Faculty of Engineering & Technology
P.K.University
Shivpuri (MP)

Syllabus and
Evaluation Scheme

DIPLOMA
Electrical & Electronics Engineering

4TH SEMESTER

(Effective from Session: 2025-26)

DIPLOMA ELECTRICAL & ELECTRONICS ENGINEERING

Study And Evaluation Scheme For Diploma Electrical & Electronics Engineering

YEAR -2ND /SEMESTER -4TH

SUBJECT CODE	SUBJECTSNAME	STUDY SCHEME Periods/Week			Credits	MARKS IN EVALUATION SCHEME						Total Marks of Internal & External
						INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT			
		L	T	P		Th	Pr	Tot	Th	Pr	Tot	Int +Ext
DNETWEX401	Networking & Programming in C & C++	3	0	0	3	30	-	30	70	-	70	100
DPOWEEX402	Power Electronics	3	0	0	3	30	-	30	70	-	70	100
DCOMMEX403	Communication Engineering	3	0	0	3	30	-	30	70	-	70	100
DGENEEX404	Generation, Transmission & Distribution of Elect. power	4	0	0	4	30	-	30	70	-	70	100
DELECEX405	Electric Machine-II	3	0	0	3	30	-	30	70	-	70	100
DNETWEX405	Networking & Programming in C & C++ Lab	0	0	2	1	-	25	25	-	25	25	50
DPOWEEX406	Power Electronics Lab	0	0	2	1	-	25	25	-	25	25	50
DCOMMEX407	Communication Engineering Lab	0	0	2	1	-	25	25	-	25	25	50
DELECEX405	Electric Machine-II Lab	0	0	2	1	-	25	25	-	25	25	50
Total		20	0	8	20	150	100	250	350	100	450	700

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L	T	P
3	0	0

II Year IV Semester

DNETWEX401: NETWORKING & PROGRAMMING IN C & C++

1 **CONCEPT OF PROGRAMMING:**

Concept of Flow charring, algorithm, programming, Structured Programming Various Techniques of programming, Use of programming.

1. PROGRAMMING IN C:

Data Types, Operators and Expressions; Input & Output print f, scanf, clibrary Control Statement: IF- ELSE, While, For, Do- While, Switch; Functions and modular programming; Scope of variables, parameter passing, recursion, block structure; preprocessor statements; pointers and arrays; structures and unions; File handling.

2. NETWORKING:

What is network, need of network, terminology of network, network topologies, types of network, transmission media, network devices, network security?

3. OPEN SOURCE CONCEPT:

Open source based software, free software, types of standard, common open standard format.

4. IT APPLICATION:

Front and interface, backend database, front end and backend database connectivity, impact of ICT on society.

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II Year IV Semester
DPOWEEX402: POWER ELECTRONICS

1. INTRODUCTION:

(I) Role of power electronics in the field of electric power control.

(II) Salient features of power semiconductor devices and relative comparison from application point of view.

(III) Characteristics and symbols of power semiconductor devices.

(IV) Types of power electronic circuits.

2. POWER SEMI CONDUCTOR DIODES:

(I) Characteristics and applications of general purpose diode, fast recovery diode and schottky diode.

(II) Series and Parallel operation of power diodes.

(III) (III)Performance parameters.

3. THYRISTORS:

(I) Construction, characteristics and application of SCR, Gate, Turn off thyristor (GTO thyristor), and Light activated SCR and reverse conducting SCR, Performance parameters.

(II) Methods of triggering a SCR, Gate characteristics. General layout of gate triggering circuits, R-C firing circuit, characteristics of UJT and its application in the triggering of SCR, Triggering of GTO thyristor.

(III) Commutation of SCR, methods of commuting a SCR, converter grade and Inverter grade SCRs.

(IV) Series and Parallel operation of SCR.

(V) Protection of SCR and GTO thyristor.

(VI) Construction, Characteristics and applications of Diac andTriac.

4. POWER TRANSISTORS:

(I) Characteristics and application of Bipolar Junction, Transistor, Power MOSFET, Performance Parameter.

(II) Base drive requirements, typical base drive circuits.

(III) Service and parallel operation of power transistor.

(IV) Protection of power transistor.

5. CONTROLLED RECTIFIERS:

(I) Phase controlled rectifier operation on resistive and resistive inductive loads. Use of freewheeling diode.

(II) Single phase and three phases controlled and fully controlled bridge rectifiers, Dual converters, Effect of load and source inductance. Performance comparison. Capacitor aided commutation.

(III) Single phase and three phase line commutated bridge invertors.

(IV) Simple numerical problems on controlled rectifiers.

6. A. C. VOLTAGE CONTROLLERS:

(I) Principle of integral cycle control and phase control.

(II) Single phase and Three phase A. C. voltage controllers. Various configurations.

(III) Single Phase transformer Tap Changer.

(IV) Single phase and Three phase Cyclo-Converter.

7. CHOPPERS:

(I) Principle of operation and control techniques of chopper, current and voltage waveforms for resistive inductive static and motor loads, effects of chopper frequency and load inductance.

(II) Voltage commutated and current cumulated thyrist or chopper circuits. Power transistor chopper circuits, Use of input and output D. C.filters.

(III) Step up chopper and its applications.

8. INVERTERS:

(I) Single phase series and parallel inverters. Output voltage and current waveforms.

(II) Principle of operation of bridge inverter concept of voltage source. Current source and Pulse width modulated bridge inverter. Performance parameters.

(III) Single phase and Three phase voltage source (auxiliary and complementary commutated only) and current source bridge inverters, methods of voltage control, various techniques of pulse width modulation, comparison of voltage source and current source inverters application.

(IV) High frequency inverters and their application.

9. POWER SUPPLIES:

(I) D. C. and A. C. power supplies, Switched mode power supplies, Resonant power supply and Bi-directional power supply.

(II) Switching mode regulators, Principle of switching mode regulator; Bulk, Boost, Bulk-Boost regulators.

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II Year IV Semester

DCOMMEX403: COMMUNICATION ENGINEERING

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1. INTRODUCTION

1.1 Brief idea of various types of communication system.

1.2 Need of modulation and demodulation in communication system.

1.3 Types of modulation-Brief description and typical application of AM, FM, phase modulation and pulse modulation (PAM, PPM and PCM).

1. AMPLITUDEMODULATION

1.1 Derivation of expression for an amplitude modulated wave. Carrier and side bands, modulation index and depth of modulation.
1.2 Relative power distribution in carrier and sidebands.
1.3 Elementary idea of DSB, DSB-SC, SSB, SSB-SC modulation and their comparison.

2. FREQUENCYMODULATION

2.1 Derivation of an expression for frequency modulated wave and its frequency spectrum (without analysis of Bassel= function) Modulation index, Maximum frequency deviation and deviation ratio.
2.2 Advantages and disadvantages of FM over AM in communication systems based on consideration of band width requirement and noise.

3. PHASEMODULATION

Expression of phase modulated wave and its comparison with frequency modulation. (Brief introduction only)

4. PRINCIPLE OF AMMODULATORS

4.1 Working principles and typical application of
- Collector Modulator.
- Base Modulator.
- Balanced Modulator.

4.2 Single-Side-Band (SSB) generation and its typical applications.

5. PRINCIPLE OF FMMODULATORS

5.1 Working principle and applications of reactance tube modulator, varactor diode modulator and Armstrong phase modulator.
5.2 Limiter, pre-emphasis and de-emphasis in FM communication system.

6. DEMODULATION OF AMWAVES

6.1 Principle of demodulation of AM wave using diode detector circuit; concept of diagonal clipping and formula for RC time constant for minimum distortion (No derivation).

6.2 Comparison of typical diode detector circuits in a Radio and TV receiver.

7. DEMODULATION OF FMWAVES

7.1 Basic principles of detection of FM waves.

7.2 Foster-seely discriminator and its working principles.

7.3 Working of Ratio-detector circuit and its advantage over Foster-seely discriminator circuits.

7.4 Basic principle of Quartered election.

8. TRANSMITTERS

8.1 Block diagram of an AM transmitters and working of each stage. Low level and High level modulation.

8.2 Block diagram and working principle of reactance tube and Armstrong FM transmitters.

9. RADIORECEIVER

9.1 Brief description of crystal and TRF radio receivers; Need for and principles of super heterodyne radio receiver.

9.2 Block diagram of super-heterodyne AM receiver, function of each block and typical waveforms at the input and output of each block.

9.3 Block diagram of an FM receiver, function of each block and wave/forms at input and output at different blocks

10. ANTENNA AND PROPAGATION

10.1 Physical concept of radiation of electromagnetic energy from an antenna, relationship between the direction of electric and magnetic fields with direction of propagation; concept of polarization of EM waves.

10.2 Electromagnetic spectrum and its various range VLF,LF,HF, VHF, UHF, Micro wave, Optical waves etc.

10.3 Definition and physical concepts of the terms used with antennas like point source, gain, power gain, directivity aperture, effective area, radiation pattern,(field strength, power and phase) beam angle, beam width and radiation resistance.

10.4 Types of antennas-Brief description, characteristics and typical applications of medium wave antenna, shortwave antenna, HF antenna, VHF, UHF and Microwave antennae's., half wave dipole, ground plane, yagi and ferrit rod antenna in transistor receiver. Brief idea about Rhombic antenna, dish antenna, Horn, Parabolic reflector and Lens antenna.

10.5 Antenna arrays-Brief description of broad side and end fire arrays, their radiation pattern and application (without analysis);

10.6 Basic idea about different modes of radio wave propagation- ground wave propagation, space wave propagation and sky wave propagation, their characteristics and typical areas of application. (e.g. medium wave, shortwave, TV communication.)

10.7 Explanation of the terms-critical frequency, maximum usable frequency (MUF) and skipdistance.

List of Books

1. Simon Haykin- Communication System- John Wiley &Sons.
2. Kennedy & Davis-Electronic Communication System-Tata Mcgraw Hill.
3. Sombir Singh - Principle of Communication Engineering- Jai Prakesh Publication, Meerut

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DGENEEX404:

GENERATION, TRANSMISSION & DISTRIBUTION OF ELECTRICAL POWER

1. POWER PLANTS:

(A) Thermal Power Plant:

Plant layout and working of various elements, fuel handling combustion, combustion equipment, Steam generation and its temperature and pressure, environmental pollution due to dust and ash, methods of dust collection, cooling of turbo-alternators.

(B) Hydro-Electric Power Plant:

Plant layout and working of various elements, Hydrology and hydrograph, flow duration curves, Types of hydrograph plants and their use, Water turbines, Automatic and remote control of power plants, Head water control and Penstocks, Pumped storage plant.

(C) Nuclear Power Plant:

Plant layout and working of various elements. Fuels, Classification of nuclear power stations. Types of nuclear reactor, Coolants.

(D) Other Plants:

Plant layout and working of various elements of gas turbine plant, Open and closed cycle plants, Fuel and Fuel systems.

2. UNCONVENTIONAL POWER GENERATION:

Types of non-conventional energy resources, Solar cell and Solar power generation, Wind power generation, Role of unconventional power generation on rural socio-economic growth.

3. POWER PLANT ECONOMICS:

Load estimation, Load curves, Load and diversity factors, Demand factor, Plant capacity and utilization factors. Cost of generation and influence of load and diversity factors, Tariff and various methods of calculation, Bill preparation. Causes and effect of low power factor methods for improving power factor.

4. CONSTRUCTION FEATURES OFTRANSMISSION AND DISTRIBUTION LINES:

Constructional features of transmission and distribution lines. Types of supports, Types of conductors, Types of insulators. Erection of transmission towers and distribution poles. Fixing of insulators a on conductors, testing, operation and maintenance of distribution lines. Testing of insulators, Voltage distribution of string insulators, Vibration dampers. Basic idea of Sag calculation.

5. TRANSMISSION SYSTEM:

Short, medium and long transmission lines. Parameters of lines. Performance of short lines (Regulation, Efficiency, Vactor diagram).Corona formation and its effects on performance of lines. Advantage of EHV transmission. Concept of HVDC transmission and its salient feature. Kelvin's law its limitations and utility.

Concepts of Grid and advantages.

6. DISTRIBUTION SYSTEM:

Feeders, distributors and service mains, radial and ring main distributors, A. C. distributors fed from one end and both ends (Simple problems on feeders and distributors).

7. UNDERGROUND CABLES:

H. T. and L. T. power cables construction, Cable joining, Laying of cables, Fault location, Murray loop test, Testing of cables, Comparison of underground cable with overhead line.

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DELECEX405:ELECTRICAL MACHINES-II

COURSE CONTENTS

Unit I: Three Phase Induction Motor (10 Periods)

Working principle: production of rotating magnetic field, Synchronous speed, rotor speed and slip. Locking of rotor and stator fields. Constructional details of 3 phase induction motors: Squirrel cage induction motor and Slip ring induction motor. Rotor quantities: frequency, induced emf, power factor at starting and running condition. Characteristics of torque versus slip (speed), Torques: starting, full load and maximum with relations among them. Relationship between rotor copper losses, slip and rotor input power (Power flow diagram) Starters: need and types; stator resistance, auto transformer, star delta, rotor resistance and soft starters. Speed control methods: stator voltage, pole changing, rotor resistance and VVVF. Motor selection for different applications as per the load torque-speed requirements. Cogging and Crawling.

Unit II: Single phase induction motors (08 Periods)

Double field revolving theory, principle of making these motors self-start. Construction, working and Torque-speed characteristics: Resistance start induction run, capacitor start induction run, capacitor start capacitor run, shaded pole, repulsion type, series motor, universal motor, hysteresis motor. Motor selection for different applications as per the load torque-speed requirements.

Unit III: Three phase Alternators (10 Periods)

Principle of working, moving and stationary armatures. Constructional details: parts and their functions, Windings: Single and Double layer. Equivalent circuit diagram, E.M.F. equation of an Alternator with numerical by considering short pitch factor and distribution factor. Necessary conditions of parallel operation of alternators. Armature reaction at various power factors and synchronous impedance. Voltage regulation: direct loading and synchronous impedance methods. Operation of synchronous machine as a motor.

Unit IV: Synchronous Motors (08 Periods)

Principle of working , Torques: starting torque, running torque, pull in torque, pull out torque. Synchronous motor on load with constant excitation (numerical), effect of excitation at constant load (numerical). Concept of synchronous condenser V-Curves and Inverted V-Curves. Hunting and Phase swinging. Methods of Starting of Synchronous Motor. Losses in synchronous motors and efficiency (no numerical). Applications areas

Unit V: Special Electric Machines (06 Periods)

Construction, working and applications: Linear Induction Motor, Synchronous Reluctance Motor, Switched Reluctance Motor, Permanent Magnet Synchronous Motors, stepper motors, AC and DC servomotors, Submersible motor..

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DNETWEX406: NETWORK AND PROGRAMMING IN C & C ++ LAB

List of Experiments

1. Exercises involving output and input format controls in Pascal.
2. Exercises involving control transfer statements in C
3. Exercises with arrays & Pointers in C.
4. Exercises with functions in C.
5. Exercises with files in C.
6. Making of straight and gross wire UTPcable
7. Study of modem, switch, hub.
8. Creation of LAN.

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DPOWEEX407: POWER ELECTRONICS LAB

LIST OF PRACTICALS

1. V-I characteristics of SCR.
2. Study of R-C firing circuit of SCR.
3. Study of UJT firing circuit of SCR.
4. Study of Power Transistor as as witch.
5. Study of SCR as witch.
6. Power control using Diac andTriac.
7. Fabrication and testing of Half Controlled Bridge Rectifier circuit.
8. Fabrication and testing of SCR Chopper Circuit.
9. Fabrication and Testing of Single Phase Series inverter circuit.

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DCOMMEX408:COMMUNICATION ENGINEERING LAB

List of Experiments

1. To observe an AM wave on CRO and calculate the modulation index.
2. To observe the output of reactance tube modulator.
3. To observe the output of balanced modulator.
4. Identification of different block and tracing of wave shapes at different block of a super heterodyne radio receiver.
5. Tracing of circuit and fault finding in different stages of AM radio receiver.
6. Tracing of circuit and output of a AM detector circuit.
7. To plot the selectivity characteristics of a radio receiver.
8. To plot the sensitivity characteristics of a radio receiver
9. Tuning and alignment of radio receiver.
10. To study the different types of antennas.

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DELECEX409: ELECTRICAL MACHINES-II LAB

LIST OF PRACTICALS (To perform any Ten practicals)

1. Identify the different parts (along with function and materials) for the given single phase and three phase induction motor.

2. Connect and run the three-phase squirrel cage induction motors (in both directions) using the DOL, stardelta, auto-transformer starters (any two).

3. Perform the direct load test on the three-phase squirrel cage induction motor and plot the

(a) efficiency versus output, (b) power factor versus output,

(c) power factor versus motor current and (d) torque – slip/speed characteristics.

4. Conduct the No-load and Blocked-rotor tests on given 3-phase squirrel cage induction motor and determine the equivalent circuit parameters .

5. Control the speed of the given three phase squirrel cage/slip ring induction motor using the applicable methods: (a) auto-transformer, (b) VVVF.

6. Measure the open circuit voltage ratio of the three-phase slip ring induction motor.

7. Conduct the direct load test to determine the efficiency and speed regulation for different loads on the given single phase induction motor; plot the efficiency and speed regulation curves with respect to the output power.

8. Demonstrate that power factor of an induction motor load is improved by connecting capacitor bank.

9. Perform the direct loading test on the given three phase alternator and determine the regulation and efficiency.

10. Determine the regulation and efficiency of the given three phase alternator from OC and SC tests (Synchronous impedance method)

11. Conduct the test on load or no load to plot the 'V' curves and inverted 'V' curves (at no-load) of 3-phase synchronous motor.

12. Synchronization of 3 Phase Alternators by - a) Lamp method. b) Synchroscope method

13. Control the speed and reverse the direction of stepper motor

14. Control the speed and reverse the direction of the AC servo motor

15. Control the speed and reverse the direction of the DC servo motor