# Lession Plan 2024-25

## Electrical-2nd Semester

### APPLIED PHYSICS-II

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| **1St Sessional Exam 2024**<br>UNIT I<br>**Wave Motion and its Applications**<br>1.1 Waves: definition, types (mechanical and electromagnetic wave)<br>1.2 Wave motion- transverse and longitudinal with examples, terms used in wave motion like displacement, amplitude, time period, frequency, wavelength, wave velocity; relationship among wave velocity, frequency and wave length<br>1.3 Simple harmonic motion (SHM): definition, examples<br>1.4 Cantilever: definition, formula of time period (without derivation)<br>1.5 Free, forced and resonant vibrations with examples<br>1.6 Sound waves: types (infrasonic, audible, ultrasonic) on the basis of frequency, noise, coefficient of absorption of sound, echo<br>**UNIT II**<br>**Optics**<br>2.1 Reflection and refraction of light with laws, refractive index<br>2.2 Lens: introduction, lens formulae (no derivation), power of lens and simple numerical problems<br>2.3 Total internal reflection and its applications, critical angle and conditions for total internal reflection<br>2.4 Superposition of waves (concept only), definition of Interference, Diffraction and Polarization of waves<br>2.5 Introduction to Microscope, Telescope and their applications | Upto-14-03-2024 |
| **2nd Sessional Exam 2024**<br>**UNIT III**<br>**Electrostatics and Electricity**<br>3.1 Electric charge, unit of charge, conservation of charge<br>3.2 Coulomb's law of electrostatics<br>3.3 Electric field, electric lines of force (definition and properties), electric field intensity due to a point charge<br>3.4 Definition of electric flux, Gauss law (statement and formula)<br>3.5 Capacitor and capacitance (with formula and unit)<br>3.6 Electric current and its SI Unit, direct and alternating current<br>3.7 Resistance, conductance (definition and unit)<br>3.8 Series and parallel combination of resistances<br>3.9 Ohm's law (statement and formula)<br><br>**UNIT IV**<br>**Classification of Materials and their Properties** | Upto-24-04-2024 |

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| 4.1 Definition of energy level, energy bands<br>4.2 Types of materials (conductor, semiconductor, insulator and dielectric) with examples, intrinsic and extrinsic semiconductors (introduction only)<br>4.3 Introduction to magnetism, type of magnetic materials: diamagnetic, paramagnetic and ferromagnetic materials with examples<br>4.4 Magnetic field, magnetic lines of force, magnetic flux<br>4.5 Electromagnetic induction (definition) | |
| **3rd Sessional Exam 2024**<br>**UNIT V**<br>**Modern Physics**<br>5.1 Laser: introduction, principle, absorption, spontaneous emission, stimulated emission, population inversion<br>5.2 Engineering and medical applications of laser<br>5.3 Fibre optics**:** introduction to optical fibers (definition, principle and parts), light propagation, fiber types (mono-mode, multi-mode), applications in medical, telecommunication and sensors<br>5.4 Nanotechnology: introduction, definition of nanomaterials with examples, properties at nano scale, applications of nanotechnology (brief) | Upto-25-05-2024 |

## APPLIED MATHEMATICS – II

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| **1$^{St}$ Sessional Exam 2024**<br>UNIT I<br>**Differential Calculus**<br>1.1 Definition of function; Concept of limits (Introduction only) and problems related to four standard limits only.<br>1.2 Differentiation of $x_n$, sin x, cos x, $e_x$ by first principle.<br>1.3 Differentiation of sum, product and quotient of functions<br>**UNIT II**<br>**Differential Calculus and Its Applications**<br>2.1 Differentiation of trigonometric functions, inverse trigonometric functions. Logarithmic differentiation, successive differentiation (upto 2nd order)<br>2.2 Application of differential calculus in:<br>(a) Rate measures (b) Maxima and minima | Upto-14-03-2024 |

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| **2nd Sessional Exam 2024**<br>**UNIT III**<br>**Integral Calculus**<br>3.1 Integration as inverse operation of differentiation with simple examples.<br>3.2 Simple standard integrals and related problems, Integration by Substitution method and Integration by parts.<br>3.3 Evaluation of definite integrals with given limits.<br>$\pi/2$ $\pi$ /2 $\pi/2$ Evaluation of $\int \sin^n x.\, dx$, $\int \cos^n x\, dx$ , $\int \sin^m x \cos^n x\, dx$<br>0 0 0<br>using formulae without proof (m and n being positive integers only) using pre-existing mathematical models.<br>**UNIT IV**<br>**Application of Integration, Numerical Integration and Differential Equations**<br>4.1 Applications of integration: for evaluation of area under a curve and axes (Simple problems).<br>4.2 Numerical integration by Trapezoidal Rule and Simpson's 1/3rd Rule using pre-existing mathematical models.<br>**Differential Equations**<br>4.3 Definition, order, degree, Type of differential Equations, linearity, Formulation of ordinary differential equation (up to 1st order), solution of ODE (1st order) by variable separation method. | Upto-24-04-2024 |
| **3rd Sessional Exam 2024**<br>**UNIT V**<br>**Statistics and Software Statistics**<br>5.1 Measures of Central Tendency: Mean, Median, Mode<br>5.2 Measures of Dispersion: Mean deviation, Standard deviation<br>**Software**<br>5.3 SciLab software – Theoretical Introduction.<br>5.4 Basic difference between MATLAB and SciLab software,<br>5.5 Calculations with MATLAB or ScilLab - (a) Representation of matrix (2×2 order),<br>(b) Addition, Subtraction of matrices (2×2 order) in MATLAB or SciLab | Upto-25-05-2024 |

# ELECTRICAL NETWORKS

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| **1St Sessional Exam 2024**<br>**UNIT I**<br>**DC Network Theorems**<br>1.1 Mesh analysis<br>1.2 Nodal analysis using voltage and current sources<br>1.3 Superposition theorem<br>1.4 Thevenin theorem<br>1.5 Norton theorem<br>1.6 Maximum power transfer theorem<br>1.7 Active and passive network, Linear and Non Linear network<br>**UNIT II**<br>**AC Fundamentals**<br>2.1 Generation of alternating Voltage and current. Difference between ac and dc, Equation of<br>alternating quantity.<br>2.2 AC Terminology: waveform, cycle, frequency, time period, amplitude, instantaneous<br>value, alternation, and their important relations (time period and frequency, angular<br>velocity and frequency etc.)<br>2.3 Values of alternating voltage and current: Instantaneous value, peak value average value,<br>r.m.s. value, form factor and peak factor<br>2.4 Vector representation of alternating quantities<br>2.5 Concept of phase, phase difference and phasors<br>2.6 Representation of electrical quantities through phasors<br>2.7 Addition of two alternating quantities: parallelogram method, component method | Upto-14-03-2024 |
| **3rd Sessional Exam 2024**<br>**UNIT V**<br>**Polyphase Circuit**<br>5.1 Principle of generation of 3 –ø alternating emf.<br>5.2 Advantages of Polyphase circuit over single phase circuit, Phase Sequence.<br>5.3 Types of three phase connections-Star connection and delta connection.<br>5.4 Concept of balanced and unbalanced load.<br>5.5 Relation between phase and line quantities of star and delta connection | Upto-25-05-2024 |

# NON-CONVENTIONAL SOURCES OF ENERGY

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| **1St Sessional Exam 2024**<br><br>**UNIT I**<br>**Introduction to Energy and Solar Energy**<br>1.1 **Classification of Energy Resources:** Conventional Energy Resources, Nonconventional<br>Energy Resources, Roles and responsibility of Ministry of New and Renewable Energy Sources. Needs of renewable energy. Targets and Present Status of<br>Renewable Energy Sources in India.<br>1.2 **Solar Energy:** Introduction, potential of solar energy in India, Solar Radiation, Principle<br>of conversion of solar radiation into heat, construction and working principle of photovoltaic<br>cell. Solar cell materials, Difference between solar cell, panel, array, module,<br>Characteristics, important terms related to solar energy, Efficiency of Solar Cells.<br>Applications of solar energy like solar PV system (standalone and grid connected), solar<br>water heating system, solar furnaces, solar cookers, solar lighting, solar water pumping<br>system, solar still. Government schemes and policies.<br>**UNIT II**<br>**Bio-Energy and Hydro Energy**<br>2.1 **Bio-Energy:** Introduction, Biomass energy, Photosynthesis process, Biomass fuels,<br>Biomass energy conversion technologies and applications, Biomass Gasification, Types<br>and application of gasifier, Types of biogas plants, Factors affecting biogas generation,<br>Environmental impacts and benefits, Future role of biomass , Biomass potential and<br>programs in India.<br>2.2 **Hydro Energy:** Introduction, Capacity and Potential, Hydro Power Plant (mini and<br>micro), Environmental and social impacts | Upto-14-03-2024 |
| **2nd Sessional Exam 2024**<br><br>**UNIT III**<br>**Wind Energy and Geothermal Energy**<br>3.1 **Wind Energy:** Introduction, Wind energy conversion system, windmills, types of wind<br>mills, selection of site, electricity generation from wind energy, Wind Energy potential<br>and Scenario in India.<br>3.2 **Geothermal Energy:** Introduction , Geothermal Resource Utilization like hydrothermal,<br>Geo-pressured hot dry rock, magma, Geothermal based Electric Power Generation,<br>Associated Problems, environmental Effects, prospects of geothermal energy in India. | Upto-24-04-2024 |

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| **UNIT IV**<br>**Tidal Energy and Mhd**<br>4.1 **Tidal Energy:** Introduction, Capacity and Potential, Principle of Tidal Power,<br>Components of Tidal Power Plant, Classification of Tidal Power Plants.<br>4.2 **Ocean Energy:** Introduction, Ocean Thermal Energy Conversion (OTEC),<br>Principle of OTEC system, Methods of OTEC power generation, prospects of OTEC in<br>India.<br>4.3 **MHD power generation**: Principle of working of Magneto Hydro Dynamic (MHD)<br>Power Generation, materials for MHD generators and future prospects, performance and<br>limitations. | |
| **3rd Sessional Exam 2024**<br><br>**UNIT V**<br>**Fuel Cell and Energy Storage Devices**<br>5.1 **Fuel Cells:** Fuel cell definition, difference between batteries and fuel cells, Principle of<br>working of fuel cells ,types of fuel cell, power generation by fuel cell ,conversion<br>efficiency, applications, advantages and disadvantages of fuel cell .<br>5.2 **Energy Storage:** Need of energy storage, Different modes of energy storage, Flywheel<br>storage, Superconducting Magnet Energy Storage (SMES) systems, Capacitor, battery,<br>Super capacitor. Comparison and application. | Upto-25-05-2024 |

# ENVIRONMENTAL STUDIES AND DISASTER MANAGEMENT

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| **1St Sessional Exam 2024**<br>**UNIT I**<br>**Introduction**<br>1.1 Basics of ecology, eco system- concept, and sustainable development, Sources,<br>advantages, disadvantages of renewable and nonrenewable energy.<br>1.2 Rain water harvesting<br>1.3 Deforestation – its effects & control measures<br>**UNIT II**<br>**Air and Noise Pollution**<br>2.1 Air Pollution: Source of air pollution. Effect of air pollution on human health, economy,<br>Air pollution control methods.<br>2.2 Noise Pollution: Source of noise pollution, Unit of noise, Effect of noise pollution,<br>Acceptable noise level, Different method of minimizing noise pollution. | Upto-14-03-2024 |
| **2nd Sessional Exam 2024**<br>**UNIT III**<br>**Water and Soil Pollution**<br>3.1 Water Pollution: Impurities in water, Cause of water pollution, Source of water pollution.<br>Effect of water pollution on human health, Concept of DO, BOD, COD. Prevention of<br>water pollution- Water treatment processes, Sewage treatment. Water quality standard.<br>3.2 Soil Pollution :Sources of soil pollution, Effects and Control of soil pollution, Types of<br>Solid waste- House hold, Industrial, Agricultural, Biomedical, Disposal of solid waste,<br>Solid waste management E-waste, E – waste management<br>**UNIT IV**<br>**Impact of Energy Usage on Environment**<br>Global Warming, Green House Effect, Depletion of Ozone Layer, Acid Rain. Eco-friendly<br>Material, Recycling of Material, Concept of Green Buildings, Concept of Carbon Credit &<br>Carbon footprint | Upto-24-04-2024 |
| **3rd Sessional Exam 2024**<br>**UNIT V**<br>**Disaster Management**<br>**A. Different Types of Disaster:**<br>Natural Disaster: such as Flood, Cyclone, Earthquakes and Landslides etc.<br>Man-made Disaster: such as Fire, Industrial Pollution, Nuclear Disaster, Biological Disasters,<br>Accidents (Air, Sea Rail & Road), Structural failures(Building and Bridge), War & Terrorism<br>etc... | Upto-25-05-2024 |

# Lession Plan 2024-25

## Electrical-4th Semester

### ENGLISH AND COMMUNICATION SKILLS - II

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| **1St Sessional Exam 2024**<br><br>**UNIT I**<br>**Reading**<br>1.1 All The World's A Stage – W. Shakespeare<br>1.2 Life Sketch of Dr. Abdul Kalam<br>1.3 The Portrait of a Lady - Khushwant Singh<br>1.4 The Doctor's Word by R K Narayan<br>1.5 Speech by Dr Kiran Bedi at IIM Indore2007 Leadership Concepts<br>1.6 The Bet - by Anton Chekov<br>**UNIT II**<br>**Effective Communication Skills**<br>2.1 Modern means of Communication (Video Conferencing, e- mail, Teleconferencing)<br>2.2 Effective Communication Skills: 7 C's of Communication<br>2.3 Non-verbal Communication – Significance, Types and Techniques for Effective Communication<br>2.4 Barriers and Effectiveness in Listening Skills<br>2.5 Barriers and Effectiveness in Speaking Skills | Upto-14-03-2024 |
| **2nd Sessional Exam 2024**<br>**UNIT III**<br>**Professional Writing**<br>3.1 Correspondence: Enquiry letters, placing orders, complaint letters<br>3.2 Report Writing<br>3.3 Memos<br>3.4 Circulars<br>3.5 Press Release<br>3.6 Inspection Notes and tips for Note-taking<br>3.7 Corrigendum writing<br>3.8 Cover Letter<br>3.9 Drawing inferences<br>**UNIT IV**<br>**Grammar and Vocabulary**<br>4.1 Prepositions<br>4.2 Conjunctions<br>4.3 Punctuation<br>4.4 Idioms and Phrases<br>4.5 Pairs of words (Words commonly misused and confused)<br>4.6 Translation of Administrative and Technical Terms in Hindi or Mother | Upto-24-04-2024 |

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| **3rd Sessional Exam 2024**<br>**UNIT V**<br>**Employability Skills**<br>5.1 Presentation Skills: How to prepare and deliver a good presentation<br>5.2 Telephone Etiquettes<br>5.3 Importance of developing employable and soft skills | Upto-25-05-2024 |

# ELECTRICAL MACHINES - II

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| **1St Sessional Exam 2024**<br>**UNIT I**<br>**Synchronous Machines**<br>1.1 Main constructional features of synchronous machine including commutator<br>1.2 Generation of three phase emf<br>1.3 Production of rotating magnetic field in a three phase winding<br>1.4 E.M.F. Equation, Concept of distribution factor and coil span factor<br>1.5 Operation of single synchronous machine independently supplying a load,<br>voltage regulation by synchronous impedance method<br>1.6 Need and necessary conditions of parallel operation of alternators, synchronizing an alternator (Synchroscope method) with the bus bars<br>1.7 Operation of synchronous machine as motor, Starting methods of Synchronous<br>Motor<br>1.8 Concept and Cause of hunting and its prevention<br>1.9 Specification of Synchronous Machine<br>1.10 Cooling of synchronous machines<br>1.11 Application of synchronous machines (as a synchronous condenser)<br>**UNIT II**<br>**Three Phase Induction Motors**<br>2.1 Salient constructional features of 3 phase squirrel cage and slip ring induction motors<br>2.2 Principle of operation, slip and its significance<br>2.3 Locking of rotor and stator fields<br>2.4 Rotor resistance, inductance, e.m.f. and current<br>2.5 Relationship between copper loss and the motor slip<br>2.6 Power flow diagram of an induction motor<br>2.7 Factors determining the torque<br>2.8 Torque-slip curve, stable and unstable zones<br>2.9 Effect of rotor resistance upon the torque slip relationship<br>2.10 Starting of 3-phase induction motors by DOL, star-delta and auto transformer starter<br>2.11 Causes of low power factor of induction motors<br>2.12 Speed control of induction motor<br>2.13 Cogging and Crawling in Induction Motors. | Upto-14-03-2024 |
| **2nd Sessional Exam 2024**<br>**UNIT III**<br>**Single Phase Induction Motors:**<br>3.1 Single phase induction motors; Construction characteristics and applications<br>3.2 Nature of field produced in single phase induction motor<br>3.3 Split phase induction motor: Capacitors start and run motor, Shaded pole motor<br>and Reluctance start motor<br>3.4 Alternating current series motor and universal motors | Upto-24-04-2024 |

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| **3rd Sessional Exam 2024**<br>**UNIT IV**<br>**Special Purpose Machines**<br>4.1 Working principle of Linear induction motor, Stepper motor and Servomotor<br>4.2 Introduction to Energy efficient Motors | Upto-25-05-2024 |

# PLC & MICROCONTROLLERS

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| **1St Sessional Exam 2024**<br>**UNIT I**<br>**Fundamentals of PLC**<br>Introduction, Definition and advantage; Building blocks of PLC**:** CPU, Memory organization, Input- output modules (discrete and analog), Specialty I/O Modules, Power supply; I/O module selection criteria; Interfacing different I/O devices with appropriate I/O modules.<br>**UNIT II**<br>**PLC Instructions and Programming**<br>PLC programming Instructions**:** Relay type instructions, Timer instructions: On delay, off delay, retentive, counter instructions: Up, Down, High speed, Logical instructions, Comparison Instructions, Data handling Instructions, Arithmetic instructions. Simple Programming examples using ladder logic**:** Language based on relay, timer counter, logical, comparison, arithmetic and data handling instructions | Upto-14-03-2024 |
| **2nd Sessional Exam 2024**<br>**UNIT III**<br>**Applications of PLC**<br>PLC Based Applications: Motor sequence control, Motor in forward and reverse direction, Star-Delta, DOL Starters Traffic light control, Elevator control, Conveyor system, Stepper motor control, packaging etc.<br>**UNIT IV**<br>**Architecture of Microcontroller 8051**<br>Difference between micro processor and micro controller, Block diagram of 8051, function of each block, Pin diagram, function of each pin, Concept of Internal memory and External memory (RAM and ROM), Internal RAM structure, Reset and clock circuit, Various registers and SFRs of 8051. | Upto-24-04-2024 |
| **3rd Sessional Exam 2024**<br>**UNIT V**<br>**Microcontroller Instruction and Programming**<br>Instruction set and addressing modes: Timer operation, Serial Port operation, interrupts: Data Transfer operations, Input/output operations. Design and Interface: keypad interface, 7- segment interface, LCD, stepper motor; applications. | Upto-25-05-2024 |

# ESTIMATING AND COSTING IN ELECTRICAL ENGINEERING

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| **1St Sessional Exam 2024**<br>**UNIT I**<br>**Essentials of Estimation and Costing**<br>1.1 **Introduction** :Purpose of estimating and costing, proforma for making estimates, preparation of materials schedule, costing, price list, net price list, market survey, overhead charges, labour charges, electrical point method and fixed percentage method, contingency, profit.<br>1.2 **Tenders and Quotations**-Type of tender, tender notice, preparation of tender document, and method of opening of tender, Quotation-quotation format, comparison between tender and quotation, Comparative statement, format comparative statement. Earnest money deposit (EMD), purchase system, orders for supply, payment of bills;<br>**UNIT II**<br>**Domestic Installation**<br>2.1 **Wiring and accessories:** Introduction, types of wiring**:** Cleat, batten, casing capping and conduit wiring, comparison of different wiring systems, selection and design of wiring schemes. Selection of wires and cables, wiring accessories and use of protective devices i.e. MCB, ELCB etc. Use of wire-gauge and tables (to be prepared/arranged).<br>2.2 **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 (single story and multi- story buildings having similar electrical load). | Upto-14-03-2024 |
| **2nd Sessional Exam 2024**<br>**UNIT III**<br>**Industrial Installation**<br>3.1 **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 singe-phase, 3-phase motor load and the light load (3-phase supply system).<br>3.2 Design electrical installation scheme of factory/ small industrial unit, Preparation of material schedule and detailed estimation.<br>**UNIT IV**<br>**Street Lighting Installation**<br>4.1 Classification of outdoor installations streetlight/ public lighting installation, Street light pole structures. Selection of equipments, sources used in street light installations. Cables, recommended types and sizes of cable. Control of street light installation.<br>4.2 Design, estimation and costing of streetlight, Preparation of tenders | Upto-24-04-2024 |
| **3rd Sessional Exam 2024**<br>**UNIT V**<br>**Distribution Line and LT Substation**<br>4.1 Transmission and distribution lines (overhead and underground) planning and designing of lines with different fixtures, earthing etc. based on unit cost calculations .Service line connections estimate for domestic and industrial loads (overhead and underground connections) from pole to energy meter.<br>4.2 Substation: Types of substations, substation schemes and | Upto-25-05-2024 |

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| components, estimate of 11/0.4 kV pole mounted substation up to 200 kVA rating, earthing of substations . | |

# UTILIZATION OF ELECTRICAL ENERGY

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| **1St Sessional Exam 2024**<br>**UNIT I**<br>**Illumination**<br>Introduction, terms used in illumination, laws of illumination, indoor and outdoor illumination levels. Discharge lamps, MV and SV lamps. General ideas about time switches, street lighting, flood lighting and decorative lighting<br>**UNIT II**<br>**Electric Heating & Electric Welding**<br>Advantages and methods of electric heating, resistance heating, induction heating, and dielectric heating. Electric welding, resistance and arc welding, electric welding equipment, comparison between A.C. and D.C, Welding. er (hollow and solid shaft) subjected to combined torsion and bending | Upto-14-03-2024 |
| **2nd Sessional Exam 2024**<br>**UNIT III**<br>**Electrolytic Processes**<br>Need of electro-deposition; Laws of electrolysis; process of electro-deposition - clearing, operation, deposition of metals, polishing and buffing; Principle of galvanizing and its applications; Principles of anodizing and its applications; Electroplating of non-conducting materials, Electrical Circuits used in Refrigeration and Air Conditioning and Water Coolers.<br>**UNIT IV**<br>**Electric Drives**<br>Electric Drive and its part, Advantages of electric drives, Types of electric Drives, Characteristics of different mechanical loads, Types of motors used in used in Industrial Drives, Factors affecting selection of motors, Applications of Electric Drive. Introduction to Energy efficient drives. | Upto-24-04-2024 |
| **3rd Sessional Exam 2024**<br>**UNIT V**<br>**Electrical Traction**<br>Advantages of electric traction, Concept of diesel electric Traction system, Systems of Track Electrification (DC & AC system), types of services – urban, sub-urban, and main line and their speed-time curves. Electrical block diagram and accessories of an electric locomotive and different accessories for track electrification such as overhead centenary wire, conductor rail system, current collector / pentagraph etc. Power supply arrangements and types of motors used for electric traction. Starting and braking of electric locomotives. Introduction to EMU and metro railways | Upto-25-05-2024 |

# Lession Plan 2024-25

## Electrical-6th Semester

### ELECTRICAL ENERGY CONSERVATION AND MANAGEMENT

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| **1St Sessional Exam 2024**<br><br>1. **Lighting System** (10 periods)<br>1.1. Basic definitions- Lux, lumen and illumination space to height ratio<br>1.2 Types of different lamps and their features<br>1.3 Energy efficient practices in lighting<br>1.4. Tips for energy saving in building - New Building, Existing Building<br>1.5 Laws of Illumination<br>1.6 Calculation of illumination at different points, Main requirements for proper lighting<br>1.7 Macro level approach at design stage<br>2. **Energy Conservation and EC Act 2001 (05 periods)**<br>2.1 Introduction to<br><br>2.2 Salient features of Energy Conservation Act 2001 & The Energy Conservation (Amendment) Act, 2010 and its importance<br>2.3 Standards and Labeling - Concept of star rating and its importance, Types of product available for star rating | Upto-14-03-2024 |
| **2nd Sessional Exam 2024**<br><br>3. **Energy Audit (08 periods)**<br><br>3.1 Types and methodology<br>3.2 Energy auditing reporting format<br>3.3 Energy audit instruments<br><br>4. **Electrical Supply System and Motors (20 periods)**<br><br>4.1 Types of electrical supply system<br>4.2 Single line diagram<br>4.3 Transformer loading<br>4.4 Tips for energy savings in transformers | Upto-24-04-2024 |

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| 4.5 Motor Loading<br>4.6 Variation in efficiency and power factor with loading<br>4.7 Tips for energy savings in motors<br>4.8 Need for energy efficient motors<br>4.9 Initial cost versus like cycle cost<br>4.10 Cost analysis on life cycle basis<br>4.11 Various constructional features of EEMs<br>4.12 EEM as compared to standard motors<br>.. 5. **Energy Efficiency in Electrical Utilities. (17 periods)**<br>5.1. Understanding Electricity Bill<br>5.1.1. Tariff structure<br>5.1.2. Components of power (kW, kVA and kVAR) and power factor<br>5.1.3 Concept of sanctioned load, maximum demand, contract demand and monthly minimum charges (MMC)<br>5.2. Pumps<br>5.2.1. Introduction to pump and its application<br>5.2.2. Efficient pumping system operation<br>5.2.3 Energy efficiency in agriculture pumps<br>5.2.4. Tips for energy saving in pumps<br>5.3. Compressed Air System<br>5.3.1. Types of air compressor and its applications<br>5.3.2. Leakage test<br>5.3.3. Energy saving opportunities in compressors<br>5.4. Energy Conservation in HVAC and Refrigeration System<br>5.4.1. Introduction<br>5.4.2. Concept of Energy Efficiency Ratio (EER)<br>5.4.3. Energy saving opportunities in Heating, Ventilation and Air-conditioning (HVAC) and Refrigeration Systems. 5.5. Thermal Basics:<br>5.5.1 Types of fuels<br>5.5.2 Thermal energy<br>5.5.3 Energy contents in fuel<br>5.5.4 Energy Units and its conversion in terms of metric tonne of oil equivalent (MTOE. | |
| **3rd Sessional Exam 2024**<br><br>6. **General Energy Saving Tips (10 periods)**<br><br>6.1 Lighting System<br>6.2 Room Air Conditioners<br>6.3 Refrigerators<br>6.4 Water Heater<br>6.5 Computers<br>6.6 Fans, Heaters, Blowers and Washing Machines<br>6.7 Water Pumps<br>6.8 Kitchens<br>6.9 Transport<br>7. **Energy Conservation Building Code (10 periods)**<br><br>7.1 Haryana ECBC and its salient features including thermal behavior of buildings<br>7.2 ECBC Guidelines on Building Envelope<br>7.3 ECBC Prescriptive Requirements for Building Envelope | Upto-25-05-2024 |

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| 7.4 ECBC Guidelines on Heating, Ventilation and Air Conditioning<br>7.5 ECBC Guidelines on Service Hot Water and Pumping<br>7.6 ECBC Guidelines on Lighting<br>7.7 ECBC Guidelines on Electrical Power<br>7.8 ECBC Guidelines on Star Labelling and Minimum Star rating | |

# ELECTRICAL POWER-II

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| **1St Sessional Exam 2024**<br>1. Faults: (06 Periods)<br>Common type of faults in both overhead and underground systems, symmetrical/ unsymmetrical faults. Single line to ground fault, double line to ground fault, 3-phase to ground fault open circuit , simple problems relating to fault finding.<br>2. Switch Gears (16 Periods)<br>2.1 Purpose of protective gear. Difference between switch, isolator and circuit breakers. Function of isolator and circuit breaker. Making capacity and breaking capacity of circuit breaker (only definition)<br>2.2 Principles of Arc extinction in OCB and ACB, Constructional features of OCB, VCB, ACB, and their working,<br>2.3 Types of circuit breakers, bulk and mini | Upto-14-03-2024 |
| **2nd Sessional Exam 2024**<br>3. Protection Devices (16 Periods)<br>3.1 Fuses; function of fuse. Types of fuses, HV and LV fuses, rewire-able, cartridge, HRC<br>3.2 Earthing: purpose of earthing, method of earthing, Equipment earthing, Substation earthing, system earthing as per Indian Electricity rules. Methods of reducing earth resistance.<br>3.3 Relays:<br>a) Introduction- types of relays. Electromagnetic, numercial and thermal relays, their construction and working<br>b) Induction type over-current, earth fault relays, instantaneous over current relay<br><br>c) Directional over-current, differential relays, their functions<br>d) Distance relays, their functions<br>e) Static numeric and digital relays and their applications<br>4. Protection Scheme (10 Periods) 4.1 Relays for generator protection 4.2 Relays for transformer, protection including Buchholtz relay protection<br>4.3 Protection of feeders and bus bars, Over current and earth fault protection.<br>4.4 Distance protection for transmission system<br>4.5 Relays for motor protection | Upto-24-04-2024 |
| **3rd Sessional Exam 2024**<br>5. Over-voltage Protection (10 Periods)<br>5.1 Protection of system against over voltages, causes of over voltages, utility of ground wire<br>5.2 Lightning arrestors, rod gap, horn gap, metal oxide type.<br>5.3 Transmission Line and substation protection against over-voltages and lightning<br>6. Various Types of Tariffs: (06 Periods)<br>6.1 Concept of Tariffs<br>6.2 Block rate, flat rate, maximum demand and two part tariffs<br>6.3 Simple problems | Upto-25-05-2024 |

# INDUSTRIAL ELECTRONICS AND CONTROL OF DRIVES

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| **1St Sessional Exam 2024**<br><br>***DETAILED CONTENTS***<br>1. Introduction to SCR (16 Periods**)**<br>1.1. Construction and working principles of an SCR, two transistor analogy and characteristics of SCR<br>1.2. SCR specifications and rating<br>1.3. Construction, working principles and V-I characteristics of DIAC, TRIAC and Quadriac<br>1.4. Basic idea about the selection of heat sinks for SCR and TRIACS<br>1.5. Methods of triggering a Thyristor. Study of triggering circuits<br>1.6. UJT, its Construction, working principles and V-I characteristics, UJT relaxation oscillator<br>1.7. Commutation of Thyristors<br>1.8. Series and parallel operation of Thyristors<br>1.9. Applications of SCR, TRIACS and Quadriac such as light intensity control, speed control of DC and universal motor, fan regulator, battery charger etc.<br>1.10. dv/dt and di/dt protection of SCR.<br>2. Controlled Rectifiers (10 Periods**)**<br>2.1 Single phase half wave controlled rectifier with resistive load and inductive load, concept of free wheeling diode.<br>2.2 Single phase half controlled full wave rectifier<br>2.3 Single phase fully controlled full wave rectifier<br>2.4 Single phase full wave centre tapped rectifier<br>2.5 Three phase full wave half controlled bridge rectifier<br>2.6 Three phase full wave fully controlled bridge rectifier | Upto-14-03-2024 |
| **2nd Sessional Exam 2024**<br><br>3. Inverters, Choppers, Dual Converters and Cyclo Convertors (18 Periods**)**<br>3.1 Inverter-introduction, working principles, voltage and current driven series and parallel inverters and applications<br>3.2 Choppers-introduction, types of choppers and their working principles and applications<br>3.3 Dual converters-introduction, working principles and applications<br>3.4 Cyclo-converters- introduction, types, working principles and applications<br>4. Thyristor Control of Electric Drives (15 Periods**)**<br>4.1 DC drives control (Basic Concept)<br>4.2 Half wave drives<br>4.3 Full wave drives<br>4.4 Chopper drives<br>4.5 AC drives control | Upto-24-04-2024 |

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| 4.6 Phase control<br>4.7 Variable frequency a.c. drives<br>4.8 Constant V/F application<br>4.9 Voltage controlled inverter drives<br>4.10 Constant current inverter drives<br>4.11 Cyclo convertors controlled AC drives<br>4.12 Slip control AC drives | |
| **3rd Sessional Exam 2024**<br><br>5 Uninterrupted power supplies (05 Periods**)**<br><br>5.1 UPS online, off line<br>5.2 Storage devices (batteries)<br>5.3 SMPS, CVT | Upto-25-05-2024 |

**ENTREPRENEURSHIP DEVELOPMENT AND MANAGEMENT**

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| **1St Sessional Exam 2024**<br><br>**SECTION – A ENTREPRENEURSHIP**<br>1. Introduction (10 Periods)<br>□ Concept /Meaning and its need<br>□ Qualities and functions of entrepreneur and barriers in entrepreneurship<br>□ Sole proprietorship and partnership forms and other forms of business organisations<br>□ Schemes of assistance by entrepreneurial support agencies at National, State, District –level, organisation: NSIC, NRDC, DC, MSME, SIDBI, NABARD, NIESBUD, HARDICON Ltd., Commercial Banks, SFC's TCO, KVIB, DIC, Technology Business Incubators (TBI) and Science and Technology Entrepreneur Parks<br>2. Market Survey and Opportunity Identification/Ideation (08 Periods)<br>□ Scanning of the business environment<br>□ Salient features of National and Haryana State industrial policies and resultant business opportunities<br>□ Types and conduct of market survey<br>□ Assessment of demand and supply in potential areas of growth<br>□ Identifying business opportunity<br>□ Considerations in product selection | Upto-14-03-2024 |

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| □ Converting an idea into a business opportunity<br>3. Project report Preparation (06 Periods)<br>□ Preliminary project report<br>□ Detailed project report including technical, economic and market feasibility<br>□ Common errors in project report preparations<br>□ Exercises on preparation of project report<br>□ Sample project report | |
| **2nd Sessional Exam 2024**<br>**SECTION –B MANAGEMENT**<br>4. Introduction to Management (04 Periods)<br>□ Definitions and importance of management<br>□ Functions of management: Importance and process of planning, organising, staffing, directing and controlling<br>□ Principles of management (Henri Fayol, F.W. Taylor)<br>□ Concept and structure of an organisation<br>□ Types of industrial organisations and their advantages<br><br>□ Line organisation, staff organisation<br>□ Line and staff organisation<br>□ Functional Organisation<br>5. Leadership and Motivation (03 Periods)<br>a) Leadership<br>□ Definition and Need<br>□ Qualities and functions of a leader<br>□ Manager Vs leader<br>□ Types of leadership<br>□ Case studies of great leaders<br>β) Μοτιϖατιον<br>• Δεφινιτιον ανδ χηαραχτεριστιχσ<br>• Ιμπορτανχε οφ σελφ μοτιϖατιον<br>• Φαχτορσ αφφεχτινγ μοτιϖατιον<br>• Τηεοριεσ οφ μοτιϖατιον (Μασλοω, Ηερζβεργ, Δουγλασ, ΜχΓρεγορ)<br><br>6. Management Scope in Different Areas (06 Periods)<br>a) Human Resource Management<br>□ Introduction and objective<br>□ Introduction to Man power planning, recruitment and selection<br>□ Introduction to performance appraisal methods<br><br>b) Material and Store Management<br>□ Introduction functions, and objectives<br>□ ABC Analysis and EOQ<br><br>c) Marketing and sales | Upto-24-04-2024 |

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| □ Introduction, importance, and its functions<br>□ Physical distribution<br>□ Introduction to promotion mix<br>□ Sales promotion<br><br>d) Financial Management<br>□ Introductions, importance and its functions<br>□ knowledge of income tax, sales tax, excise duty, custom duty, VAT, GST | |
| **3rd Sessional Exam 2024**<br>7. Work Culture (04 Periods)<br>7.1. Introduction and importance of Healthy Work Culture in organization<br>7.2. Components of Culture<br>7.3. Importance of attitude, values and behaviour<br>Behavioural Science – Individual and group behavior.<br>7.4. Professional ethics – Concept and need of Professional Ethics and human values.<br>8. Basic of Accounting and Finance (04 Periods)<br>a) Basic of Accounting:<br>- Meaning and definition of accounting<br>- Double entry system of book<br>Trading account, PLA account and balance sheet of a company<br>b) Objectives of Financial Management<br>- Profit Maximization v/s Wealth Maximization<br>9. Miscellaneous Topics (03 Periods)<br>a) Total Quality Management (TQM)<br>□ Statistical process control<br>□ Total employees Involvement<br>□ Just in time (JIT)<br><br>b) Intellectual Property Right (IPR)<br>□ Introduction, definition and its importance<br>□ Infringement related to patents, copy right, trade mark | Upto-25-05-2024 |