

Scheme of Instruction & Syllabi
of
Diploma in Electrical Engineering
(Three Year Diploma Course)
II and III Year

(Effective Session 2017-2018)

Invertis Institute of Engineering & Technology
INVERTIS UNIVERSITY
Invertis Village, Bareilly-Lucknow NH-24, Bareilly



Study and Evaluation Scheme, Diploma (Electrical Engineering)
Effective from session 2017-18
(Year-II, Semester-III)

S.NO.	CODE	SUBJECT	PERIODS			EVALUATION SCHEME					TOTAL	CREDIT
						SESSIONAL				END SEMESTER		
			L	T	P	CT	TA	AT	Total	E-Sem		
1	DEE-301	Electrical Circuits	3	1	0	20	10	10	40	60	100	4
2	DEE-302	DC Machines and Transformer	3	1	0	20	10	10	40	60	100	4
3	DEE-303	Electrical & Electronics Measurements	3	1	0	20	10	10	40	60	100	4
4	DEE-304	Solid state Electronics Engg.	3	1	0	20	10	10	40	60	100	4
5	DEE-305	Basic Signal and system	3	1	0	20	10	10	40	60	100	4
PRACTICAL/TRAINING/PROJECT												
6	DEE-351	Electrical Wiring Lab	0	0	4	0	0	0	50	50	100	2
7	DEE-352	Electrical Machines Lab	0	0	4	0	0	0	50	50	100	2
8	DEE-353	Electrical Measurement Lab	0	0	4	0	0	0	50	50	100	2
9	DEE-354	Electrical Network Lab	0	0	4	0	0	0	50	50	100	2
10	GP-301	General Proficiency	-	-	-	-	-	-	50	-	50	1
			15	05	16				450	500	950	29



**Study and Evaluation Scheme (Year-II, Semester-IV)
Diploma (Electrical Engineering) Effective from session 2017-18**

S.NO.	CODE	SUBJECT	PERIODS			EVALUATION SCHEME					TOTAL	CREDIT
						SESSIONAL				END SEMESTER		
			L	T	P	CT	TA	AT	Total	E-Sem		
1	DEE-401	AC Machines	3	1	0	20	10	10	40	60	100	4
2	DEE-402	Power System –I	3	1	0	20	10	10	40	60	100	4
3	DEE-403	Electrical Installation & Estimation	3	1	0	20	10	10	40	60	100	4
4	DEE-404	Digital Electronics	3	1	0	20	10	10	40	60	100	4
5	DEE-405	Electrical Engineering Material	3	1	0	20	10	10	40	60	100	4
PRACTICAL/TRAINING/PROJECT												
6	DEE-451	AC Machines Lab	0	0	4	0	0	0	50	50	100	2
7	DCS-459	Programming in C Lab	0	0	4	0	0	0	50	50	100	2
8	DEE-453	Electrical Workshop Lab	0	0	4	0	0	0	50	50	100	2
9	DEE-454	Digital Electronics Lab	0	0	4	0	0	0	50	50	100	2
10	GP-401	General Proficiency	-	-	-	-	-	-	50	-	50	1
			15	5	16				450	500	950	29



Study and Evaluation Scheme (Year-III, Semester-V)
Diploma (Electrical Engineering) Effective from session 2017-18

S.NO.	CODE	SUBJECT	PERIODS			SESSIONAL				END SEMESTER	TOTAL	CREDIT
			L	T	P	CT	TA	AT	Total	E-Sem		
1	DEE-501	Power System –II	3	1	0	20	10	10	40	60	100	4
2	DEE-502	Basics of Microprocessor	3	1	0	20	10	10	40	60	100	4
3	DEE-503	Control System	3	1	0	20	10	10	40	60	100	4
4	DEE-504	Power Electronics	3	1	0	20	10	10	40	60	100	4
5	DEE-505	Modern electric traction system	3	1	0	20	10	10	40	60	100	4
PRACTICAL/TRAINING/PROJECT												
6	DEE-551	Control system lab	0	0	4	0	0	0	50	50	100	2
7	DEE-552	Power Electronics Lab	0	0	4	0	0	0	50	50	100	2
8	DEE-553	Industrial Training Viva	0	0	4	0	0	0	100	-	100	2
9	DEE-554	Mini Project work	0	0	4	0	0	0	50	50	100	2
10	GP-501	General Proficiency	-	-	-	-	-	-	50	-	50	1
			15	5	16				500	450	950	29



Study and Evaluation Scheme (Year-III, Semester-VI)
Diploma (Electrical Engineering) Effective from session 2017-18

S.NO.	CODE	SUBJECT	EVALUATION SCHEME										TOTAL	CREDIT
			PERIODS			SESSIONAL				END SEMESTER				
			L	T	P	CT	TA	AT	Total	E-Sem				
1	DEE-601	Utilization of electrical energy and drive	3	1	0	20	10	10	40	60	100	4		
2	DAS-604	Environment & Ecology	2	0	0	8	03	04	15	35	50	2		
3	DEE-603	Power system protection	3	1	0	20	10	10	40	60	100	4		
4	DEE-604	Power Station Practice	3	1	0	20	10	10	40	60	100	4		
PRACTICAL/TRAINING/PROJECT														
5	DEE-651	Power system lab	0	0	4	0	0	0	50	50	100	2		
6	DEE-652	Major Project	0	0	8	0	0	0	150	200	350	8		
7	DEE-654	Instrumentation Lab	0	0	4	0	0	0	50	50	100	2		
8	GP-601	General Proficiency	-	-	-	-	-	-	50	-	50	1		
			11	3	16				435	515	950	27		

DEE-301 ELECTRICAL CIRCUITL T P
3 1 0**Unit-I****Circuit elements and laws:**

Voltage, current, power and energy, Resistance, Inductance & capacitance as parameters, Active, Passive, Bilateral & Unilateral, Linear & Nonlinear elements, KVL and KCL, Voltage division & current division.

Unit -II**Magnetic circuits:**

Introduction on Magnetizing force, Intensity, MMF, flux and their relations Permeability, reluctance and permeance , Analogy between electric and Magnetic Circuits ,B-H Curve Series & parallel magnetic circuit ,Hysteresis loop.

Unit -III**Network analysis:**

Mesh Analysis, Mesh Equations by inspection, Super mesh Analysis, Nodal Analysis Nodal Equations by inspection, Super node Analysis, and Source Transformation Technique

Unit-IV**Network theorems:**

Star – delta transformation ,Super position Theorem ,Thevenin's Theorem ,Norton's Theorem ,Reciprocity Theorem ,Compensation Theorem ,Maximum power Transfer theorem ,Milliman's Theorem.

Unit –V**Two-port network:**

Open circuit impedance (z) parameters, Short circuit admittance (y) parameters, Transmission (ABCD) parameters, Hybrid (n) parameters.

Filters:

Classification of filters ,Filter networks , Equations of filter networks , Classification of pass Band and stop Band , Characteristic impedance in the pass and stop bands Band pass filter.

Text book:

1. CIRCUIT & NETWORKS By: A. Sudhakar & Shyam Mohan S Palli Publisher Tata Mc Graw Hill.
2. Electrical Technology Volume – I, By- B. L. Thereja Publisher: S. Chand.

DEE-302: D.C. MACHINES & TRANSFORMER

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3 1 0

Unit-I

D.C. Machines:- Construction of DC Machines, Armature winding, Emf and torque equation, Armature Reaction, Commutation, Interpoles and Compensating Windings, Performance Characteristics of D.C. generators, Performance Characteristics of D.C. motors.

Unit-II

D.C. Machines (Contd.):- Starting of D.C. motors; 3 point and 4 point starters, Speed control of D.C. motors: Field Control, armature control and Voltage Control (Ward Leonard method); Efficiency and Testing of D.C. machines (Hopkinson's and Swinburne's Test).

Unit-III

Single Phase Transformer: Phasor diagram, efficiency and voltage regulation, all day efficiency.

Unit-IV

Testing of Transformers: O.C. and S.C. tests, Sumpner's test, polarity test.

Auto Transformer: Single phase and three phase auto transformers, volt-amp, relation, efficiency, merits & demerits and applications.

Unit-V

Three Phase Transformers: Construction, three phase transformer phasor groups and their connections, open delta connection, three phase to 2 phase, 6 phase or 12 phase connections, and their applications, parallel operation and load sharing of single phase and three phase transformers.

Test Books:-

1. I.J. Nagrath & D.P.Kotahri," Electrical Machines", Tata McGraw Hill.
2. Husain Ashfaq," Electrical Machines", Dhanpat Rai & Sons.
3. A.E. Fitzgerald, C.Kingsley Jr and Umans,"Electric Machinery" 6th Edition.

DEE-303 ELECTRICAL & ELECTRONICS MEASUREMENT

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3 1 0

Unit-I

Analog Measurement of Electrical Quantities: Electrodynamic, Thermocouple, Electrostatic & Rectifier type Ammeters & Voltmeters, Electrodynamic Wattmeter, Three Phase Wattmeter, Power in three phase system, errors & remedies in wattmeter and energy meter.

Unit-II

Instrument Transformer: Instrument Transformer and their applications in the extension of instrument range, Introduction to measurement of speed, frequency and power factor.

Unit-III

Measurement of Parameters: Different methods of measuring low, medium and high resistances, measurement of inductance & capacitance with the help of AC Bridges, Q Meter.
AC Potentiometer: Polar type & Co-ordinate type AC potentiometers.

Unit-IV

Digital Measurement of Electrical Quantities: Concept of digital measurement, block diagram, Study of digital voltmeter.

Unit-V

Cathode Ray Oscilloscope: Basic CRO circuit (Block Diagram), Cathode ray tube (CRT) & its components, application of CRO in measurement, Lissajous Pattern; Dual Trace & Dual Beam Oscilloscopes.

Test Books:-

1. E.W. Golding & F.C. Widdis, "Electrical Measurement & Measuring Instrument", A.W. Wheeler & Co. Pvt. Ltd. India.
2. A.K. Sawhney, "Electrical & Electronic Measurement & Instrument", Dhanpat Rai & Sons, India.

DEE-304: SOLID STATE ELECTRONICS ENGINEERING

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3 1 0

Unit I

Special semiconductor devices:

Photo diode, Zener Diode, Tunnel Diode, LED.

Unit II

Rectifier circuits & filters:

Classification of rectifiers , Analysis of half wave, full wave centre tapped and Bridge rectifiers and calculate , DC output current and voltage , RMS output current and voltage, Rectifier efficiency , Ripple factor , Regulation, Transformer utilization factor ,Peak inverse voltage, Filters: T filter, π filter.

Unit III

Transistors:

Principle of Bipolar junction transistor ,Different modes of operation of transistor, Current components in a transistor ,Transistor as an amplifier , Transistor circuit configuration & its characteristics , CB Configuration , CE Configuration ,CC Configuration.

Unit IV

Operational amplifiers:

General circuit simple of OP-AMP and IC – CA – 741 OP AMP Operational amplifier stages, Equivalent circuit of operational amplifier.

Unit V

Open loop OP-AMP configuration ,OPAMP with feedback , Inverting OP-AMP , Non inverting OP-AMP ,Voltage follower & buffer ,Differential amplifier ,Adder or summing amplifier ,Subtractor, Integrator, Differentiator , Comparator.

Text Book:

1. Electronic Devices and Circuits. By: Sanjeev Gupta Publisher: Dhanpat Rai Publications.

DEE-305: Basic Signal and system

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3 1 0

Unit I

Introduction to continuous time signals and systems: Basic continuous time signals, unit step, unit ramp, unit impulse and periodic signals with their mathematical representation and Characteristics. Various types of systems: Linear, casual, time-varying.

Unit II

Fourier Transform Analysis: Exponential form and Trigonometric form of Fourier series, Fourier symmetry, Fourier Integral and Fourier Transform. Transform of common functions and periodic wave forms.

Unit III & IV

Laplace Transform Analysis: Review of Laplace Transform, Laplace Transform of periodic functions and complex waveforms, Initial and Final Value Theorems, Inverse Laplace Transform, Convolution Theorem, Superposition Integral.

Unit V

Z-Transform Analysis : Concept of Z-Transform, Inverse Z-Transform, Initial and Final Value theorems , Applications to solution of difference equations, Pulse Transfer Function.

Text Book:

1. B.P. Lathi, "Linear Systems & Signals" Oxford University Press, 2008.
2. A.K. Chakrabarti, "Circuit Theory" Danpat Rai publication.

DEE-351: Electrical Wiring Lab

LIST OF PRACTICALS:

- 1.** Preparations of joints on multistrand insulated wire: Twisted joint, Married joint, plain cross joint, duplex cross joint.
- 2.** Preparation of wiring diagram and wiring of the following: Sodium vapour lamp, Mercury vapour lamp, Corridor wiring, Row of lamps (decorative light)
- 3.** To make the positions, fix and complete the internal wiring of the fitting of a switch board, containing at least four switches, one plug and one regulator.
- 4.** Assembling, dismantling and fault investigation in the following domestic appliances: Electric heater, Electric immersion heater, Room heater, Electric kettle, Electric soldering iron.
- 5.** Dismantling, identifying of various parts, finding fault, removing the fault, assembling and testing of: Table fan, Ceiling fan, Electric washing machine, and Room cooler, electric toaster and sandwich maker.
- 6.** Study the construction of telephone and its circuit.
- 7.** To make connection of supply and consumer board.
- 8.** Study of contactors and time delay relays.
- 9.** Soldering practice and lugs jointing.
- 10.** Rewinding of a ceiling fan.

DEE-352: Electrical Machines Lab

LIST OF PRACTICALS:

1. Speed control of dc shunt motor (i) Armature control method (ii) Field control method
2. Study and connection of dc series motor with starter (to operate the motor on no load for a moment)
3. Study and connection of 3 point starter for starting D.C. shunt motor and change its direction of rotation. Also draw load characteristics
4. To perform open circuit and short circuit test for determining: (i) equivalent circuit (ii) the regulation and (iii) efficiency of a transformer from the data obtained from open circuit and short circuit test at full load.
5. To find the efficiency and regulation of single phase transformer by actually loading it.
6. Checking the polarity of the windings of a three phase transformer and connecting the windings in various configurations.
7. Finding the voltage and current relationships of primary and secondary of a three phase transformer under balanced load in various configurations conditions such as (a) Star-star (b) Star delta (c) Delta star (d) Delta - Delta configuring conditions
8. To test primary/ secondary windings of a transformer.

DEE-353: Electrical Measurement Lab

LIST OF PRACTICALS:

- 1.** Use of analog and digital multimeter for measurement of voltage, current (a.c/d.c) and resistance.
- 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 CRO time base as well as Lissajous pattern and draw wave shape of signal.
- 7.** Measurement of power in a 3 phase circuit using CT, PT and 3-phase wattmeter.
- 8.** Use of LCR meter, digital LCR meter for measuring inductance, capacitance and Resistance.
- 9.** To record all electrical quantities from the meters installed in the institution premises.
- 10.** To measure Energy at different Loads using Single phase Digital Energy meter.

DEE-354: Electrical Network Lab

LIST OF PRACTICALS:

1. Verification of principle of superposition with dc and ac sources.
2. Verification of Thevenin, Norton and Maximum power transfer theorems in ac circuits.
3. Verification of Tellegen's theorem for two networks of the same topology.
4. Determination of transient response of current in RL and RC circuits with step voltage Input.
5. Determination of transient response of current in RLC circuit with step voltage input for under damp, critically damp and over damp cases.
6. Determination of frequency response of current in RLC circuit with sinusoidal ac input.
7. Determination of z and h parameters (dc only) for a network and computation of Y and ABCD parameters.
8. Determination of driving point and transfer functions of a two port ladder network and verify with theoretical values.
9. Determination of image impedance and characteristic impedance of T and Π networks, using O.C. and S.C. tests Write Demo for the following (in Ms-Power point).
10. Verification of parameter properties in inter-connected two port network: series, parallel and cascade also study loading effect in cascade.

DEE-401 AC Machines

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3 1 0

Unit-I

Synchronous Machines: Main constructional features of commutator and brushless excitation system Generation of three phase emf, Production of rotating magnetic field in a three phase winding, Concept of distribution factor and coil span factor and emf equation, Armature reaction on unity, lag and lead power factor, Operation of single synchronous machine independently supplying a load -Voltage regulation by synch-impedance method.

Unit-II

Need and necessary conditions of parallel operation of alternators, Synchronizing an alternator with the bus bars, Operation of synchronous machine as a motor –its starting methods, Effect of change in excitation of a synchronous motor, Cause of hunting and prevention.

Unit-III & IV

Induction Motors: Salient constructional features of squirrel cage and slip ring 3-phase induction Motors, Principle of operation, slip and its significance and connection of submersible motor (mono block), Locking of rotor and stator fields, Rotor resistance, inductance, emf and current, Relationship between copper loss and the motor slip, Power flow diagram of an induction motor, Factors determining the torque, Torque-slip curve, stable and unstable zones, Effect of rotor resistance upon the torque slip relationship.

Unit-V

Fractional Kilo Watt (FKW) Motors: Single phase induction motors; Construction characteristics and applications, Nature of field produced in single phase induction motor, Split phase induction motor, Capacitors start and run motor, Shaded pole motor, Reluctance start motor, Alternating current series motor and universal motors, Single phase synchronous motor, Reluctance motor, Hysteresis motor .

Test Books:-

1. Electrical Machines by SK Bhattacharya, Tata Mc Graw Hill, New Delhi
2. Electrical Machines by SK Sahdev, Unique International Publications, Jalandhar
3. Electrical Machines by Nagrath and Kothari, Tata Mc Graw Hill.

DEE-402 Power System –I

L T P
3 1 0

Unit-I

Power Generation: Main resources of energy, conventional and non-conventional, Different types of power stations, thermal, hydro, gas, diesel and nuclear power stations.

Unit-II

Transmission Systems:

Layout of transmission system, selection of voltage for H.T and L.T lines, advantages of high voltage for Transmission both AC and DC, Comparison of different system, Types of supports, types of insulators, Selection of insulators, conductors, earth wire and their accessories, Transposition and string efficiency of lines, Mechanical features of line: Importance of sag, calculation of sag, effects of wind and ice and related problems, voltage regulation concept of corona.

Unit-III

Distribution System: Layout of HT and LT distribution system, constructional feature of distribution lines and their erection. LT feeders and service mains; Simple problems on AC radial distribution system, determination of size of conductor, Construction of LT and HT power cables advantages/disadvantages ,Calculation of line losses in distribution system.

Unit-IV

Substations:

Brief idea about substations; outdoor grid sub-station 220/132 KV, 66/33 KV outdoor substations, pole mounted substations and indoor substation, Layout of 33/11 KV distribution substation and various auxiliaries and equipment associated with it, Preparation of estimates for 11 KV/0.4 KV substations (pole mounted)

Unit-V

Various Types of Tariffs: Tariffs Block rate, flat rate, maximum demand and two part tariffs, Simple problems.

Power Factor: Concept of power factor, Reasons and disadvantages of low power factor, Methods for improvement of power factor using capacitor banks, VAR Static Compensator (SVC)

Test Books:-

1. Electrical Power System and Analysis by CL Wadhwa, 3rd edition, New Age International Publishers, New Delhi

2. Substation Design and Equipment by Satnam and PV Gupta, Dhanpat Rai & Sons, New Delhi

DEE-403 Electrical Installation & Estimation

L T P

3 1 0

Unit-I

Introduction:

Purpose of estimating and costing, preparation of materials schedule, costing, price list, preparation of tender document, net price list, market survey, overhead charges, labour charges, electrical point method and fixed percentage method, contingency, profit, purchase system, enquiries, comparative statements, orders for supply, payment of bills.

Unit-II

Types of wiring:

IE rules and safety codes, Cleat, batten, casing capping and conduit wiring, comparison of different wiring systems, selection and design of wiring schemes for particular situation Selection of wires and cables, wiring accessories and use of protective devices i.e. MCB, ELCB etc.

Unit-III

Estimating and Costing: Domestic installations; standard practice as per IS and IE rules. Planning of circuits, sub-circuits and position of different accessories, electrical layout, preparing estimates including cost as per schedule rate pattern and actual market rate (for house of two room set along with layout sketch), single storey building, auditorium hospital, cinema hall, computer networking.

Unit-IV & V

Industrial installations: relevant IE rules and IS standard practices, planning, designing and estimation of installation for single phase motors of different ratings, electrical circuit diagram, starters, preparation of list of materials, estimating and costing exercises on workshop with single-phase, 3-phase motor load and the light load.

Text Books:

1. Electrical Installation, Estimating and Costing by JB Gupta, SK Kataria and Sons, New Delhi.
2. Estimating and Costing by SK Bhattacharya, Tata McGraw Hill, and New Delhi.
3. Estimating and Costing by Surjeet Singh, Dhanpat Rai & Co., New Delhi.
4. Estimating and Costing by Qurashi.

DEE-404 Digital Electronics

L T P
3 1 0

Unit-I

Number Systems:

Decimal, binary, octal and hexa-decimal number systems. Binary addition, subtraction and multiplication, 1's and 2's complement methods of addition/subtraction.

Unit-II

Logic Gates: Definition, symbol and truth tables for inverter, OR, AND, NAND, NOR and X-OR gates

Unit-III

Boolean algebra: Boolean Relations, DeMorgan's Law, K-Map up to four variables.

Combinational Circuits: Half adder, Full adder, Encoder, Decoder, Multiplexer/Demultiplexer, Display Devices (LED, LCD and 7-segment display)

Unit-IV

Flip-Flops: J-K Flip-Flop, R-S Flip-Flop, D-Type Flip-Flop, T-Type Flip-Flop.

Unit-V

A/D and D/A Converter: D/A converters (Binary weighted, R-2R D/A Converter), A/D converter (Counter ramp, successive approximation method of A/D Conversion).

Test Books:-

1. Modern Digital Electronics by RP Jain.
2. Digital Principles and Electronics by Malvino & Leach.
3. Digital Electronics by RL Rokheine.
4. Digital Electronics by SN Ali.

DEE-405 Electrical Engineering Material

L T P
3 1 0

Unit-I

Dielectric Materials: Static dielectric constant, Polarization, atomic interpretation of the dielectric constant of mono-atomic and poly atomic gases, internal fields in the solids and liquids, static dielectric constants of solids, ferroelectric materials and spontaneous polarization, piezo- electricity. Frequency dependence of electronics, ionic and orientation polarization, complex dielectric constant and dielectric losses.

Unit-II

Conductivity of Metals: Ohm's Law and relaxation time of electrons, collision time and mean free path. Electron scattering and resistivity of metals. Heat developed in current carrying conductor, thermal conductivity of metals, superconductivity.

Unit-III

Magnetic Materials: Magnetization from microscopic view point, orbital magnetic dipole movement and angular momentum materials, diamagnetism, origin of permanent magnetic dipoles in material. Paramagnetic spin systems.

Unit-IV & V

Properties of ferromagnetic materials: Spontaneous magnetization and the curie-Weils Law. Ferromagnetic Domains and coercive force, anti ferromagnetic and ferromagnetic materials. Magnetic materials for electrical devices, introduction to permanent magnets

Test Books:-

1. Electrical and Electronic Engineering Materials by SK Bhattacharya, Khanna Publishers, New Delhi.
2. Electronic Components and Materials by Grover and Jamwal, Dhanpat Rai and Co., New Delhi.
3. Electrical Engineering Materials by Sahdev, Unique International Publications.

DEE-451: AC Machines Lab

LIST OF PRACTICALS:

1. Demonstration of revolving field set up by a 3-phase wound stator of Synchronous machines.
2. Determination of excitation of Synchronous machines.
3. Determination of the relationship between the voltage and load current of an alternator, keeping excitation and speed constant.
4. Determination of the regulation and efficiency of alternator from the open circuit and short circuit test.
5. Parallel operation of poly phase alternators and load sharing.
6. Determination of the effect of variation of excitation on performance of a synchronous motor.
7. Induction Machines: Determination of efficiency by (a) no load test and blocked rotor test on an induction motor (b) direct loading of an induction motor.
8. Determination of effect of rotor resistance on torque speed curve of an induction motor.

DCS-459: Programming in C Lab

1. To do exercise on data type conversion, use of variable of different types.
2. To write simple program using expression, assignment statements and different types of operators.
3. To write simple programs using controls statements: if, switch, conditional operator, for, while, do-while, break and continue statements.
4. Familiarity with formatted and unformatted console I / O with simple programs.
5. To write program using 1D and 2D arrays, sorting and matrix manipulation.
6. Write programs on function, using function prototype declaration, function definition, with or without arguments, returning value or no value, call by value and call by reference, recursive functions.
7. To write program using pointer (int, float and character type) using malloc and calloc functions, pointer to pointer, pointer to function.
8. To write program using different file function.
9. To write program using different macro definition, file inclusion and conditional compilation.
10. To write program using string function and math function.
11. To write program to find base memory use, to make caps lock on and to control the different keys on the keyboard.

DEE-453: Electrical Workshop Lab

LIST OF PRACTICALS:

1. Study of electrical safety measures as mentioned in the Electricity Rules and shock treatment including first aid.
2. Types of wiring and to make different light control circuits in the following types wiring Casing and capping, (PVC) conduct, baten wiring.
3. Study of ISI standard for MCBs and ELCBs Conduct one test on MCB on above basis.
4. Wiring of main distribution board with four outgoing circuits for light and fan loads including main switch and MCBs Types of wiring and to make different light control circuits in the following types of wiring. (i) Casing and Capping (PVC) wiring (ii) Conduit wiring (surface/concealed)
5. Construction of distribution and extension board with two 5A sockets and two 15A Sockets, a fuse and indicator with series test lamp provision controlled by their respective Switches.
6. Testing of domestic wiring installation using meggar.
7. Fault finding and repair of a tube light circuit.
8. Carry out pipe/ plate earthing for a small house and 3 phase induction motor. Testing the earthing using earth tester.
9. Connection of single phase and three phase motors through an appropriate starter.
10. Winding/ rewinding of a fan (ceiling and table) and choke.
11. Repair of domestic electric appliances such as electric iron, geyser, fan, heat convector, desert cooler, room heater, electric kettle, electric oven, electric furnace and weighing machine.

DEE-454: Digital Electronics Lab

LIST OF PRACTICALS:

1. Verification and interpretation of truth table for AND, OR, NOT, NAND, NOR, X-OR gates.
2. Construction of Half Adder using gates.
3. Construction of Full Adder using gates.
4. Verification of operation of an 8-bit D/A Converter.
5. Verify the truth table of R-S, J-K, D,T, flip flops
6. Writing assembly language programme using numemoanics and test them on microprocessor Kit:
 - (i) Addition of two 8-bit numbers
 - (ii) Subtraction of two 8-bit numbers
 - (iii) Multiplication of two 8-bit numbers
 - (iv) Division of two 8-bit numbers

DEE-501 Power System –II

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3 1 0

Unit-I

Power System Faults:

Types of faults, single line to ground, double line to ground, three phase to ground, open conductors, severity of faults and their effects on system.

Unit-II & III

Load flow solution:

Introduction, bus classifications, nodal admittance matrix (BUS Y), development of load flow equations, load flow solution using Gauss Siedel and Newton-Raphson method, approximation to N-R method, line flow equations and fast decoupled method

Unit-IV & V

Wave equation:

Wave equation for uniform Transmission lines, velocity of propagation, surge impedance, reflection and transmission of traveling waves under different line loadings

Test Books:-

1. Electrical Power System and Analysis by CL Wadhwa, 3rd edition, New Age International Publishers, New Delhi.
2. Electrical Power System by VK Mehta, S Chand & CO., New Delhi
3. Electrical Power System by JB Gupta, Kataria and Sons, New Delhi

DEE-502 Basics of Microprocessor

L T P
3 1 0

Unit-I

Introduction: Evolution of microprocessor, Digital computer, Organization of computer, Definition of Instruction, Program, Machine language, Assembly language, High level language, Compiler and Assembler.

Unit-II & III

Microprocessors Architecture (Intel 8085): Functional block diagram, Pin-Out diagram with description, Buses, Address bus, Data bus, Control bus, Registers, Arithmetic and logic unit, Timing and control unit, Types of instructions and classification into groups, Types of addressing modes, Status flags.

Unit-IV & V

16-bit Microprocessors: Architecture: Architecture of INTEL 8086 (Bus Interface Unit, Execution unit), register organization, memory addressing, memory segmentation, Operating Modes, Instruction Set of 8086 Addressing Modes.

Test Books:-

1. Gaonkar, Ramesh S, "Microprocessor Architecture, programming and applications with the 8085" Pen ram International Publishing 5th Ed.
2. Ray, A.K. & Burchandi, K.M., "Advanced Microprocessors and Peripherals: Architecture, Programming and Interfacing" Tata Mc. Graw Hill.

DEE-503 Control System

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Unit-1

Systems & Representation: Basic elements in control systems, Open and closed loop systems, Electrical analogy of mechanical and thermal systems, Transfer function, Synchros , AC and DC servomotors, Block diagram reduction techniques , Signal flow graphs.

Unit-2

Time Response: Time response, Time domain specifications, Types of test input, I and II order system response, Error coefficients, Generalized error series, Steady state error, P, PI, PID modes of feedback control

Unit-3

Frequency Response: Bode plot, Polar plot, Determination of closed loop response from open loop response.

Unit-4 & 5

Stability of Control System: Characteristics equation, Location of roots in S plane for stability, Routh Hurwitz criterion, Effect of pole-zero addition, Gain margin and phase margin.

Text Books:

- 1) I.J. Nagrath and M. Gopal, "Control Systems Engineering", New Age International Publishers, 2003.
- 2) Benjamin C. Kuo," Automatic Control systems, Pearson Education", New Delhi, 2003.

DEE-504 Power Electronics

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Unit-I & II

Introduction to SCR:

Construction and working principles of an SCR, two transistor analogy circuit and characteristics of SCR, SCR specifications and rating, Construction, working principles and V-I characteristics of DIAC and TRIAC, Methods of triggering a Thyristor. Study of triggering circuits, UJT, its Construction, working principles and VI characteristics, UJT laxation oscillator, Commutation of Thyristors, Series and paralalled operation of Thyristor.

Unit-III & IV

Controlled Rectifiers:

Three phase full wave fully controlled bridge rectifier Single phase half wave controlled rectifier with resistive load and inductive load, Single phase half controlled full wave rectifier, Fully controlled full wave rectifier bridge, Single phase full wave centre lap rectifier, Three phase full wave half controlled bridge rectifier

Unit-V

Inverters, choppers, dual convertors and cyclo convertors:

Inverter-introduction, working principles, voltage and current driven in series and parallel invertors and applications, Choppers introduction, types of choppers and their working principles and applications, Dual Convertors-introduction, types of cyclo-convertors, working principles and applications, Cyclo-convertors-introduction, types, working principles and applications

Text Books:

1. Power Electronics, Circuits Devices and Applications by Mohammad H. Rashid
2. Power Electronics by PC Sen
3. Power Electronics by Dr. PS Bhimbra, Khanna Publishers, New Delhi

DEE-505 Modern electric traction system

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Unit-I

Introduction:

Electric Traction System, Advantages over other system, Types of electric traction systems, Choice of traction system in India.

Unit-II

System of Tract Electrification:

Single phase low frequency D.C. System, Three phase low frequency system, Composite System, Disadvantages of Single phase to D.C. System, Comparison between pure A.C. and D.C system.

Unit-III

Track Mechanics:

Types of services (Urban, Suburban and Mainline), Speed time curve, Tractive effort & traction effort speed characteristics, Power of traction motor, Specific energy consumption, Mechanics of train movement.

Unit-IV

Power Supply arrangement:

Constituents of Power supply system i.e. substation, Sectioning and paralleling post. Subsection and post, Sub-sectioning post and elementary sections, Major control posts or switching substations.

Unit-V

Traction Motors and Traction Motor Control:

Desirable characteristic of traction motors. Comparative study of characteristic of Induction motor. Linear induction motor and their suitability for traction applications. Series parallel control of traction motors. Advantages of series parallel control.

Text Books:

1. Art and Science of utilization of electrical energy by H. Partab, Dhanpat Rai and Sons, Delhi.
2. Modern Electric Traction by Partab, Dhanpat Rai and Sons, Delhi.

DEE-551: Control system lab

LIST OF PRACTICALS:

- 1.** To determine response of first order and second order systems for step input for various values of constant 'K' using linear simulator unit and compare theoretical and practical results.
- 2.** To study P, PI and PID temperature controller for an oven and compare their performance.
- 3.** To study and calibrate temperature using resistance temperature detector (RTD)
- 4.** To design Lag, Lead and Lag-Lead compensators using Bode plot.
- 5.** To study DC position control system
- 6.** To study synchro-transmitter and receiver and obtain output V/S input characteristics
- 7.** To determine speed-torque characteristics of an ac servomotor.
- 8.** To study performance of servo voltage stabilizer at various loads using load bank.
- 9.** To study behavior of separately excited dc motor in open loop and closed loop conditions at various loads.
- 10.** To study PID Controller for simulation proves like transportation lag.

DEE-552: Power Electronics Lab

LIST OF PRACTICALS:

1. To draw firing characteristics of an SCR.
2. To draw firing characteristics of a TRIAC.
3. To draw firing characteristics of a DIAC.
4. To draw uni-junction transistor characteristics.
5. Observe the output wave of an UJT relaxation oscillator.
6. Observe the wave shape across SCR and load of an illumination control circuit.
7. Fan speed regulator using TRIAC (fabrication of this circuit)
8. Speed-control of a universal motor.
9. Single phase 1 half controlled full wave rectifier.
10. Single phase controlled rectifier.
11. Three phase controlled rectifier.
12. Single phase inverter circuit (fabrication of this circuit)

DEE-601 Utilization of electrical energy and Drive

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Unit-I

Electric Drives: Advantages of electric drives, Characteristics of different mechanical loads, Types of motors used in electric drive, Electric braking, Plugging, Rheostat braking, Regenerative braking, Methods of power transfer by direct coupling by using devices like belt drive, gears, pulley drives etc.

Unit- II & III

Illumination: Definition: Luminous flux, solid angle, luminous intensity, illumination, luminous efficiency, depreciation factor, coefficient of utilization, space to height ratio, reflection factor, glare, shadow, lux. Laws of illumination–simple numerical, Different type of lamps, construction and working of incandescent and discharge lamps – their characteristics, fittings required for filament lamp, mercury vapor lamp, fluorescent lamp, metal halide lamp, neon lamp.

Unit-IV & V

Electric Heating:

Advantages of electrical heating, heating methods: Resistance heating – direct and indirect resistance heating, domestic water heaters and other heating appliances and thermostat control circuit, Induction heating; principle of core type and coreless induction furnace, Electric arc heating; direct and indirect arc heating, construction, working and applications of arc furnace, Dielectric heating, applications in various industrial fields, Infra-red heating and its applications.

Text Books:

1. Art and Science of Utilization of Electrical Energy by H Partap, Dhanpat Rai & Sons, Delhi.
2. Utilization of Electrical Energy by JB Gupta, Kataria Publications, Ludhiana.
3. A.Text Book. of Electrical Power by Dr. SL Uppal, Khanna Publications, Delhi.

DEE-603: Power system protectionL T P
3 1 0**Unit-I & II**

Switch gears: Purpose of protective gear. Difference between switch, isolator and circuit breakers. Function of isolator and circuit breaker. Making and breaking capacity of circuit breaker (only definition), Principles of Arc extinction by OCB and ACB, Constructional features of OCB, ACB, and their working, Circuit breakers. Types of circuit breakers, bulk and minimum oil circuit breakers, air blast circuit breakers, SF6 circuit breakers, Miniature circuit breakers ACB, ELCB, MCB, for distribution and transmission system.

Unit-III**Protection Devices:**

Fuses; function of fuse. Types of fuses, HV and LV fuses, rewire-able, cartridge, HRC, Earthing, purpose of earthing: Equipment earthing, Substation earthing, system earthing as per Indian Electricity rules. Relays: (a) Introduction, types of relays. Electromagnetic and thermal relays, their construction and working (b) Induction type over-current, earth fault relays, instantaneous over current relay(c) Directional over-current, differential relays, and their functions

Unit-IV**Protection Scheme:**

Relays for generator protection, Relays for transformer, protection including Buchholtz relay protection, Protection of feeders and bus bars. Over current and earth fault protection, distance protection.

Unit-V

Over-voltage Protection: Protection of system against over voltage; causes of over voltage, function of ground wire, Lightning arrestors, Rod gap, horn gap, metal oxide type. Line protection.

Text Books:

1. Testing, Commissioning , Operation and Maintenance of Electrical Equipment by S Rao, Khanna Technical Publication, New Delhi
2. Electrical Power Systems by CL Wadhwa, Wiley Eastern Ltd., New Delhi
3. Textbook of Electrical Technology by BL Theraja, S Chand and Co., New Delhi
4. Electrical Power by Dr. SL Uppal, Khanna Publications, Delhi
5. A Course in Electrical Power by ML Soni, PV Gupta and Bhatnagar, Dhanpat Rai.

DEE-604: Power Station Practice

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Unit-I

Thermal Power Plant: Site selection, general layout and operation of plant, detailed description and use of different parts.

Hydro Electric Plants: Classifications, location and site selection, detailed description of various components, general layout and operation of Plants.

Unit-II

Nuclear Power Plant: Location, site selection, general layout and operation of plant. Brief description of different types of reactors Moderator material, fissile materials, control of nuclear reactors, disposal of nuclear waste material, shielding.

Unit-III

Gas Turbine Plant: Operational principle of gas turbine plant & its efficiency, fuels, open and closed-cycle plants, regeneration, inter-cooling and reheating, role and applications.

Diesel Plants: Diesel plant layout, components & their functions, its performance, role and applications.

Non Conventional Energy Sources: Power Crisis, future energy demand, role of Private sectors in energy management.

Unit-IV

MHD generation: Working principle, open and closed cycles, MHD systems, advantages, parameters governing power output.

Solar power plant: Conversion of solar heat to electricity, solar energy collectors, Photovoltaic cell, power generation, future prospects of solar energy use.

Unit-V

Wind Energy: Windmills, power output with combined operation of wind turbine generation and isolated generating system, technical choices & economic size.

Geothermal Energy: Earth energy, heat extraction, vapor turbine cycle, difficulties & disadvantages.

Text Books:

1. B.R. Gupta, "Generation of Electrical Energy", S. Chand Publication.
2. Soni, Gupta & Bhatnagar, "A text book on Power System Engg.", Dhanpat Rai & Co.
3. P.S.R. Murthy, "Operation and control of Power System" BS Publications, Hyderabad.

DEE-651: Power system lab

LIST OF PRACTICALS:

1. To determine direct axis reactance (X_d) and quadrature axis reactance (X_q) of a salient pole alternator.
2. To determine negative and zero sequence reactances of an alternator.
3. To determine sub transient direct axis reactance (x_d) and sub transient quadrature axis reactance (x_q) of an alternator.
4. To determine fault current for L-G, L-L, L-L-G and L-L-L faults at the terminals of an alternator at very low excitation
5. To study the IDMT over current relay and determine the time current characteristics
6. To study percentage differential relay
7. To study Impedance, MHO and Reactance type distance relays
8. To determine location of fault in a cable using cable fault locator
9. To study Ferranti effect and voltage distribution in H.V. long transmission line using transmission line model.
11. To study operation of oil testing set.

DEE-652: Major Project

Students should devote themselves to expedite progress of the project as soon as 6th semester starts. They are supposed to finish project work latest by middle of April and submit project report by the end of the April month. The assessment of performance of students should be made at least twice in the semester. The students should present project using overheads project or power point presentation using in the end semester project examination.

ENVIRONMENT AND ECOLOGY (DAS604)

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Unit-1

Introduction to Environmental Science - Definition and scope and need for public awareness
Ecosystems, Concept, structure and functions, restoration of damaged ecosystems
Biodiversity – Definition, description at national and global level, threats and conservation

Unit-2

Natural Resources - Renewable and non-renewable and their equitable use for sustainability,
Material cycles – carbon, nitrogen and sulphur cycle. Conventional and Non-conventional
Energy Sources – fossil fuel-based, hydroelectric, wind, -nuclear and solar energy, biomass,
biodiesel, hydrogen as an alternative fuel.

Unit-3

Transportation and industrial growth Social Issues Related to Environment–Sustainable
development, resettlement and rehabilitation Environmental ethics.

Unit-4

Environmental Changes and Human Health Environmental Pollution–Definition, causes and
effects, control measures for water, air, soil, noise, thermal pollution.

Textbook:

1. Environmental Studies, J Krishna wamy , R J Ranjit Daniels, Wiley India.

Reference Books:

2. Environmental Science, Bernard J. Nebel, Richard T. Right, 9780132854467, Prentice Hall Professional 1993.
3. Environment and Ecology, R K Khandal, 978-81-265-4277-2, Wiley India.

DEE-654: Instrumentation Lab

Note: Minimum Eight experiments should be performed from the following

1. Measurement of displacement using LVDT.
2. Measurement of displacement using strain gauge based displacement transducer.
3. Measurement of displacement using magnetic pickup.
4. Measurement of load using strain gauge based load cell.
5. Measurement of water level using strain gauge based water level transducer
6. Measurement of flow rate by anemometer
7. Measurement of temperature by RTD.
8. Measurement of temperature by thermocouple
9. Study of P,PI and PID controllers
10. Study of storage oscilloscope and determination of transient response of RLC circuit.
11. Determination of characteristics of a solid state sensor/fibre-optic sensor
12. Design and test a signal conditioning circuit for any transducer