

3RD SEM

TEACHING SCHEME

Subject code	Subject	Teaching Scheme				Examination Scheme			
		T	Tut	Pra	C	(E)	(M)	(I)	Total
3330901	AC CIRCUITS	3	2	2	7	70	30	50	150
3330902	D C MACHINES AND TRANSFORMER	4	0	4	8	70	30	100	200
3330903	ELECTRICAL INSTRUMENTATION	4	0	2	6	70	30	50	150
3330904	ELECTRICAL POWER GENERATION	4	2	0	6	70	30	50	150
3330905	ELECTRONICS COMPONENTS AND CIRCUITS	4	0	2	6	70	30	50	150
	TOTAL	19	4	10	33	350	180	300	800

Syllabus(333901) AC CIRCUITS

Teaching Scheme			Evaluation Scheme			
Theory	Tutorial	Practical	Mid Term	Internal	University Exam	Credits
3	2	2	30	50	70	7

1. **AC Fundamentals** : Principle of generating an alternating voltage , Cycle, Time period, Frequency, Amplitude, Phase and Phase difference, Average value, R.M.S. value, Form factor, Peak Factor and Power Factor, Vector representation of alternating quantities, addition, subtraction, multiplication and division.
2. **AC Series circuits** : Waveforms, phasor diagram and expression of voltage, current and power in pure: Resistance, Inductance, Capacitance, AC through RL, RC, LC, RLC series circuit, Resonant frequency and Resonance condition in RLC series circuit.
3. **AC Parallel Circuits:** Solution of AC RL, RC, LC and RLC parallel circuits using phasor method, Solution of AC RL, RC, LC and RLC parallel circuits using admittance method, Resonant frequency and resonance condition in parallel AC circuits, Numerical based on AC parallel circuits and parallel resonance.
4. **Poly phase circuits** : Principle of generation of three phase alternating voltage, Line and phase voltage, line and phase current ,Single and three phase circuits ,Three-phase star connection, Three phase delta connection.
5. **Power in AC Circuits:** Active, reactive and apparent power with examples, Lagging, leading power and unity power factor , Illustrate the effects of power factor , Effects of poor power factor.

Reference Books: Principles of Electrical Engineering , B. R. Gupta

Syllabus of (333902) D C MACHINES AND TRANSFORMERS

Teaching Scheme			Evaluation Scheme			
Theory	Tutorial	Practical	Mid Term	Internal	University Exam	Credits
4	0	4	30	100	70	8

1. **Energy Conversion Principles** : Law of conservation of energy ,Role of electrical energy and uses, Electro-mechanical energy conversion principle and EMF ,Singly excited and doubly excited electrical machines.
2. **DC Generators** : Construction and materials used for various parts of DC generator, Functions of various parts of DC generator. ,EMF equation of DC generator ,Working principle of DC generator ,Simplex lap and wave winding, Different types of DC generators , Characteristics of various types DC generators, Efficiency and losses of DC generator, Armature reaction and its effects and commutation .
3. **DC Motors** : Working principle of DC motor, back emf, Torque equation for DC motor, Need DC motor starters ,Construction and working of DC motor starters, Series, Shunt and Compound DC motors, Performance characteristics of DC Series, Shunt and Compound motor, Speed control of D.C. motor , Losses in DC motors and its computation ,Brake test, Swinburne's test, field test, Applications of DC Series, Shunt and compound motor.
4. **Single Phase Transformers:** Single phase transformer: Working principle, construction, materials used for different parts, EMF equation and transformation ratio, Core and shell type of transformers, Phasor diagram for load and different types of loads, Losses in transformer: Iron loss, Copper loss, Hysteresis loss and eddy current loss, Efficiency Condition for maximum efficiency of single phase transformer, Voltage regulation , Equivalent circuit of single phase transformer.
5. **Testing of Single Phase Transformers:** Direct load test, OC and SC test and Sumpner Test along with connection diagrams, efficiency and regulation of transformer, Derivation of equivalent circuit and its related parameters, Need of parallel operation, essential and desirable conditions for parallel operation, Parallel operation and load sharing of single phase transformer, Construction and working of autotransformer; welding transformer.

Reference Books: Electrical Technology , S.L. Uppal

Syllabus of (333903) ELECTRICAL INSTRUMENTATION

Teaching Scheme			Evaluation Scheme			
Theory	Tutorial	Practical	Mid Term	Internal	University Exam	Credits

4	0	2	30	50	70	6
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- 1. Fundamentals of measurement & instrumentation:** Methods of measurement -Direct and indirect methods,Types of Instruments - Indicating, integrating and recording, absolute and secondary instrument ,Deflecting, Controlling and damping torques, Range, true value, indicated value, correction, sensitivity, repeatability, reproducibility, precision, Accuracy, significant figure, etc. , Types and sources of error : gross error, systematic error , random error .
- 2. Potentiometers and Bridges:** Construction and working of DC potentiometer, and its applications , Dial type and Crompton type , Low, medium, and high resistance , Kelvin's double bridge , Medium resistance by Wheatstone bridge, Ammeter-voltmeter method, Ohmmeter, High resistance by Muggers, Earth resistance by Earth tester, Measurement of inductance and capacitance by Universal impedance bridge, A.C. bridge - Maxwell, Anderson, Hays, Desauty and Wien's bridge. (no phasor diagram)
- 3. Electromechanical Instruments:** Common errors in electromechanical instruments, Moving iron instruments: Ammeter, voltmeter, PMMC instruments: ammeter, voltmeter, Vibration galvanometer , Electrodynamometer type meter: ammeter, voltmeter, wattmeter, power factor meter , Induction type Energy meter (single phase, three phase) , Hot wire type instruments, Frequency meter, Tri vector meter, Maximum demand meter, Phase sequence indicator, Solid state energy meter, Clip on meter, Extension of range using shunt, multipliers and derive equation for them, Extension of range of meters using instrument transformer like CT and PT.
- 4. Calibration and Testing:** Calibration and its importance, Calibration of ammeter, voltmeter and wattmeter and single phase energy meter(along with adjustments) as per IS.
- 5. Transducers:** Basic requirements of transducers , Classification based on : Transduction phenomenon, type of application, types of input and output signal, electrical principle involved, Resistive Transducers, Inductive Transducers: LVDT, RVDT, Capacitive Transducers, Piezoelectric Transducers, Strain Gauge Transducers (unbonded and bonded), Thermocouple, RTD, Thermistor and semiconductor sensors, Opto- electronic devices :Photo emissive cells, Photoconductive cells, Photodiode, Photo transistor, Photovoltaic cells, Photo optic transducer .

Reference Books: Electrical and electronic instruments, A .K . Sawhney

Syllabus of (333904) ELECTRICAL POWER GENERATION

Teaching Scheme			Evaluation Scheme			
Theory	Tutorial	Practical	Mid Term	Internal	University Exam	Credits

4	2	0	30	50	70	6
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- 1. Thermal Power Station:** Energy conversion process for thermal power station with plant layout ,Selection criteria for site of thermal power station, Line diagram of thermal power station (TPS); Different cycles of TPS, Major equipment and auxiliaries of TPS (including Boiler, steam turbine, Turbo Generator, super heater, economizer and electro static precipitator) ,Load curve and load duration curve , Base load and peak load power plants , Safe Practices of TPS ,Pollution generated by thermal power stations and methods to reduce them, Principle of chimney and concept of draught , Major TPS in Gujarat .
- 2. Hydro Power Station:** Energy conversion process for hydro-power station (HPS) with plant layout ,Selection of site for HPS site ,Major features of HPS ,Classification of HPS: based on head, Storage and pondage , Plant Layout, types of hydro turbines; Auxiliaries, Safe Practices of HPS ,Difference between Generators for Thermal Plant and Hydro Plants, Advantages of Hydro Power Plants and their effect on ecology/environment , Hydro power stations in Gujarat .
- 3. Nuclear Power Station:** Energy conversion process for NPS: Nuclear fusion and fission, Chain reaction ,Selection of site for NPS, Working of nuclear power station, Various types of reactors , Special precautions for NPS ,Advantages and disadvantage of NPS ,Nuclear power stations in Gujarat.
- 4. Solar Power Plant :** Solar constants, Measurement of solar radiations , Large (more than 1 MW) Solar photovoltaic (PV) and concentrated solar power (CSP) solar plants in Gujarat , Solar Energy Conversion of CSP, CSP generators, construction and working principle , construction of a solar PV systems: Solar cell, Module, Panel and array , Types of solar PV system: Stand –Alone,, Grid-Tied, Hybrid system , Safety precautions of Solar PV systems.
- 5. Wind Power Plant:** Anemometer, wind vane, site selection, Power of the wind, power curve of wind turbines, Large wind farms in Gujarat, Safety precautions to be during the routine maintenance of large and small wind turbines, HAWT and VAWT , Downwind and upwind wind turbines , Geared wind power plants (WPPs), direct-drive WPPs and Hybrid (semi-geared) WPPs , Stall control, pitch control and active stall control of WPPs , Squirrel Cage Induction Generators (SCIG), wound rotor (WRIG), doubly-fed (DFIG), wound rotor synchronous generator (WRSG), Permanent magnet synchronous generator (PMSG) , Direct-drive and geared small wind turbines, Drag and lift principle of rotation of wind turbine rotors.
- 6. Captive power plant and other renewable energy sources:** Electrical energy conversion of DG sets, advantages and limitations, Electrical energy conversion of gas-based power plants, advantages, and limitations, Electrical energy conversion of biomass energy, advantages and limitations, Electrical energy conversion of ocean technologies; tidal, wave, ocean current, ocean energy thermal conversion (OTEC), advantages and limitations, Electrical energy conversion of Geothermal energy, advantages and limitations.

Reference Books: Electrical Power system , V.K. Mehta

Syllabus of (333905) ELECTRONIC COMPONENTS AND CIRCUITS

Teaching Scheme			Evaluation Scheme			
Theory	Tutorial	Practical	Mid Term	Internal	University Exam	Credits
4	0	2	30	50	70	6

1. **Semiconductor Diode and its Applications:** Intrinsic and extrinsic semiconductor materials: P type, N type Semiconductors, P-N junction diode: Applications - Diode as rectifier, half wave, full wave and bridge wave rectifier, Need of Filters , C,L,LC, π filters.
2. **Transistors, voltage & power amplifiers:** PNP and NPN transistors, conduction through transistor leakage current, relationship between α and β , Transistor configuration & characteristics for CB,CE,CC ,Load line and biasing methods of transistor, Transistor as an amplifier : CE amplifier ,Cascade amplifiers ,Power amplifier: Class A amplifier: Series fed and transformer-coupled amplifier, Class B push-pull Amplifier Operation ,Amplifier Distortion.
3. **Oscillators and Other Semiconductor Devices:** Working principle of oscillators, Different types of oscillators: Hartley oscillator, Colpitts oscillator, Phase-Shift Oscillator, Wien Bridge Oscillator, Crystal Oscillator, Zener diode, Photo diode, LDR, Photovoltaic Cell, Light Emitting Diode, FET, MOSFET, DIAC, UJT, TRIAC and SCR.
4. **Simple circuit using IC:** Need of I.C., Operational amplifier (OPAMP),Characteristic and specification of OPAMP- IC 741 , IC 555 timer and applications , Block diagram of IC555 timer.
5. **Regulated power supplies :** Regulated power supply (module level), Shunt voltage regulator (module level) , Transistorized series voltage regulator (basic and with feedback, without derivation) , 3- Terminal Fixed/variable voltage regulator: 78xx, 79xx, LM317, Switch mode power supply(SMPS) , Uninterruptible power supply(UPS).

Reference Books: Electronic devices and circuit , Robert Boylestad