

**UNIVERSITY POLYTECHNIC
B.I.T., MESRA, RANCHI**

Syllabus of Diploma in Engineering (Electrical & Electronics)

(Semester V)

**COURSE STRUCTURE
(W.E.F. 2011 Batch Students)**

(Total Unit 7.0)

Course Code	Theory	Unit	Course Code	Sessional	Unit
DEE 5001	Power Electronics	1.0	DEE 5002	Power Electronics Lab.	0.5
DEC 5003	Microprocessor & Its Applications	1.0	DEC 5004	Microprocessor Lab.	0.5
DEE 5003	Power System II	1.0	DEE 5004	Power System Lab.	1.0
DEE 5005	Utilization of Electrical Energy	1.0	DEE 5012	Project	1.0
		4.0			3.0

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SUBJECT : POWER ELECTRONICS

Course Code : DEE 5001

Module – 1

Semiconductor Devices

Construction and principle of operation, V-I characteristics, Dynamic turn on and turn off characteristics, Gate characteristics, Protection, Series & parallel operation, power diodes, Power transistor, IGBT, UJT.

(6)

Module – 2

Converter

Principle of operation, Single phase half controlled converter, Single phase fully controlled converter with R, R-L and motor load, 3-phase converter, Dual converter.

(6)

Module – 3

Chopper

Operation, step-up & step down chopper, output voltage control.

Inverter

Principle of operation, half and full bridge inverter, 3-phase inverter, inverter with R-L load, output voltage control, harmonic control.

(6)

Module – 4

Cyclo Converter

Principle, single phase cyclo-converter, 3-phase cyclo-converter, output frequency and voltage control.

AC to AC Voltage Converter

Principle of AC to AC voltage converter, behaviour with R & R-L load, firing circuit of AC to AC converter.

(6)

Module – 5

DC Drives

Single phase half wave drive, semi converter, full converter drive, operation of DC series motor on single phase converter, operation of DC motor from two quadrant converter, Three phase semi converter and full converter DC drives, chopper drives.

(6)

Module – 6

AC Drives

Induction motor drives : starting & speed control

Synchronous motor drives : starting & speed control

(5)

Module – 7

Applications

UPS, SMPS, HVDC Transmission

(5)

Books Recommended :

1. Power Electronics – M.H. Rashid
2. Fundamentals of Electrical Drives – G.K. Dubey
3. Fundamentals of power Electronics and Drives – A. Chakraborty

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SUBJECT : MICROPROCESSOR & ITS APPLICATIONS

Course Code : DEC 5003

Module – 1

Introduction, Organisation and Block-Diagram of a Simple Micro-Computer, Word-length of a Computer/Microprocessors, Microcontrollers, Embedded Microprocessors, Hardware, Software, Firmware, CPU/Microprocessor – Schematic Diagram, Memory, Buses, Input device, Output device, Microprocessor Applications. (8)

Module – 2

Introduction to 8085 – Microprocessor : Architecture, Pin-description, System Bus – Address Bus, Data Bus, Control Bus, Instruction Cycle, Timing-diagram. (6)

Module – 3

Instruction sets of Intel - 8085 : Addressing Modes, Groups of Instructions. Simple Programming on Addition, Subtraction, Multiplication, Counting, Looping, BCD to BINARY conversion, BINARY to BCD conversion, sorting etc. (6)

Module – 4

Peripheral Devices and their Interfacing : Address space partitioning – Memory mapped I/O Scheme, I/O mapped I/O scheme, Memory and I/O interfacing, Data-transfer schemes, Interrupts of Intel 8085, Brief Introduction to 8255, 8253. Interfacing of these chips with Microprocessor. (6)

Module – 5

Introduction to 8259 interfacing chip. Brief introduction of 8086. (4)

Module – 6

Microprocessor Based Data Acquisition system : Analog to Digital converter, Digital to Analog converter. D/A-A/D accuracy & Resolution, Interfacing DAC & ADC with microprocessor. (5)

Module – 7

Microprocessor Applications : Industrial Examples of Temperature Control and Pressure monitoring. (5)

Books Recommended :

1. Fundamentals of Microprocessors & Microcontrollers – By – B. Ram

Reference :

1. Digital Computer Electronics – By – Malvino, Brown.
2. Microprocessor Architecture, Programming & Applications – By – R.S.Gaonkar.

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SUBJECT : POWER SYSTEMS II

Course Code : DEE 5003

Module – 1

Switchgear

Introduction to Switchgear, Circuit Breaker : Classification (Principle of Operation, Properties and Voltage Rating). Features, Time and Auto Reclosure, Maintenance. Arc Formation, Methods of Arc Extinction, Insulation requirements, Causes of Failure of Insulation. (5)

Module – 2

C.B. Rating & Principles of Fault Clearing

Circuit Breaker rating, Breaking Capacity, Making Capacity, Short Time Current ratings, Rated Interrupting time, Recovery Voltage, Restriking Voltage, Rate of rise of Restriking Voltage. Current Chopping Isolator, Earthing switch and Electrical Connections, Distinction between Circuit Breaker and Isolator, Earthing Switch, Load Interrupting Switches, Symbol of Circuit Breaker Equipments and their purpose. HRC Fuses & their applications. (7)

Module – 3

Introduction to Faults & Per Unit System

Representation of Power System, Per Unit Method, Advantages of Per Unit System, Types of Fault, Procedure of Fault calculation, Types of Reactors, Construction of Reactors, Their Uses, Advantages & Disadvantages, Methods of Locating Reactors, Series Reactors, Principles of Current Limiting Reactors. (7)

Module – 4

Symmetrical Faults

Percentage Reactance and Short Circuit Currents, Fault MVA & Fault Currents, Problems. (4)

Module – 5

Unsymmetrical Faults on an Unloaded Generator

Symmetrical Components of 3-phase system, Sequence Impedances, Sequence network of Alternators, Voltage Equations, Single Line to Ground Fault on an Unloaded Generator, Three Phase to Ground Fault. (5)

Module – 6

Introduction to Protective Relaying

Introduction, Importance and Functions of Protective Relaying, Primary & Back-up Protection, Selectivity, Discrimination, Relay Time, Fault Cleaning Time, Sensitivity of Relay, Stability, Reliability, Trip Circuit (Definitions) (6)

Module – 7

Relay & Protection

Introduction & Classification of Relay, Induction Relay, Directional Relay, Protection of Alternators, Transformers, Bus Bar, Feeder & Transmission Line, Merz Price Protection, Buchholz Relay (or Gas Actuated Relay), Differential Protection, Distance (or impedance) Protection, Over Current Protection Basic Idea of Static Relay & Semi-Conductor Relays & Fuses. Introductory Concepts of Microprocessor based Numerical Relays and their application. (6)

Books Recommended :

1. A Text Book on Power System Engineering by Chakraborty, Soni, Gupta & Bhatnagar
2. A Course in Power System by J.B. Gupta

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SUBJECT : UTILIZATION OF ELECTRICAL ENERGY

Course Code : DEE 5005

Module – 1

Electrical Heating : Relative advantages, types of Electrical heating equipment. Resistance oven, design of heating element and control, induction heating and induction furnace core type and coreless furnaces, dielectric heating. (6)

Module – 2

Electrical Welding : Resistance welding – But, Spot and Seam welding, Arc welding, carbon arc and metallic arc welding, DC and AC arc welding. (6)

Module – 3

Illuminations : Definition and luminous flux, luminous intensity, brightness, solid angles luminous efficiency, law of illumination, Incandescent lamp, fluorescent lamps, arc lamps, discharge lamps, sodium and mercury vapour lamps, glare and its minimization, use of reflectors, coefficient of utilization waste light factor, diversity factor, design of illumination scheme, control of light through magnetic amplifier. (6)

Module – 4

Industrial Control : Torque speed characteristics of DC series and shunt motors, electronic control of DC and AC motors, choice and use of AC and DC motors in different industries, rating and enclosure, types of motors used for lifts, cranes and rolling mills, Ward Leonard speed control, master controller, different methods of speed control, series parallel control, electrical breaking. (5)

Module – 5

Traction : General features requirement of an ideal traction system, different system traction, advantage of electric traction system over other system-system of track electrification, alternating and direct current, traction motor, general feature of traction motors, electrical features, mechanical feature, speed torque characteristics, applications. Electrical and mechanical braking, rheostatic braking, regenerative braking. (6)

Module – 6

Control of Traction Motor : Power supply for AC traction, starting & speed control of traction motors, AC/DC conversion, train movement and energy conversion, simplified speed time curves for different services, simplified speed time curve factor influencing energy consumption (5)

Module – 7

Electrolysis and Electroplating : Faraday's law of electrolysis basic principle of electrolysis, current efficiency, voltage, extraction of metals-zinc, aluminium, refining of metals, electro-deposition and factors influencing electro-deposition, electroplating-copper plating, silver plating nickel plating, power supply for electrolysis process. (6)

Books Recommended :

1. Utilization of electrical power by N.V. Suryanarayana
2. Utilization of electrical power and Electric traction by J.B. Gupta.