

SYLLABUS FOR LAB ASSISTANT
(ELECTRICAL ENGINEERING)

Unit 1.0	<p><u>Basic Electrical Engineering</u></p> <p>Electrical Charge and flow of charges, D.C. and A.C. Current and Voltage, E.M.F, Potential Difference, Resistance, Classification of resistors, Effect of Temperature on resistance, series and parallel combination of resistances., Electrical Work, power and energy. Capacitance, Energy Stored in a capacitor, series and parallel combination of capacitors, Inductors, Self and mutual Inductance, Energy Stored in an Inductor. Ohm's law, Active and Passive elements, linear and Non-linear Circuit, unilateral and Bilateral circuit element, Node, Branch, Loop, Mesh, Kirchhoff's Current Law, Kirchhoff's Voltage Law. Frequency, Time period, Amplitude, Angular Velocity, RMS Value, Average Value, A.C. Circuits. Magnetic flux, MMF, Magnetic field strength, Permeability, Reluctance, Magnetic Leakage, Magnetic Hysteresis, Comparison of Electric and Magnetic Circuits, Electromagnetic Induction, Induced emf and current, Statically and dynamically Induced emf, Faraday's laws of Electromagnetic Induction, Lenz's law, Fleming's Right hand Rule, Fleming's Left hand Rule.</p>
Unit 2.0	<p><u>Electrical Circuits and Networks</u></p> <p>Open Circuit, closed Circuit and short circuit. Star / Delta transformation of passive network, source Transformation, Mesh Analysis and Nodal Analysis of networks. Transient and Steady State. Superposition theorem, Thevenin's Theorem, Norton's Theorem, Reciprocity Theorem. Maximum Power transfer theorem. Wave forms, phasor diagram, expression of voltage, current and power in pure resistance, Inductance and capacitance. Active, Reactive and Apparent power, power factor, lagging, leading and unity Power factor, Effects of poor power factor.</p>
Unit 3.0	<p><u>Fundamentals of Electronics Engineering</u></p> <p>Overview of formation and working of P-N Junction Diode and Zener Diode, Diode and Zener Diode characteristics. Construction and working of Half-Wave Rectifier, Construction and working of Full-wave Rectifier. Symbol, types and construction of Bipolar Junction Transistor, Working of NPN and PNP Transistor, CE, CB and CC Transistor Configuration. Binary, Octal, Decimal and Hexadecimal number systems, conversion from one number system to another number systems. AND, OR, NOT, NAND, NOR, XOR Logic Gates with symbol, Truth Table, Logic expression.</p>
Unit 4.0	<p><u>Electrical Measurement and Instrumentation.</u></p> <p>Classification of basic instruments - Indicating, Recording and Integrating type. Deflecting, controlling and damping torque. Accuracy, precision, resolution, tolerance, sensitivity and repeatability. Errors in measurement, types of errors - Limiting error, gross error, systematic error, random error. Current and Voltage Measurement. Measurement of single and three phase power by one wattmeter and three wattmeter method. Measurement of energy using single phase and three phase energy meter. Classification of resistances - Low, Medium and High. Kelvin's Double Bridge, Wheatstone Bridge, ohmmeter and megger. Earth resistance. Inductance measurement by use of Anderson Bridge. Capacitance measurement by use of Schering bridge. Frequency measurement by use of wein's Bridge. CRO, Concept of Synchrocope.</p>
Unit 5.0	<p><u>D.C. Machines and Transformers</u></p> <p>Construction, working principle and Types of D.C. Generator, EMF equation of various types of D.C. generators, Losses and efficiency in D.C. generators. Construction, working principle and types of D.C. Motors, EMF equation of various types of D.C. motors, Losses and efficiency in D.C. Motors, Types of Speed Control methods in D.C. Motors. Construction, working principle and types of single phase Transformer, EMF equation of Single phase Transformer. Transformation ratio. Losses and efficiency in Transformer. Concept of three phase Transformer, Instrument Transformer, welding Transformer. Grounding Transformer, Isolation Transformer.</p>

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Unit 6.0	<p><u>Electric Power Generation, Transmission and Distribution.</u></p> <p>Layout, Site Selection, Working and major auxiliaries of Thermal Power Plant, Hydro Electric Power Plant, Nuclear Power Plant. Various types of Renewable energy sources- Solar Energy, Wind energy, Bio-Mass and Bio-Gas energy, Geo-thermal energy, ocean energy, Fuel cells. Comparison of different types of power transmission systems, Types of Conductors, Types of Insulators, Concept of corona effect, skin effect, proximity effect, Ferranti effect. power distribution system, classification of sub-station, requirement of underground cables.</p>
Unit 7.0	<p><u>A.C. Machines</u></p> <p>Construction and working principle of three phase Induction motor, slip and slip speed, types of Induction motors, Types of Induction motor starters. working principle of synchronous motor, Starting of synchronous motor, Applications of synchronous motor Applications of three phase Induction motors. Special Electrical Machines-reluctance motor, Hysteresis Motor, Universal Motor, Stepper Motor.</p>
Unit 8.0	<p><u>Control System, Switchgear and protection</u></p> <p>open and closed loop Transfer function of R C and R-L-C electrical circuits, Block diagram and it's reduction techniques. Necessity of protection system, primary and Back up protection, Necessity of fuse, working principle and materials used in fuse, working principle of isolators, Types and functions of various circuit breakers, Types and functions of Relays.</p>
Unit 9.0	<p><u>Utilisation of Electrical Energy</u></p> <p>Illumination, Luminous flux, Lumen, candle Power, Lux, Laws of Illumination-inverse square law, lambert's cosine law. LED Light, Need and significance of Electric heating, materials of heating element, Methods of Electric heating. Electric Drives, Comparison of AC and DC Drives.</p>