ORISSA SCHOO OF ENGG., BERHAMPUR

LESSION PLAN 6TH SEMESTER (2020-21)

SUBJECT-Th1. ELECTRICAL INSTALLATION AND ESTIMATING

NAME OF FACULTY-Siba Ranjan Nayak

MONTH	MODULE/ UNIT	COURSE TO BE COVERED
January	UNIT-I	**1. INDIAN ELECTRICITY RULES** 1.1 Definitions, Ampere, Apparatus, Accessible, Bare, cable, circuit, circuit breaker, conductor voltage (low, medium, high, EH), live, dead, cut-out, conduit, system, danger, Installation, earthing system, span, volt, switch gear, etc. 1.2 General safety precautions, rule 29, 30, 31, 32, 33, 34, 35, 36, 40, 41, 43, 44, 45,46 1.3. General conditions relating to supply and use of energy : rule 47, 48, 49, 50, 51, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 70. 1.4. OH lines : Rule 74, 75, 76, 77, 78, 79, 80, 86, 87, 88, 89, 90, 91
Feburary	UNIT-II	**2. ELECTRICAL INSTALLATIONS** 2. 1 Electrical installations, domestics, industrial, Wiring System, Internal distribution of Electrical Energy. Methods of wiring, systems of wiring, wire and cable, conductor materials used in cables, insulating materials mechanical protection. Types of cables used in internal wiring, multi-stranded cables, voltage grinding of cables, general specifications of cables. 2. 2 ACCESSORIES: Main switch and distribution boards, conduits, conduit accessories and fittings, lighting accessories and fittings, fuses, important definitions, determination of size of fuse – wire, fuse units. Earthing conductor, earthing, IS specifications regarding earthing of electrical installations, points to be earthed. Determination of size of earth wire and earth plate for domestic and industrial installations. Material required for GI pipe earthing. 2. 3 LIGHTING SCHEME: Aspects of good lighting services. Types of lighting schemes, design of lighting schemes, factory lighting, public lighting installations, street lighting, general rules for wiring, determination of number of points (light, fan, socket, outlets), determination of total load, determination of Number of sub-circuits.
feburary	UNIT-III	**3. INTERNAL WIRING** 3 . 1 Type of internal wiring, cleat wiring, CTS wiring, wooden casing capping, metal sheathed wiring, conduit wiring, their advantage and disadvantages comparison and applications. 3 . 2 Prepare one estimate of materials required for CTS wiring for small domestic installation of one room and one verandah within 25 m^2 with given light, fan & plug points. 3 . 3 Prepare one estimate of materials required for conduit wiring for small domestic installation of one room and one verandha within 25 m^2 with given light, fan & plug points. 3 . 4 Prepare one estimate of materials required for concealed wiring for domestic installation of two rooms and one latrine, bath, kitchen & verandah within 80m^2 with given light, fan & plug points.

		3 . 5 Prepare one estimate of materials required for erection of conduct wiring to a small workshop installation about 30m2 and load within 10KW.
March	UNIT-IV	**4. OVER HEAD INSTALLATION** 4.1. Main components of overhead lines, line supports, factors Governing Height of pole, conductor materials, determination of size of conductor for overhead transmission line, cross arms, pole brackets and clamps, guys and stays, conductors configurations, spacing and clearances, span lengths, overhead line insulators, types of insulators, lighting arresters, danger plates, anti-climbing devices, bird guards, beads of jumpers, jumpers, tee-offs, guarding of overhead lines. 4.2. Prepare an estimate of materials required for LT distribution line within load of 100 KW maximum and standard spans involving calculation of the size of conductor (from conductor chart), current carrying capacity and voltage regulation consideration using ACSR. 4.3. Prepare an estimate of materials required for LT distribution line within load of 100 KW maximum and standard spans involving calculation of the size of conductor (from conductor chart), current carrying capacity and voltage regulation consideration using ACSR. 4.3. Prepare an estimate of materials required for HT distribution line (11 KV) within 2 km and load of 2000 KVA maximum and standard spans involving calculation of the size of conductor (from conductor chart), current carrying capacity and voltage regulation of the size of conductor (from conductor chart), current carrying capacity and voltage regulation consider action using ACSR.
March	UNIT-V	**5. OVER HEAD SERVICE LINES** 5. 1 Components of service lines, service line (cables and conductors), bearer wire, lacing rod. Ariel fuse, service support, energy box and meters etc. 5. 2 Prepare and estimate for providing single phase supply of load of 5 KW (light, fan, socket) to a single stored residential building. 5. 3 Prepare and estimate for providing single phase supply load of 3KW to each floor of a double stored building having separate energy meter.
April		5. 4 Prepare one estimate of materials required for service connection to a factory building with load within 15 KW using insulated wire. 5. 5 Prepare one estimate of materials required for service connection to a factory building with load within 15 KW using bare conductor and insulated wire combined.
April	UNIT-VI	**6. ESTIMATING FOR DISTRIBUTION SUBSTATIONS** 6. 1 Prepare one materials estimate for following types of transformer substations. 6.1.1 Pole mounted substation. 6.1.2 Plinth Mounted substation.

SUBJECT-Th2. SWITCH GEAR AND PROTECTIVE DEVICES		
NAME OF FACULTY-Chinmaya Kumar Patra		
January	UNIT-I	**1. INTRODUCTION TO SWITCHGEAR** 1.1 Essential Features of switchgear. 1.2 Switchgear Equipment. 1.3 Bus-Bar Arrangement. 1.4 Switchgear Accommodation.

		1.5 Short Circuit.
		1.6 Short circuit.
		1.7 Faults in a power system.
January	UNIT-II	**2. FAULT CALCULATION**
		1.1 Symmetrical faults on 3-phase system.
		1.2 Limitation of fault current.
		2.3 Percentage Reactance.
		2.4 Percentage Reactance and Base KVA.
February		2.5 Short – circuit KVA.
		2.6 Reactor control of short circuit currents.
		2.7 Location of reactors.
		2.8 Steps for symmetrical Fault calculations.
		Solve numerical problems on symmetrical fault.
February	UNIT-III	**3. FUSES**
		3.1 Desirable characteristics of fuse element.
		3.2 Fuse Element materials.
		3.3 Types of Fuses and important terms used for fuses.
		3.4 Low and High voltage fuses.
		3.5 Current carrying capacity of fuse element.
		3.6 Difference Between a Fuse and Circuit Breaker.
February	UNIT-IV	**4. CIRCUIT BREAKERS**
		4.1 Definition and principle of Circuit Breaker.
		4.2 Arc phenomenon and principle of Arc Extinction.
		4.3 Methods of Arc Extinction.
		4.4 Definitions of Arc voltage, Re-striking voltage and Recovery voltage.
		4.5 Classification of circuit Breakers.
		4.6 Oil circuit Breaker and its classification.
		4.7 Plain brake oil circuit breaker.
		4.8 Arc control oil circuit breaker.
		4.9 Low oil circuit breaker.
		4.10 Maintenance of oil circuit breaker.
		4.11 Air-Blast circuit breaker and its classification.
		4.12 Sulphur Hexa-fluoride (SF6) circuit breaker.
		4.13 Vacuum circuit breakers.
		4.14 Switchgear component.
		4.15 Problems of circuit interruption.
		4.16 Resistance switching.
		Circuit Breaker Rating.
March	UNIT-V	**5. PROTECTIVE RELAYS**
		5.1 Definition of Protective Relay.
		5.2 Fundamental requirement of protective relay.
		5.3 Basic Relay operation
		5.3.1. Electromagnetic Attraction type
		5.3.2. Induction type
		5.4 Definition of following important terms
		5.5 Definition of following important terms.
		5.5.1. Pick-up current.
		5.5.2. Current setting.
		5.5.3. Plug setting Multiplier.
		5.5.4. Time setting Multiplier.

		5.6 Classification of functional relays 5.7 Induction type over current relay (Non-directional) 5.8 Induction type directional power relay. 5.9 Induction type directional over current relay. 5.10 Differential relay 5.10.1. Current differential relay 5.10.2. Voltage balance differential relay. 5.11Types of protection
March	UNIT-VI	**6. PROTECTION OF ELECTRICAL POWER EQUIPMENT AND LINES** 6.1 Protection of alternator. 6.2 Differential protection of alternators. 6.3 Balanced earth fault protection. 6.4 Protection systems for transformer. 6.5 Buchholz relay. 6.6 Protection of Bus bar. 6.7 Protection of Transmission line. 6.8 Different pilot wire protection (Merz-price voltage Balance system) 6.9 Explain protection of feeder by over current and earth fault relay.
April	UNIT-VII	**6. PROTECTION AGAINST OVER VOLTAGE AND LIGHTING** 7.1. Voltage surge and causes of over voltage. 7.2. Internal cause of over voltage. 7.3. External cause of over voltage (lighting) 7.4. Mechanism of lightning discharge. 7.5. Types of lightning strokes. 7.6. Harmful effect of lightning. 7.7. Lightning arresters and Type of lightning Arresters. 7.7.1. Rod-gap lightning arrester. 7.7.2. Horn-gap arrester. 7.7.3. Valve type arrester. 7.8. Surge Absorber
April	UNIT-VIII	**7. STATIC RELAY:** 8. 1 Advantage of static relay. 8. 2 Instantaneous over current relay. 8. 3 Principle of IDMT relay.

SUBJECT-Th3.CONTROL SYSTEM ENGINEERING		
NAME OF FACULTY-Ranjita Kumari Sahu		
January	UNIT-I	**1. FUNDAMENTAL OF CONTROL SYSTEM** 1.1. Classification of Control system 1.2. Open loop system & Closed loop system and its comparison 1.3. Effects of Feed back 1.4. Standard test Signals(Step, Ramp, Parabolic, Impulse Functions) 1.5. Servomechanism
January	UNIT-II	**2. MATHEMATICAL MODEL OF A SYSTEM** 2.1. Transfer Function & Impulse response, 2.2. Properties, Advantages & Disadvantages of Transfer Function 2.3. Poles & Zeroes of transfer Function 2.4. Simple problems of transfer function of network. 2.5. Mathematical modeling of Electrical Systems(R, L, C, Analogous systems)

February	UNIT-III	**3. CONTROL SYSTEM COMPONENTS** 3.1. Components of Control System 3.2. Gyroscope, Synchros, Tachometer, DC servomotors, Ac Servomotors.
February	UNIT-IV	**4. BLOCK DIAGRAM ALGEBRA & SIGNAL FLOW GRAPHS** 4.1. Definition: Basic Elements of Block Diagram 4.2. Canonical Form of Closed loop Systems 4.3. Rules for Block diagram reduction 4.4. Procedure for of Reduction of Block Diagram 4.5. Simple Problem for equivalent transfer function 4.6. Basic Definition in Signal Flow Graph & properties 4.7. Construction of Signal Flow graph from Block diagram 4.8. Mason's Gain formula 4.9. Simple problems in Signal flow graph for network
March	UNIT-V	**5.TIME RESPONSE ANALYSIS.** 5 . 1 Time response of control system. 5 . 2 Standard Test signal. 5.2.1. Step signal, 5.2.2. Ramp Signal 5.2.3. Parabolic Signal 5.2.4. Impulse Signal 5 . 3 Time Response of first order system with: 5.3.1. Unit step response 5.3.2. Unit impulse response. 5 . 4 Time response of second order system to the unit step input. 5.4.1. Time response specification. 5.4.2.Derivation of expression for rise time, peak time, peak overshoot, settling time and steady state error. 5.4.3. Steady state error and error constants. 5 . 5 Types of control system.[Steady state errors in Type-0, Type-1, Type-2 system] 5 . 6 Effect of adding poles and zero to transfer function. 5 . 7 Response with P, PI, PD and PID controller.
March	UNIT-VI	**6. ANALYSIS OF STABILITY BY ROOT LOCUS TECHNIQUE.** 5 . 1 Root locus concept. 6 . 2 Construction of root loci. 6 . 3 Rules for construction of the root locus. 6 . 4 Effect of adding poles and zeros to G(s) and H(s).
April	UNIT-VII	**7. FREQUENCY RESPONSE ANALYSIS.** 7 . 1 Correlation between time response and frequency response. 7 . 2 Polar plots. 7 . 3 Bode plots. 7 . 4 All pass and minimum phase system. 7 . 5 Computation of Gain margin and phase margin. 7 . 6 Log magnitude versus phase plot. 7 . 7 Closed loop frequency response.
April	UNIT-VIII	**8. NYQUIST PLOT** 6.1 Principle of argument. 6.2 Nyquist stability criterion. 6.3 Niquist stability criterion applied to inverse polar plot. 6.4 Effect of addition of poles and zeros to G(S) H(S) on the shape of Niquist plot. 6.5 Assessment of relative stability.

		6.6 Constant M and N circle 6.7 Nicholas chart.
SUBJECT-Th4. RENEWABLE ENERGY SYSTEMS		
NAME OF FACULTY-Siba Prasad Panda		
January	UNIT-I	**1. Introduction to Renewable energy:** 1.1. Environmental consequences of fossil fuel use. 1.2. Importance of renewable sources of energy. 1.3. Sustainable Design and development. 1.4. Types of RE sources. 1.5. Limitations of RE sources. 1.6. Present Indian and international energy scenario of conventional and RE sources
January February	UNIT-II	**2. Solar Energy**: 2.1. Solar photovoltaic system-Operating principle. 2.2. Photovoltaic cell concepts 2.2.1. Cell, module, array, Series and parallel connections. Maximum power point tracking (MPPT). 2.3. Classification of energy Sources. 2.4. Extra-terrestrial and terrestrial Radiation. 2.5. Azimuth angle, Zenith angle, Hour angle, Irradiance, Solar constant. 2.6. Solar collectors, Types and performance characteristics, 2.7. Applications: Photovoltaic - battery charger, domestic lighting, street lighting, water pumping, solar cooker, Solar Pond.
March	UNIT-III	**3. Wind Energy:** 3.1. Introduction to Wind energy. 3.2. Wind energy conversion. 3.3. Types of wind turbines 3.4. Aerodynamics of wind rotors. 3.5. Wind turbine control systems; conversion to electrical power: 3.6. Induction and synchronous generators. 3.7. Grid connected and self excited induction generator operation. 3.8. Constant voltage and constant frequency generation with power electronic control. 3.9. Single and double output systems. 3.10. Characteristics of wind power plant.
March	UNIT-IV	**4. Biomass Power:** 4.1. Energy from Biomass. 4.2. Biomass as Renewable Energy Source 4.3. Types of Biomass Fuels - Solid, Liquid and Gas. 4.4. Combustion and fermentation. 4.5. Anaerobic digestion. 4.6. Types of biogas digester. 4.7. Wood gassifier. 4.8. Pyrolysis,. 4.9. Applications: Bio gas, Bio diesel
April	UNIT-V	**5. Other Energy Sources** 5.1. Tidal Energy: Energy from the tides, Barrage and Non Barrage Tidal power systems. 5.2. Ocean Thermal Energy Conversion (OTEC). 5.3. Geothermal Energy – Classification.

5.4. Hybrid Energy Systems.
5.5. Need for Hybrid Systems.
5.6. Diesel-PV, Wind-PV, Microhydel-PV.
5.7. Electric and hybrid electric vehicles.

TOTAL NO. OF CLASSES	**REMARK**

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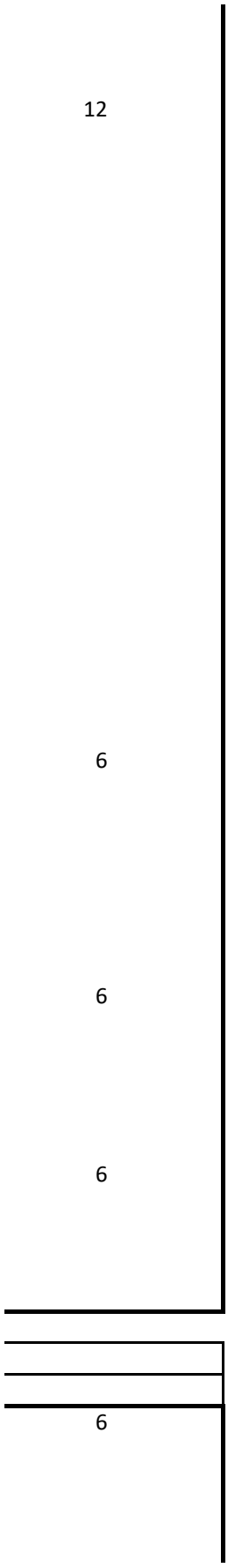
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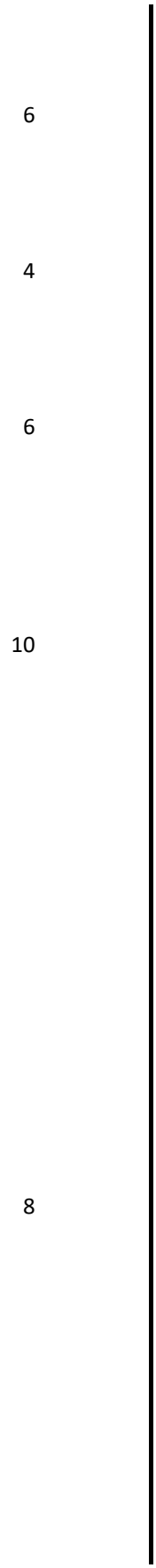
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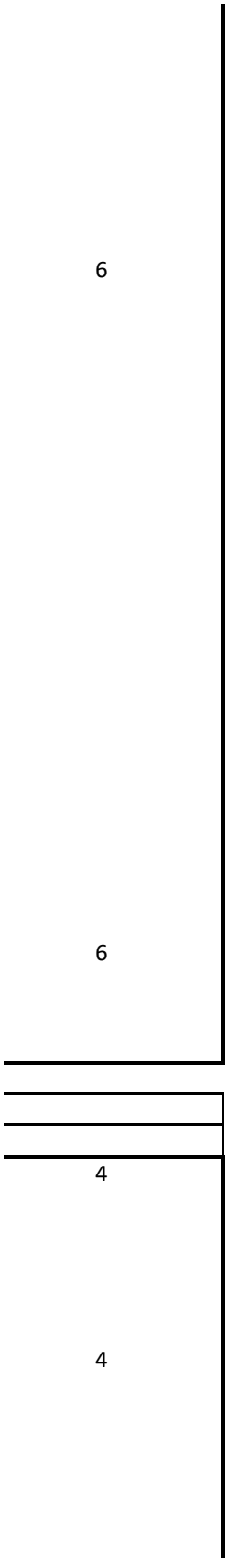
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