancement and Depletion MOSFET drain and transfer Characteristics.

Power Amplifiers: Class A, Class B, Class AB, Class C, Class D, Transformer coupled and Push-Pull amplifier

UNIT IV **9 Hrs.**

Feedback and Oscillator Circuits: Effect of positive and negative feedback, basic feedback topologies and their properties, Sinusoidal Oscillators, Operation of Oscillators, types of Transistor Oscillators, Multivibrators: Monostable and Astable Multivibrator, basic operation of 555 timer.

UNIT V **9 Hrs.**

Op Amps: Block diagram of Op-Amp, ideal and practical Op-Amp circuit, Input offset voltage, offset current, Bias Current, thermal drift, Effect of variation in power supply voltage, common-mode rejection ratio, Slew rate and its Effect

Linear Applications of Op-Amp: Op-Amp configurations: inverting, non-inverting and differential amplifier configurations, Feedback amplifiers, Voltage follower, Summing amplifier,Integrators and differentiators, Instrumentation amplifier.

Text Books:

1. Jacob Millman, Christos Halkias, Chetan Parikh, "Integrated Electronics", 2nd Edition TMH, 2017.
2. Boylested, R. L. and Nashelsky, L., "Electronic Devices and Circuit Theory", 11th Edition, Pearson Education, 2013.
3. Ramakanth A. Gayakwad, "Op-Amps and Linear Integrated Circuits", Pearson, 4th Edition, 2015.

References:

1. Adel S.Sedra, Kenneth C.Smith, Tony Chan Carusone, Vincent Gaudet, " Microelectronic Circuits", Oxford Press, 2020.

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Shri Vaishnav Vidyapeeth	Shri Vaishnav Vidyapeeth	Vishwavidyalaya, Indore	Vishwavidyalaya, Indore
Vishwavidyalaya, Indore	Vishwavidyalaya, Indore		

Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
Shri Vaishnav Institute of Technology and Science
Choice Based Credit System (CBCS) in the Light of NEP-2020
B.Tech.(EC/ECIOT /EE/EX/EI/MTX/RA)
(2021-2025)

COURSE CODE	CATE-GORY	COURSE NAME	TEACHING &EVALUATION SCHEME								
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2. David A. Bell, "Electronic Devices and Circuits", 5th Edition, Oxford Press, 2008.
3. D. Roy Chowdhury, Shail B. Jain " Linear Integrated Circuits", New Age International (P) Ltd, 4th Edition, 2018.

List of Experiments:

1. To determine and analyze the V-I characteristics of PN Junction diode.
2. To determine and analyze the V-I characteristic of Zener diode and its load regulation capability.
3. To design clipper and clamper circuits.
4. To determine input and output characteristics of transistor amplifiers in CE, CC and CB configurations.
5. To determine the frequency response of CE amplifier, direct coupled and RC coupled amplifier.
6. To determine Drain and Transfer Characteristics of JFET.
7. To determine Drain and Transfer Characteristics of MOSFET Amplifier.
8. To determine characteristics of class A and B power amplifiers.
9. Measurements of Op-Amp parameters- CMRR, slew rate, open loop gain.
10. To develop an understanding of Inverting and non-inverting Op-Amp.
11. To analyze the characteristics of Integrator and Differentiator.
12. To analyze the working of Multivibrators.

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Vishwavidyalaya, Indore

Joint Registrar
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Vishwavidyalaya, Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
Shri Vaishnav Institute of Technology and Science
Choice Based Credit System (CBCS) in the Light of NEP-2020
B.Tech. in Electrical Engineering
(Common to EE/EX)
(2021-2025)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
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			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTEE305	DCC	Electrical Engineering Materials	60	20	20	0	0	3	0	0	3

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Course Educational Objectives (CEOs):

1. To introduce the concepts of different electrical engineering materials.
2. To gain the concepts of conducting, semiconducting, dielectric and insulating materials with their properties and application.
3. It will also provide the various phenomena such as Magnetostriction, Hall Effect, Super conductivity etc.

Course Outcomes (COs):

Upon completion of this course the students will be able to:

1. Apply core concepts in materials science to solve engineering problems.
2. Select the material for design and construction
3. Understand the importance of life -long learning
4. Evaluate the insulating, conducting and magnetic materials used in electrical machines.
5. Understand the properties of liquid, gaseous and solid insulating materials.

Syllabus

UNIT I **9 Hrs.**

Insulating Materials and their Applications: Plastics- Definition and classification, thermosetting materials, Thermo-plastic materials; Natural insulating materials, properties and their applications; Gaseous materials – Ceramics-properties and applications.

UNIT II **9 Hrs.**

Semi-Conducting Materials: Introduction - Semi-conductors and their properties, Different semiconducting materials (silicon and germanium) used in manufacture of various semiconductor devices (i.e. p-type and n-type semiconductors), Materials used for electronic components like resistors, capacitors, diodes, transistors and inductors etc.

Chairperson	Chairperson	Controller of Examinations	Joint Registrar
Board of Studies	Faculty of Studies	Shri Vaishnav Vidyapeeth	Shri Vaishnav Vidyapeeth
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Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
Shri Vaishnav Institute of Technology and Science
Choice Based Credit System (CBCS) in the Light of NEP-2020
B.Tech. in Electrical Engineering
(Common to EE/EX)
(2021-2025)

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BTEE305	DCC	Electrical Engineering Materials	60	20	20	0	0	3	0	0	3

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UNIT III **9 Hrs.**

Materials For Electrical Applications: Materials used for Resistors, rheostats, heaters, transmission line structures, stranded conductors, bimetals fuses, soft and hard solders, electric contact materials, electric carbon materials, thermocouple materials. Solid Liquid and Gaseous insulating, materials. Effect of moisture on insulation.

UNIT IV **9 Hrs.**

Magnetic Materials

Introduction and classification of magnetic materials, spontaneous magnetization in ferromagnetic materials, magnetic Anisotropy,Magnetostriction,Diamagnetism,magnetically soft and hard materials, Ferrites, cast and cermet permanent magnets, ageing of magnets. Factors effecting permeability and hysteresis. B-H curve, magnetic saturation, hysteresis loop (including) coercive force and residual magnetism, concept of eddy current and hysteresis loss, Curie temperature,

UNIT V **9 Hrs.**

Special Purpose Materials

Refractory Materials, Structural Materials, Radioactive Materials, Galvanization and Impregnation of materials, Processing of electronic materials, Insulating varnishes and coolants, Properties and applications of mineral oils, Testing of Transformer oil as per ISI.

Textbooks:

1. SK Bhattacharya: "Electrical and Electronic Engineering Materials" 1st edition Khanna Publishers, New Delhi, 2006.
2. A.J. Dekker "Electrical Engineering Materials", PHI, 2006.

Chairperson	Chairperson	Controller of Examinations	Joint Registrar
Board of Studies	Faculty of Studies	Shri Vaishnav Vidyapeeth	Shri Vaishnav Vidyapeeth
Shri Vaishnav Vidyapeeth	Shri Vaishnav Vidyapeeth	Vishwavidyalaya, Indore	Vishwavidyalaya, Indore
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Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
Shri Vaishnav Institute of Technology and Science
Choice Based Credit System (CBCS) in the Light of NEP-2020
B.Tech. in Electrical Engineering
(Common to EE/EX)
(2021-2025)

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References:

1. TTTI Madras: "Electrical Engineering Materials" TMH.
2. R K Rajput: "A course in Electrical Engineering Materials", Laxmi Publications. 2009.
3. T K Basak: "A course in Electrical Engineering Materials"New Age Science Publications 2009.
4. C. S. Indulkar and S. Thruvengadem: "Electrical Engineering Materials" S. Chand.
5. John Allison "Electrical Engineering Material s & Devices" TMH.
6. V. Raghvan: "Material Science & Engineering" PHI.
7. S.P. Seth & P.V. Gupta: "A course Electrical Engineering Materials" Dhanpat Rai & Sons.

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Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
Shri Vaishnav Institute of Technology and Science
Choice Based Credit System (CBCS) in the Light of NEP-2020
B.Tech. in Electrical Engineering
(Common to EE/EX)
(2021-2025)

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY			PRACTICAL	
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BTEE307	DCC	Electrical Instrumentation	3	0	2	4	60	20	20	30	20

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
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Course Educational Objectives (CEOs):

1. To enable the students to learn in detail about the various instruments available for monitoring/measuring electrical parameters encountered in domestic / industrial applications.
2. To introduce the fundamental concepts of electrical instrumentation.

Course Outcomes (COs):

1. To test and calibrate ammeter, voltmeter, wattmeter and energy meter.
2. Learn the measurement of magnetic parameters.
3. Understand the operating principles of energy and power meters.
4. Measure low, medium & high Resistances using suitable bridges.
5. To select proper instrument for measurement various electrical elements

Syllabus

UNIT I **9 Hrs.**

Introduction: SI units, static and dynamic characteristics of electrical instruments, measurement and error, accuracy and precision, sensitivity resolution, error & error analysis, effect of temperature, internal friction, stray field, hysteresis and frequency variation & method of minimizing them, loading effects, due to shunt connected and series connected instruments, testing & calibration of instruments.

Galvanometers: Galvanometer equation dc and ac measurement, theory & operation of D'arsonal galvanometer, ballistic galvanometer and vibration galvanometer, definition of analog & digital instruments, classification of analog instruments, their operating principle, operating force, types of supports, damping, controlling.

Chairperson
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Shri Vaishnav Vidyapeeth
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Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
Shri Vaishnav Institute of Technology and Science
Choice Based Credit System (CBCS) in the Light of NEP-2020
B.Tech. in Electrical Engineering
(Common to EE/EX)
(2021-2025)

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
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BTEE307	DCC	Electrical Instrumentation	3	0	2	4	60	20	20	30	20

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UNIT II **9 Hrs.**

Ammeters and Voltmeters: PMMC, moving iron, electrostatic meter, hotwire, rectifier and, electrodynamometer ,expression for control & deflection torque, their advantages, disadvantages & error, extension of range of instruments using shunt & multiplier.

Wattmeters: Electrodynamometer and induction wattmeters, construction, theory, operation, errors and their compensation, measurement of power in three phase circuit, one, two & three wattmeter method, low power factor & UPF wattmeter, measurement of reactive power, double element and three element dynamometer wattmeter.

UNIT III **9 Hrs.**

Energy Meters: Single phase induction type energy meter –construction & operation, driving and braking torques, calibration devices, errors and their compensation, polyphase energy meter, Testing by phantom loading, Smart energy meter -construction, operation and advantages. Prepaid meter.

Special Meters: Maximum demand indicator, bi-vector and Tri-vector meter, power factor and Frequency meter –Vibrating reed, Resonance type & Weston type, synchronoscope.

UNIT IV **9 Hrs.**

Resistance Measurement: Classification of resistance, measurement of low, medium and high resistances, voltmeter and ammeter method, Wheatstone bridge, Kelvin's double bridge & loss of charge methods for resistance measurement, Ohmmeter –series & shunt type, multi-meter, Megger, earth resistance measurement.

Potentiometer: DC potentiometer, application of DC potentiometer, AC polar type and coordinate type potentiometer, their construction and applications.

UNIT V **8 Hrs.**

Instrument Transformers: Potential and current transformers, construction, phasor diagrams, ratio and phase angle errors, difference between CT and PT, errors and reduction of errors, testing of instrument transformers.

Magnetic Measurements: Magnetic Measurement –B-H Curve, Hysteresis Loop determination.

Chairperson	Chairperson	Controller of Examinations	Joint Registrar
Board of Studies	Faculty of Studies	Shri Vaishnav Vidyapeeth	Shri Vaishnav Vidyapeeth
Shri Vaishnav Vidyapeeth	Shri Vaishnav Vidyapeeth	Vishwavidyalaya, Indore	Vishwavidyalaya, Indore
Vishwavidyalaya, Indore	Vishwavidyalaya, Indore		

Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
Shri Vaishnav Institute of Technology and Science
Choice Based Credit System (CBCS) in the Light of NEP-2020
B.Tech. in Electrical Engineering
(Common to EE/EX)
(2021-2025)

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY			PRACTICAL	
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BTEE307	**DCC**	**Electrical Instrumentation**	3	0	2	4	60	20	20	30	20

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Textbooks:

1. Golding E. W. and Widdis F. C., "Electrical Measurements and Measuring Instruments", 5th Ed., A.H. Wheeler and Company,1994
2. A.K. Sawhney "A course in Electrical & Electronic Measurement & Instruments", Dhanpat Rai & Co.,2012
3. K. S. K. Weranga and D. P. Chandima "Smart Metering Design and Applications" Springer,2014

References:

1. Helfrick and Cooper, "Modern Electronic Instrumentation and Measurement Techniques", Prentice-Hall of India, Reprint 1988.
2. Jones, B.E., "Instrumentation Measurement and Feedback", Tata McGraw-Hill, 1986.
3. Golding, E.W., "Electrical Measurement and Measuring Instruments", 3rd Edition, Sir Issac Pitman and Sons, 1960.

List of Experiments:

1. Measurement of low resistance using Kelvin's Double bridge
2. Measurement of medium resistance using Whetstone's bridge
3. Measurement of high resistance by loss of charge method
4. Measurement of Insulation resistance using Megger
5. Measurement of earth resistance by fall of potential method and verification by using earth tester
6. Measurement of power in a single phase ac circuit by three voltmeter/ three Ammeter method
7. Calibration of a dynamometer type of wattmeter with respect to a standard/Sub Standard wattmeter
8. Calibration of single phase digital/ Electronic type energy meter.
9. Calibration of a dynamometer type of wattmeter by Phantom Loading method.
10. Measurements using Instrument Transformers.
11. Study of various types of Indicating Instruments.
12. Measurement of Power in three phase circuit by one, two & three wattmeters.

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COURSE CODE	CATEGORY	COURSE NAME	TEACHING &EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTEE310	DCC	Signals and Systems	60	20	20	30	20	2	1	2	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):

1. To have an introduction to approaches of signals & systems analysis with an increased emphasis on the frequency response and Analysis of system with continuous signal and discrete time signal.
2. To enable the students to understand the fundamentals of signals, their time & frequency characteristics.

Course Outcomes (COs):

After the successful completion of this course students will be able to

1. Classify both continuous and discrete time signals and systems.
2. Analyse continuous signals in complex plain.
3. Understand Laplace transform and z transform.
4. Understand the random signals and systems.

Syllabus

UNIT I **9 Hrs.**

Introduction to signal and systems: Classification, definition, and representation of various types of Signals, representation of basic time domain functions, Various signal operations: shifting, scaling and inversion. System properties: Linearity, Causality, time invariance and stability, Dirichlet's conditions, Determination of Fourier series coefficients of signal.

UNIT II **9 Hrs.**

Signal Transformation: Fourier transformation of continuous and discrete time signals and their properties, Fourier transformation-analysis with examples and properties, Parseval's theorem. Convolution in time and frequency domain with magnitude and phase response of LTI systems.

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UNIT III **9 Hrs.**

Laplace Transform: Definition, Region of Convergence, Laplace Transform of some important functions, Convolution Integral and Inverse Laplace Transform. Concepts of s-plane Poles and Zeros & its Plot. Applications of Laplace Transformation in analysing networks.

UNIT IV **9 Hrs.**

Z-Transforms: Basic principles of z-transform, z-transform definition, Relationship between z-transform and Fourier transform. Region of convergence and properties of ROC, Properties of z-transform, Poles and Zeros, inverse z-transform using Contour integration, Residue Theorem, Power Series expansion and Partial fraction expansion.

UNIT V **9 Hrs.**

Random Signals & Systems: Definitions, distribution & density functions, mean values & moments, function of two random variables, concepts of correlation, random processes, spectral densities, response of LTI systems to random inputs.

Textbooks:

1. Alan V. Oppenheim, Alan S. Willsky, with S. Hamid, Signals and Systems 2/E, PHI
2. J. G. Proakis, D. G. Manolakis, Digital Signal Processing –Principles, algorithms and applications, 3rd Edition, PHI.
3. A. Anand Kumar, " Signals& Systems", PHI.
4. Signals & Systems", Special Edition – MRCET, McGraw Hill Publications, 2017.

References:

1. B. P. Lathi, "Linear Systems & Signals" Oxford University Press, 2008.
2. I. J. Nagrath, S.N. Saran, R. Ranjan and S. Kumar, "Singnals and Systems", Tata Mc. Graw Hill, 2001.
3. Robert, Signals & Systems Analysis Using Transformation Methods & MATLAB, TMH.

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List of Experiments:
(MATLAB Programs)

1. Study of basic MATLAB commands and Relational Operators , Loops & Functions using MATLAB.
2. Write a program to generate continuous time signals (i) Sine wave (ii) Cosine Wave (iii) Square wave (iv) Triangular wave.
3. Write a program to generate the discrete sequences (i) unit step (ii) unit impulse (iii) ramp (iv) periodic sinusoidal sequences. Plot all the sequences.
4. Find the Fourier transform of a square pulse .Plot its amplitude and phase spectrum.
5. Write a program to convolve two discrete time sequences. Plot all the sequences. Verify the result by analytical calculation.
6. Generate a discrete time sequence by sampling a continuous time signal.
7. Write a program to find the autocorrelation and cross correlation of sequences.
8. Write a program to generate a random sinusoidal signal and plot four possible realizations of the random signal.

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