Course Curriculum

UNIVERSITY POLYTECHNIC

THIRD SEMESTER

ELECTRICAL ENGINEERING

DEE-301: BASIC ELECTRICAL ENGINEERING

Credits: 4 **Semester III**

Module No.	Contents	Teaching Hours
Unit –I	**NETWORKS & A.C. FUNDAMENTALS**: Definitions & explanation: Active & passive elements as well as networks – Linear & non-linear networks – Unilateral & bilateral networks. Statement, explanation, limitation & problems on Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Star-delta conversion. Single-phase A.C. Circuits: Concept of complex impedance – Rectangular & polar form. R-L-C Series Circuit: Representation of impedance, voltage, current and power in complex form phasor diagram Impedance triangle – problems. Parallel Circuit: Phasor diagram, problems (maximum 3 branches).	16
Unit – II	**RESONANCE & SELECTIVITY:** Series Resonance: General aspects – Impedance & phase angle of series resonant circuit – Voltages & current in series resonant circuit – Study of different curves – Quality factor – Selectivity & bandwidth – Voltage magnification – Problems – Acceptor Circuit (concept only). Parallel Resonance: Resonant frequency for a tank circuit study of curves attaining resonance by varying frequency & RL – Current magnification – Quality Factor – Selectivity & bandwidth – Applications – Problems – Rejector circuit (concept only). Comparison between series & parallel resonance.	16
Unit - III	**TRANSFORMERS:** Principle of operation. E.M.F equation, Voltage & Current relations. Construction and applications of small transformers used in electronics and communication engg., construction of auto transformers, constant voltage transformer. Phasor diagram of a transformer on load; Definition of regulation and efficiency; Elementary idea of losses in transformer, open circuit and short circuit test. **D.C. MACHINES: D. C. Generator:** Working principle, constructional details. **SYNCHRONOUS MACHINES:** Alternators: Working principle, types of alternators, **INDUCTION MOTOR**: Working principle and constructional details, types of induction motor.	16

Text Books:-

1. Fundamentals of Electric Circuit Alexander Mc Graw Hill
2. Electric Circuit David A. Bell Oxford
3. Circuits & Network Sukhua, Nagsarkar Oxford

A Text Book of Electrical Technology Part-I B.L. Thereja S. Chand.

DEE 302: ELECTRICAL MEASUREMENTS AND MEASURING INSTRUMENTS

Credits: 4 **Semester III**

Module No.	Contents	Teaching Hours
Unit – I	**Introduction to Electrical Measuring Instruments** Concept of measurement and measuring instruments Types of electrical measuring instruments – indicating, integrating and recordingtype instruments Essentials of indicating instruments – deflecting, controlling and damping torque a). Measurement & Errors Fault identification & basic symptoms if instrument is not working. **Ammeters and Voltmeters (Moving coil and moving iron type)** Concept of ammeters and voltmeters and difference between them Extension of range of voltmeters and ammeter Construction and working principles of moving Iron and moving coil instruments Merits and demerits, sources of error and application of these instruments	16
Unit – II	**Wattmeter's (Dynamometer Type)** Construction, working principle, merits and demerits of dynamometer type wattmeter, sources oferror **Energy meter (Induction type)** Construction, working principle, merits and demerits of single phase and three-phase energymeters a). Testing b). Digital Energy Meter c). Trivector Meter Errors and their compensation Simple numerical problems Construction and working principle of maximum demand indicator **Measurement of parameters R,L& C with different bridges.** **LCR meters** Study of LCR meter and its applications **Power Measurements in 3-phase circuits by** **(i)** 2 wattmeter method in balanced and unbalanced circuits and simple problems **(ii)** Three wattmeter method	16
Unit –III	**Electronic Instruments** Cathode Ray Oscilloscope: Block diagram, working principle of CRO and its variouscontrols. Applications of CRO. Digital multi-meter (only block diagram) and Applications **Miscellaneous Measuring Instruments** Construction, working principle and application of Meggar, Earth tester, Multimeter, Frequencymeter (dynamometer type) single phase power factor meter (Electrodynamometer type).Working principle of synchroscope and phase sequence indicator, tong tester(Clamp-onmeter) Instrument Transformers: Construction, working and applications a) CT b) PT and their ratio and phase angleerror	16

DEE 303: CIRCUIT THEORY

Credits: 4 **Semester III**

Module No.	Contents	Teaching Hours
Unit - 1	CIRCUIT ANALYSIS & D.C TRANSIENTS Ideal and practical voltage and current sources. Source transformation Voltage sources to Current Source and Vice versa. Mesh and Nodal Analysis of DC Circuits with voltage sources, current sources and combination of these two. Growth of current in an Inductive circuit, Time constant of R L circuit, Decay of current in an Inductive circuit. Charging of a capacitor, Time constant of R.C. circuit, Initial and final values. Discharge of a capacitor.	16
Unit - 2	NETWORK THEOREMS Superposition Theorem, Thevenin's Theorem, Norton's Theorem, and their application to 2 terminal A.C & D.C Networks. Maximum power transfer theorem for D.C. Network matching. TWO PORT NETWORK Various two port circuit parameter: their interrelationship, evaluation of Z,Y,h and transmission (ABCD) parameters, cascading of two port network.	16
Unit - 3	A.C. CIRCUIT Definition and explanation of alternating current, voltage and their relative terms, Phasor diagrams of alternating current and voltage in Series and Parallel A.C. Circuit containing Purely Resistive, Capacitive, Inductive elements (a combination of two elements and a combination of all three elements). RESONANCE Series resonance definition, derivation of expressions for resonant frequency, quality factor, voltage and current, resonance curve, lower and upper half power frequency, bandwidth and selectivity dependence of bandwidth and selectivity on Quality factor (problems based on the above). Parallel resonance circuit (same as for series resonance).	16

RECOMMENDED BOOKS:

Electrical Technology By R.L Thereja

Fundamentals of Electrical Engineering. By Ashfaq Hussain, Dhanpat Rai & Co

Electrical Circuit & Fields by Alexzender.

Network Synthesis & Analysis By K.M.Soni

[Diploma in Engineering]

DEC 304 – Basic Electronics

Credits: 4 **Semester III**

Module No.	Contents	Teaching Hours
Unit –I	**Semiconductor Physics**: Basic of Semiconductor materials and effect of temperature on semiconductor. **PN Junction Diode**:P-N junction diode with its Forward & Reverse Characteristics. Important specifications of P-N junction diode(ratings) , Break down in P-N junction, Voltage regulation **Rectifiers & Filters**: Rectifier circuit (HWR, FWR). Their comparison on the basis of circuit operation, waveforms, average (dc) value of rectifier output, ripple factor, ripple frequency, transformer utilization factor, rectification efficiency,	12
Unit – II	**Clipping & Clamping circuits**: Types and applications. Voltage Multiplier circuits: Types and applications. **Special purpose diode**: Light Emitting Diode, Liquid Crystal Display & Opt-couplers, Tunnel diode(with tunneling function),varactor diode,Schottky-Barrier diode, Zener diode, Zener diode as a voltage regulator. **Bipolar Junction Transistor (BJT):**Construction, working principle of PNP and NPN transistors, characteristics of CB, CE and CC configurations. D.C load line, Thermal stability factor. Different types of biasing methods (Fixed biasing, Collector–Base bias, Potential divider biasing,).	12
Unit - III	**Applications of BJT:** **a) Small Signal Amplifier:** Approximate hybrid model for Common Emitter Amplifier. Analysis of CE single stage Small Signal Amplifier (with un-bypassed & bypassed emitter resistor), using approximate hybrid equivalent circuit (amplifier input, output impedance, current & voltage gain).	12

DEE-304: Math's-III

Credits: 4 **Semester III**

Module No.	Contents
Unit-1	LAPLACE TRANSFORMS Define Gamma function and $\Gamma(n+1) = n!$ and find $\Gamma\ ) = \pi$ 2 (1 (No problem) Define Laplace transform of a function f(t) and inverse laplace transform. Derive L.T. of standard functions and explain existence conditions of L.T. Explain linear, shifting and Change of scale property of L.T. Formulate L.T. of derivatives, integrals, multiplication by n t and division by t. Derive formula of inverse L.T.
UNIT-III	UNIT-II NUMERICAL METHODS Appraise limitations of analytic method of solution of algebraic and transcendental equations. Derive Iterative formula for finding the solutions of algebraic and transcendental equations by: a) Bisection method b) Newton Raphson method Solve problems FINITE DIFFERENCE and INTERPOLATION Explain finite difference and form table of forward and backward difference. Define shift operator (E) and establish relation between E and difference operator(Δ). Derive Newton's forward and backward interpolation formula for equal interval. State Lagrange's Interpolation formula for unequal intervals. Explain numerical integration and state Newton-Cote's formula(No derivation) Trapezoidal Rule Simpson's 1/3rd rule

DEE 351: ELECTRICAL MEASUREMENTS AND MEASURING INSTRUMENTS Lab

Credits: 2 **Semester III**

LIST OF PRACTICALS

Module No.	Contents	Teaching Hours
1	Use of analog and digital multimeter for measurement of voltage, current (a.c/d.c) and resistance	24
2	To calibrate 1-phase energy meter by direct loading method.	
3	To measure the value of earth resistance using earth tester.	
4	To measure power, power factor in a single-phase circuit, using wattmeter and power factor meter and to verify results with calculations.	
5	Measurement of power and power factor of a three-phase balanced load by two wattmeter method.	
6	Measurement of voltage and frequency of a sinusoidal signal using	
7	CRO and draw wave shape of signal.	
8	Measurement of power in a 3 phase circuit using CT, PT and 3-phase wattmeter.	
9	Use of LCR meter for measuring inductance, capacitance and esistance.	
10	To record all electrical quantities from the meters installed in the institution premises.	
11	To measure Energy at different Loads using Single phase Digital Energy meter.	
12	Study of all bridges.	

DEE 352: BASIC ELECTRICAL LAB

Credits: 2 **Semester III**

LIST OF EXPERIMENTS
1. Verification of Kirchhoff's laws 2. Verification of (i) Superposition theorem (ii) Thevenin's Theorem (iii) Maximum Power Transfer Theorem. 3. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor 4. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency. 5. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor. 6. Determination of parameters of ac single phase series RLC circuit 7. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer

DEC – 351 : BASIC ELECTRONICS LAB

Credits: 2 **Semester-III**

LIST OF PRACTICALS

Module No.	Contents	Teaching Hours
1.	PN Junction diode characteristics A. Forward bias B. Reverse bias.	
2.	Zener diode characteristics and voltage regulator	
3.	Half wave Rectifier with and without filter.	
4.	Full wave Rectifier with and without filter.	
5.	Full wave Bridge Rectifier with and without filter.	
6.	Transistor CB Characteristics (Input and Output)	
7.	Transistor CE characteristics (Input and Output)	
8.	Transistor CC characteristics (Input and Output)	

DCS – 354 : COMPUTER LAB

Credits: 2 **Semester-III**

LIST OF PRACTICALS

Module No.	Contents
	Microsoft Access 1.a)Brief overview of Databases and Database Applications b)Starting Microsoft Access c)Creating and Viewing Tables 2• Creating a Table Using the Design View 3• Exercise: Creating a Table • Viewing and Adding Data to a Table • Exercise: Adding Data to a Table • Creating Relationships Between tables d)Creating and Running Queries 4 •Single Table Queries •Exercise: Single Table Queries •Multiple Table Queries • Exercise: Multiple Table Queries e)Creating and Running Data Entry Forms • Creating a Single Table Form using the Wizard 5• Exercise: Creating a Single Table Form • Review of Creating and Running a Data Entry Form f)Creating and Running Reports • Creating a Single Table Report using the wizard • Exercise: Creating a Single Table Report • Review of Creating and Running a Report
6. 7. 8.	Write Programs in C to implement Programming Exercise on Executing and Editing a C Program. Programming Exercise on defining Variable and assigning values to variables. Programming Exercise on arithmetic's and relational operators.