PANDIT DEENDAYAL PETROLEUM UNIVERSITY

SCHOOL OF TECHNOLOGY

COURSE STRUCTURE FOR B.TECH. ELECTRICAL ENGINEEING

SEMESTER III			B.TECH. ELECTRICAL ENGINEEING											
Sr. No	Course Code	Course Name	Teaching Scheme					Exam Scheme						
								Theory			Practical		Total
			L	T	P	C	Hrs/wk	MS	ES	IA	LW	LE/Viva	Marks
1	MA 201T	Maths-III	3	1	0	4	4	25	50	25	--	--	100
2	UEE 202T	Network Theory	3	1	--	4	4	25	50	25	--	--	100
3	UEE 203T	Electronics Devices and Circuits	4	0	--	4	4	25	50	25	--	--	100
4	UEE 204T	Electrical Machines-I	4	0	--	4	4	25	50	25	--	--	100
5	UEE 205T	Electrical Measurement and Measuring Instruments	3	1	--	4	4	25	50	25	--	--	100
6	UEE 206P	Electrical Machines-I Laboratory	-	-	3	1.5	3				50	50	100
7	UEE 207P	Networks & Electrical Measurements Laboratory	-	-	3	1.5	3				50	50	100
		Total	**17**	**3**	**6**	**23**	**26**						700

MS = Mid Semester, ES = End Semester; IA = Internal assessment (like quiz, assignments etc)
LW = Laboratory work; LE = Laboratory Exam

Semester – III										
Course Code: UEE 202T					**Course: NETWORK THEORY**					
Teaching Scheme					**Examination Scheme**					
L	**T**	**P**	**C**	**Hrs/Week**	**Theory**			**Practical**		**Total Marks**
					MS	**ES**	**IA**	**LW**	**LE/Viva**	
3	**1**	**--**	**4**	**4**	**25**	**50**	**25**	**--**	**--**	**100**

Prerequisites : Elements of Electrical Engineering

Course Objectives:

- To provide essential understanding of design, analysis, testing and practical implementation of electrical networks.
- To provide sound understanding about the electrical networks, network elements, network analysis using Mesh current & Nodal voltage method.
- To impart knowledge about the AC and DC circuits and methods to determine the values of electrical quantities in different parts of the AC and DC circuits.
- To provide an insight into analyzing the coupled circuits and the impact of R-L-C components on the operation of a circuits
- To introduce the concept of two port networks

UNIT I **10**

NETWORK CONCEPTS: Network Element Symbols & Conventions, Active Elements, Current & Voltage Conventions, Loops & Meshes, Nodes, Coupled Circuits & Dot Conventions.

NETWORK ANALYSIS TECHNIQUES ANDTHEOREMS: Mesh Currents Analysis, Node Voltage Analysis, Solutions of Linear Node Equations & Circuit Analysis Using Matrices, Linearity & Superposition, Independent Sources & their Transformations, Circuit Analysis Based on Thevenin's Theorem, Norton's Theorem, Millman's Theorem, Tellengen's Theorem, Reciprocity Theorem & Maximum Power Transfer Theorem, Duality & Concept of Dual Network, Magnetically Couples Circuit Analysis.

UNIT II **10**

LAPLACE TRANSFORMATION: Laplace Transform Fundamentals, Properties & Theorems, Unit Step Function, Unit Impulse Function, Unit Ramp Function, Doublet Function, Signal Analysis based on Step, Ramp, Impulse & Doublet Functions, Laplace Transform for Shift & Singular Functions, Initial & Final Value Theorems, Waveform Synthesis, Convolution Integral.

TWO PORT NETWORK: Characteristic of Two Port Network, Impedance & Admittance Parameters, ABCD & H Parameters, Symmetry & Reciprocity, Inter Relationship between the Parameters, Ladder & Lattice Network, T & π Representation, Connection of Two Port Networks.

UNIT III **09**

GRAPH THEORY AND ITS APPLICATIONS: Fundamental Concepts, Definition of Graph & Various Related Terms, Paths & Circuit Connections, Trees of a Graph, Cut Sets & Tie Sets, Non-Separable Planner & Dual Graphs, Matrices of Oriented Graphs, Properties & Inter Relationships of Incidence, Tie &

Cut Set Matrices, Complete Circuit Analysis using Tie Set & Cut Set Matrices.

UNIT IV **10**

NETWORK FUNCTIONS: Concepts of Complex Frequency, Transform Impedance, Network Functions of One & Two Port Networks, Concept of Poles & Zeros, Properties of Driving Point & Transfer Functions, Time Response Stability From Pole Zero Plot.

AC AND DC TRANSIENTS: Initial & Final Conditions of Networks, DC Transients Analysis with R-L, R-C & R-L-C Circuits, Two Mesh Transients, Sinusoidal Transient Analysis of R-L, R-C & R-L-C Circuits using Laplace Transforms, Two Mesh AC Transients, Complete Response of R-L, R-C, & R-L-C Circuits to Step, Sinusoidal, Exponential, Ramp, Impulse functions & their Combinations.

Self-study: The self- study contents will be declared at the commencement of semester.

TOTAL HOURS	**39**

Texts and References:

1 Hayt W.H., Kemmerly J. E., Durbin S. M., "***Engineering Circuit Analysis***", Tata Mcgraw Hill.

2 Edminister Joseph A., "***Electrical Circuits, Schaum's Outline Series***", Tata Mcgraw Hill.

3 Van Valkenburg M.E., "***Network Analysis***", Prentice Hall, India, 2002.

4 A. Chakarbrati, "***Circuit Theory***", DhanapatRaiand Co.

Semester III										
Course Code: UEE 203T					**Course: ELECTRONIC DEVICES AND CIRCUITS**					
Teaching Scheme					**Examination Scheme**					
L	**T**	**P**	**C**	**Hrs/Week**	**Theory**			**Practical**		**Total Marks**
					MS	**ES**	**IA**	**LW**	**LE/Viva**	
4	**--**	**--**	**4**	**4**	**25**	**50**	**25**	**--**	**--**	**100**

Prerequisites : Basic Electronics

Course Objectives:

- To impart the students with knowledge about semiconductor devices like diodes, transistors, BJTs and FETs.
- To provide the sound understanding of theoretical concepts, configurations, frequency response analysis of electronic circuits comprising of semiconductor devices.
- To introduce the concept of feedback and the applications of semiconductor devices such as amplifiers and oscillators.

UNIT I **06**

P-N JUNCTION DIODE CHARACTERISTICS AND CIRCUITS: Introduction to Semiconductor Materials, Electron & Hole Pairs in Intrinsic Semiconductors, Donor & Acceptor Impurities, P-Type & N-Type Semiconductors, Formation of P-N Junction Diode, Biasing of P-N Junction Diode, V/I Characteristic of Diode, ON-State & OFF-State Diode Resistance, Concept of Load-Line, Piecewise Linear Model, Clipper & Clamper Circuits using Diodes, Diode Comparators, Diode Bridge Rectifier (1-Phase Half Wave And Full Wave Rectifier), Ripple Calculation in Rectifier Output, Reduction in Ripple using L- Filter, C-Filter, & L-C Filter, Reverse Recovery Characteristics of Diode, Schotky Diode, V-I Characteristics of Zener Diode, Zener Diode as a Voltage Regulator.

UNIT II **18**

BIPOLAR JUNCTION TRANSISTOR CHARACTERISTICS: Introduction to Bipolar Junction Transistor (BJT), Transistor Current Components, Working of a BJT, Transistor as an Amplifier (CB, CE and CC Configurations), Input and Output Characteristics, Transistor as a Switch, Early Effect, Punch Through Effect.

TRANSISTOR BIASING AND THERMAL STABILIZATION: Load Line Analysis (AC load line and DC load line), Significance of Biasing, Bias Stability, Factors Affecting Bias Stability, Biasing Methods, Stability Factor, Bias Compensation.

FIELD EFFECT TRANSISTORS: Junction FET, Pinch-Off Voltage, JFET Operating & Transfer Characteristics, the FET as a Voltage Variable Resistor, FET Small-Signal Model, Biasing the FET, Different FET Configurations, MOSFET, MOSFET Characteristics in Enhancement and Depletion Modes.

UNIT III **16**

TRANSISTOR AT LOW & HIGH FREQUENCIES: Transistor Hybrid Model, h-Parameters, Conversion Formulas for the Parameters of Three Transistor Configurations, Analysis of a Transistor Amplifier Circuit using h-Parameters, Thevenin's Theorem, Norton's Theorem & Corollaries, Emitter Follower, Comparison of Transistor Amplifier Configurations, Linear Analysis of a Transistor Circuit, Miller's Theorem and its Dual, Cascading Transistor Amplifiers, Simplified Calculations for CE and CC configuration. Hybrid–π CE Transistor Model, Hybrid– π Conductance, Hybrid– π Capacitances, CE Short-Circuit Current Gain, Current Gain with Resistive Load.

UNIT IV **12**

FEEDBACK AMPLIFIERS: Classification of Amplifiers, Feedback Concept, Transfer Gain with Feedback, General Characteristics of Negative Feedback Amplifiers, Input and Output Resistance, Method of Analysis of a Feedback Amplifier, Voltage Series Feedback, Current Series Feedback, Current Shunt Feedback, Voltage Shunt Feedback.

OSCILLATORS: Damped & Un-damped Oscillations, Barkhausen's criteria for Oscillators, Various Oscillator Circuits.

POWER AMPLIFIERS: Classification of Power Amplifiers, Class A, Class B, Class AB & Class C Power Amplifiers.

Self-study: The self- study contents will be declared at the commencement of semester.

TOTAL HOURS	**52**

Texts and References:

1 Millman and Halkias, "***Integrated Electronics***", McGraw Hill Publications.

2 Boylestad and Nashlesky, "***Electronic Devices and Circuit Theory***", PRENTICE HALL OF INDIA.

3 Albert Malvino and David J. Bates, "***Electronic Principles***", Tata McGraw Hill.

4 Floyd, "***Electronic Devices***", PRENTICE HALL OF INDIA.

Semester III										
Course Code: UEE 204T					**Course: ELECTRICAL MACHINES-I**					
Teaching Scheme					**Examination Scheme**					
L	**T**	**P**	**C**	**Hrs/Week**	**Theory**			**Practical**		**Total Marks**
					MS	**ES**	**IA**	**LW**	**LE/Viva**	
4	**0**	**--**	**4**	**4**	**25**	**50**	**25**	**--**	**--**	**100**

Prerequisites : Elements of Electrical Engineering

Course Objectives:

- To create awareness about the basic principles, fundamental concepts, working and operating characteristics of electrical machines, such as D.C. Machines & Transformers.
- To understand the operating characteristics and testing methods for D.C. Machines & Transformers.
- To understand the performance analysis of different types of DC machines & Transformers
- To have a sound knowledge about the different applications of DC machines & Transformers.

UNIT I **06**

PRINCIPLES OF ELECTROMECHANICAL ENERGY CONVERSIONS: Introduction, Principle of Singly Excited & Doubly Excited Systems, Electromagnetic & Reluctance Torques, Physical Concept of Force & Torque Production, Concept of General Terms Pertaining to Rotating Machines, Generated EMF in Full Pitched & Short Pitched Winding, Pitch & Distribution Factors, MMF of a Coil, Energy Stored in Magnetic Field, Torque in Machines with Cylindrical Air-Gap.

UNIT II **22**

DC MACHINES

DC generator: Principle & Construction of a DC Machine, Armature Windings, Types of DC Generators, EMF Equation, Voltage Build-Up in a Shunt Generator, Critical Resistance & Speed, Losses in DC Machine, Power Stages & Efficiency, Armature Reaction & its Effects, Inter Poles & Compensating Winding, Commutation & Methods to Improve Commutation, Characteristics of DC Generators, Applications.

DC Motor: Working Principle, Back EMF, Voltage & Power Equations, Types, Torque of a DC Motor, Power Stages, Efficiency, Performance Characteristics, Necessity of Starter, Three & Four Point Starters, Speed Control of DC Motors, Applications.

Efficiency and Testing of DC Machines: Methods of Testing, Brake Test, Swinburne's Test, Hopkinson's Test, Field Test, Retardation Test.

UNIT III **12**

SINGLE PHASE TRANSFORMER: Types, Working Principle, Construction, EMF Equation, Transformer on No-Load & ON Load, Ideal Transformer, Actual & Practical Transformer, Vector Diagrams, Equivalent Resistance & Reactance, Equivalent Circuits, Losses, Efficiency & Voltage Regulation, All Day Efficiency, Direct Load Test, O.C. & S.C. Tests, Sumpner's Test, Polarity Test, Parallel Operation & Load Sharing, Auto Transformers, Applications of Auto Transformers.

UNIT IV **12**

THREE PHASE TRANSFORMER: Construction, Types, Phase Groups, Connections (Including Open Delta), Parallel Operation of 3-Phase Transformers, Scott Connection, Three Winding Transformer, Tertiary Winding, Voltage Regulation & Tap Changers, Magnetizing Inrush, Harmonics in Transformer, Cooling Methods, Protective & Safety Devices Fitted on Transformers.

Self-study: The self- study contents will be declared at the commencement of semester.

TOTAL HOURS	**52**

Texts and References:

1. I. J. Nagrath and D.P. Kothari, "***Electrical Machines***", Tata Mcgraw Hill.
2. J. B. Gupta, "***Theory and Performance of Electrical Machines***", S. K. Kataria and Sons.
3. Ashfaq Hussain, "***Electrical Machines***", Dhanpat rai and Sons.
4. M. G. Say, "***The Performance and Design of Electrical Machines***", Pitman and Sons.
5. J. G. Jamnani, ***"Electrical Machines"***, Mahajan Publishing House.
6. Fitzgerald A.E and Kingsley, Electrical Machinery, Tata McGraw Hill

Semester III										
Course Code: UEE205T					**Course: ELECTRICAL MEASUREMENT AND MEASURING INSTRUMENTS**					
Teaching Scheme					**Examination Scheme**					
L	**T**	**P**	**C**	**Hrs/Week**	**Theory**			**Practical**		**Total Marks**
					MS	**ES**	**IA**	**LW**	**LE/Viva**	
3	**1**	**--**	**4**	**4**	**25**	**50**	**25**	**--**	**--**	**100**

Course Objectives:

- To enable the students to gain knowledge about different techniques for measuring the resistance/capacitance/inductance/impedance offered by the circuit components and that of the electrical quantities using electrical and electronic instruments.
- To learn the use of DC and AC bridges for measuring resistance, capacitance, and inductance.
- To learn the use of different types of analog meters for measuring electrical quantities such as current, voltage, power, energy, power factor, and frequency.
- To learn the principle of working and applications of CRO and other electronic measuring devices.

UNIT I **12**

STANDARDS: Standards & their Classification, Electrical Standards of EMF, Current, Resistance & Capacitance.

MEASUREMENT OF RESISTANCE: Classification of Resistances, Kelvin's Bridge, Wheatstone's Bridge, Carey Foster's Bridge, Direct Deflection Method & Loss of Charge Method for Measurement of Insulation Resistance, Meg-Ohm Bridge, Measurement of Surface Resistivity, Earth Resistance.

MEASUREMENT OF INDUCTANCE AND CAPACITANCE: General Four Arm AC Bridge Network, Maxwell, Hay Anderson, Schering & Wien Bridge Networks, Wagner Earthling Device, Headphone & Vibration Galvanometer as Detector.

UNIT II **12**

INDICATING AND INTEGRATING INSTRUMENTS: Classification, Operating Principles, General Construction Details of Indicating Instruments, Balancing, Control & Damping Method, Theory & Construction of PMMC, Moving Iron, Electrostatic & Rectifier Instruments, Electrodynamic Wattmeter, Induction Energy Meter, Measurement of Three Phase Power.

INSTRUMENT TRANSFORMERS: Theory of Current & Voltage Transformer, Ratio Error & Phase Angle, Burden, Turns Compensation Performance Characteristics, Testing & Application of CT & PT.

UNIT III **06**

MAGNETIC MEASUREMENTS: Theory & Calibration of Ballistic Galvanometer, Flux Meter & Measurement of Flux, Measurement of Iron Loss by Wattmeter Method, Hibbert's Magnetic Standard.

UNIT IV **09**

POTENTIOMETERS: Construction, Operation, Types, Standardization & Application of DC & AC Potentiometers, VR Box, Measurement of Unknown Resistance, Current, Voltage.

CATHODE RAY OSCILLOSCOPE: Basic CRO Circuit (Block Diagram), Cathode Ray Tube (CRT) & Its Components, Application of CRO in Measurement, Measurement of Phase, Frequency, Current & Voltage-Lissajous Pattern, Dual Trace & Dual Beam Oscilloscopes, Digital Storage Oscilloscope(DSO).

Self-study: The self- study contents will be declared at the commencement of semester.

TOTAL HOURS	**39**

Texts and References:

1. Golding and Widdis, "***Electrical measurements and Measuring instruments***", Wheeler Books
2. W. D. cooper and A.P. Helfrick, "***Modern Electronic Instrumentation and Measurement Techniques***", PRENTICE HALL OF INDIA.
3. A. K. Sawhney, "***Electrical and Electronic Measurements and Instrumentation***", Dhanpat Rai and Co.
4. R. K. Rajaput, "***Electrical and Electronics Measurements and Instrumentation***", S. Chand and Company Ltd.

Semester III										
Course Code: UEE 206P					**Course: ELECTRICAL MACHINES – I LABORATORY**					
Teaching Scheme					**Examination Scheme**					
L	**T**	**P**	**C**	**Hrs/Week**	**Theory**			**Practical**		**Total Marks**
					MS	**ES**	**IA**	**LW**	**LE/Viva**	
--	**--**	**3**	**1.5**	**3**	**--**	**--**	**--**	**50**	**50**	**100**

List of Experiments:

1. To understand the construction and operation of dc machine by working cut section.
2. To obtain the efficiency and load characteristics of a dc shunt motor by direct load test.
3. To determine external and internal characteristics of a dc shunt generator.
4. To determine external and internal characteristics of a dc shunt generator.
5. To control speed of a dc shunt motor by armature control and field control methods.
6. Speed Control Methods of dc series motors.
7. To find the efficiency of a dc machine by Swinburne's test.
8. To perform Hopkinson's Test on a pair of two identical dc machines to find the efficiency of each machine.
9. To perform Field test on a pair of two identical dc series machines to find the efficiency
10. Polarity and Voltage ratio Test on Single Phase Transformer.
11. Load Test on Single Phase Transformer.
12. Open circuit and short circuit test on single Phase Transformer.
13. To determine the parameters of an equivalent circuit of a single phase transformer
14. Sumpner's Test on Single Phase Transformer
15. Parallel operation of Single Phase Transformers.
16. To perform load test on three phase transformer to find out efficiency and regulation.
17. Parallel operation of two three Phase Transformers.
18. To obtain 2-phase supply from 3-phase supply using Scott connection.

Semester III										
Course Code: UEE207P					**COURSE: NETWORKS THEORY & ELECTRICAL MEASUREMENTS LABORATORY**					
Teaching Scheme					**Examination Scheme**					
L	**T**	**P**	**C**	**Hrs/Week**	**Theory**			**Practical**		**Total Marks**
					MS	**ES**	**IA**	**LW**	**LE/Viva**	
--	**--**	**3**	**1.5**	**3**	**--**	**--**	**--**	**50**	**50**	**100**

List of Experiments:

1. Study and verification of Thevenin's Theorem.
2. Study and verification of Norton Theorem.
3. Study and verification of Superposition theorem.
4. Study and verification of Maximum power transfer Theorem.
5. Transient analysis of RL/RC circuits.
6. Transient analysis of RLC circuits.
7. Study of Two Port Network.
8. Study of Two Port Ladder Network.
9. Study and verification of T and π Networks.
10. Measurement of resistance using Wheatstone Bridge
11. Measurement of Inductance and Capacitance using Wein Bridge
12. Measurement of Inductance and Capacitance using Hay's Bridge
13. Measurement of Resistance using Kelvin Double Bridge
14. Measurement of Resistance using Carey foster Bridge
15. Measurement of Inductance and Capacitance using Maxwell Bridge
16. Measurement of Inductance and Capacitance using Anderson Bridge
17. Measurement of Capacitance using Schering Bridge
18. Measurement of Capacitance using De-Sauty's Bridge
19. Single Phase Energy meter Demonstration