SEMESTER-3

ELECTRICAL & ELECTRONICS ENGINEERING

COURSE TITLE : ENVIRONMENTAL SCIENCE AND DISASTER MANAGEMENT
COURSE CODE : 3001
COURSE CATEGORY : P
PERIODS/ WEEK : 3
PERIODS/ SEMESTER : 45
CREDIT : 3

TIME SCHEDULE

MODULE	TOPICS	PERIODS
1	Renewable and Non-renewable Resources	12
2	Ecosystems	11
3	Environmental Pollution and its control	11
4	Hazards, Disasters and Mitigation measures	11
TOTAL		**45**

GENERAL COURSE OUTCOME

Sl.	Sub	Student will be able to
1	1	Understand the various types of natural resources and problems due to over exploitation.
	2	The components of various types of ecosystem and interrelation between the components.
	3	Understand various factors which cause environmental pollution and their control measures.
2	1	Understand various hazards & disasters, their affects and mitigation measures.

SPECIFIC COURSE OUTCOME:

MODULE - 1: RENEWABLE AND NON-RENEWABLE RESOURCES

1.1.0 Understand the various types of natural resources and problems due to over exploitation.
1.1.1 List various resources supplied by forest.
1.1.2 Explain various uses of forest resources.
1.1.3 Identify the problems due to over exploitation of forests.
1.1.4 Explain the problems due to de-forestation.
1.1.5 Identify the social and ecological problems due to dams.

1.1.6 Identify various sources of fresh water.
1.1.7 State the importance of water as a resource.
1.1.8 Explain the problems due to over consumption of water.
1.1.9 Identify the causes of flood and drought.
1.1.10 Explain the reasons for the conflicts over water.
1.1.11 Describe the advantages and disadvantages due to large dams.
1.1.12 List various mineral resources.
1.1.13 State the problems due to mining.
1.1.14 Explain the environmental impacts due to mining.
1.1.15 State the reasons for global food crisis.
1.1.16 Explain impacts on food production due to adoption of modern agricultural practices.
1.1.17 Explain the problems due to the use of artificial pesticides and fertilizers.
1.1.18 Identify the causes for water logging, salinity and Eutrophication and the problems due to that.
1.1.19 Explain the world energy scenario and energy demands
1.1.20 List various conventional and non-conventional sources of energy.
1.1.21 Distinguish between renewable and non renewable sources of energy.
1.1.22 State the importance of renewable energy.
1.1.23 Explain the importance of energy conservation.
1.1.24 Define sustainable development and state its importance.
1.1.25 Explain why land is considered as a resource.
1.1.26 List the different types of resources from land.
1.1.27 Identify the causes for land degradation.
1.1.28 State the reasons for soil erosion, land slide and desertification.
1.1.29 Describe the control measures for land degradation.
1.1.30 Describe the role of an individual in conservation of resources and achieving sustainable development

MODULE – 2: ECOSYSTEMS

2.1.0 Understand the components of various types of ecosystem and interrelation between the components.

2.1.1 Define an Ecosystem.
2.1.2 Explain the biotic and abiotic components of an ecosystem.
2.1.3 Identify the producers, consumers and decomposers in an ecosystem.
2.1.4 Explain the role of producers, consumers and decomposers in an ecosystem.
2.1.5 State the meaning of what is meant by Biomes.
2.1.6 Explain the phenomenon Ecological Succession.
2.1.7 Explain food chain and food web.
2.1.8 State the inter dependence of each link in a food chain.
2.1.9 Explain the ecological pyramid.
2.1.10 Explain Biomagnifications and its impacts.
2.1.11 Explain the types, structure and characteristic features of forest ecosystem
2.1.12 Explain the types, structure and characteristic features of grassland ecosystem
2.1.13 Explain the types, structure and characteristic features of desert ecosystem
2.1.13 Explain the types, structure and characteristic features of aquatic ecosystem
2.1.14 Describe the importance of biodiversity and the need to conserve it.
2.1.15 Illustrate the effects of urbanization – Heat islands, stress on land and water
2.1.16 Identify the causes of global warming and the effects due to that.

MODULE – 3: ENVIRONMENTAL POLLUTION AND ITS CONTROL

3.1.0 Understand various factors which cause environmental pollution and their control measures.

3.1.1 Define environmental pollution.
3.1.2 Identify the factors contributing air pollution.
3.1.3 State the role of air pollution in global pollution.
3.1.4 Explain the effectsof air pollution.
5.1.5 State various methods to control air pollution.
5.1.6 Explain the functioning of air pollution control devices.
3.1.7 Identify the sources contributing to water pollution.
3.1.8 State the role of water pollution in global pollution.
3.1.9 Explain theeffectsof water pollution.
5.1.10 State various methods to control water pollution.
5.1.11 Explain the functioning of water pollution control devices.
3.1.12 Identify the sources contributing oil pollution.
3.1.13 State the role of oil pollution in marine pollution.
3.1.14 Explain the effectsof oil pollution.
5.1.15 State various methods to control oil pollution.
3.1.16 Identify the factors contributing marine pollution.
3.1.17 State the role of marine pollution in global pollution.
3.1.18 Explain the effectsof marine pollution.
5.1.19 State various measures to control marine pollution.
3.1.20 Identify the factors contributing noise pollution.
3.1.21 State the role of noise pollution in environmental stress.
3.1.22 Explain the effectsof noise pollution.
5.1.23 State various measures to control noise pollution.
3.1.24 Identify the factors contributing thermal pollution.
3.1.25 State the role of thermal pollution in global warming.
3.1.26 Explain the effectsof thermal pollution.
5.1.27 State various measures to control thermal pollution.
3.1.28 Identify the major nuclear hazards occurred in the world.
3.1.29 State the global affects of nuclear radiation.
3.1.30 Explain the local affects of nuclear pollution.
3.1.31 Identify various categories of solid wastes.
3.1.32 Explain various methods of solid waste management specific to each category of waste.
3.1.33 Explain the effectsdue to solid waste pollution.
3.1.34 Explain EIA and the need for EIA while implementing projects.
3.1.35 Identify the factors to be considered for conducting EIA of a mini-project.
3.1.36 Explain the role ofeach individual to control various aspects of environmental pollution.
3.1.37 Explain the case studies of cause and effect of each category of pollution.

MODULE – 4:HAZARDS, DISASTERS AND MITIGATION MEASURES

4.1.0 Understand various hazards & disasters, their affects and mitigation measures.

4.1.1 Define Hazard, Disaster, Vulnerability, Risk and Capacity.
4.1.2 Explain the relation between Hazard, Disaster, Vulnerability, Risk and Capacity.
4.1.3 State the factors influencing vulnerability and risk.
4.1.4 Explain assessment, evaluation and management of risk.

4.1.5 Identify the classifications of hazards based on various aspects.
4.1.6 Explain the causes for different types of disasters.
4.1.7 List the effectsof each type of disaster on human beings and ecosystem.
4.1.8 Illustrate major hazards under each category occurred in world as case study.
4.1.9 Explain the disaster management operation cycle.
4.1.10 Identify and explain various operations to be carried out during pre-disaster phase.
4.1.11 Identify and explain various operations to be carried out during emergency phase.
4.1.12 Identify and explain various operations to be carried out during post-disaster phase.
4.1.13 Explain the relationship between disaster and development.
4.1.14 Illustrate how health and disaster management are interrelated.
4.1.15 Explain the Institutional frame work of disaster management in India at National, state and district level and the role of each body.
4.1.16 Explain hazard zonation map.
4.1.17 Explain new & emerging approach in disaster management – Use of Early warning systems base on IT enabled services like GIS, GPS, MIS, DDS, Remote sensing etc.
4.1.18 Illustrate the community based disaster preparedness programmes as a mitigation measure.
4.1.19 Explain various preventive measures for disaster risk reduction.
4.1.20 Explain the need for safety audit - onsite and offsite safety audits to be done and formulation of emergency plans.
4.1.21 Explain the management plan for transportation accidents.
4.1.22 State the use of TREM card in accidents involving hazardous goods transport.
4.1.23 State the role of regulatory frame work and code of practice in disaster management.
4.1.24 Explain the role played by various acts related to disaster management.

CONTENT DETAILS

MODULE - 1: RENEWABLE AND NON-RENEWABLE RESOURCES

Natural resources and associated problems:

(a) Forest resources: Use and overexploitation, deforestation, case studies, mining, dams and their effects on Forests, Environment and tribal people.
(b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
(c) Mineral resources: Use and exploitation, environmental effects of Mining and extraction of mineral resources, case studies.
(d) Food resources: World Food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, Genetically modified crops – boon or bane, fertilizer-pesticide problems, water logging, salinity, Eutrophication, Case studies.
(e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Importance of energy conservation and sustainable development.
(f) Land resources: Land as a resource, land degradation, role of land use planning in sustainable development, human induced landslides, soil erosion and desertification.
(g) Role of individuals in the conservation of natural resources. Equitable use of resources for sustainable development.

(Students shall conduct a case study of any resource utilization as an assignment)

MODULE - 2: ECOSYSTEMS

Concept of an ecosystem, structure and functions of biotic and abiotic components of an ecosystem, producers, consumers and decomposers. Biomes, Ecological succession.
Food chains, food webs and ecological pyramids, Biomagnifications.
Introduction, types, characteristics features, structure and function of the following ecosystem:

(a) Forest ecosystem
(b) Grassland ecosystem
(c) Desert ecosystem
(d) Aquatic ecosystems (Ponds, streams, lakes, ox-bow lakes, rivers, estuaries, oceans)
(e) Concept of biodiversity - Importance of biodiversity conservation
(f) Urbanization and impacts on environment (Heat island, stress on water and soil), global warming, climate change, sea level rise.

(Students shall study the characteristic features of any local ecosystem as an assignment)

MODULE - 3: ENVIRONMENTAL POLLUTION AND ITS CONTROL

Definition of Environment and Environmental Pollution. Causes, effects and control measures of (a) Air pollution (b) Water pollution (c) Oil pollution (d) Marine pollution e) Noise pollution (f) Thermal pollution g) Nuclear hazards. Case studies in each type of pollution. Environmental stress.
Solid waste management: Causes, effects and control measures of urban and industrial wastes.
Introduction to Environment Impact Analysis. Role of an individual in prevention of pollution.
(Students should conduct the case study of any local pollution issue and suggest remedial measure as an assignment)

MODULE - 4: HAZARDS, DISASTERS AND MITIGATION MEASURES

Define: Hazard, Disaster, Vulnerability (Physical, Economic and Social vulnerability), Risk, Capacity and inter-relationship between them. Factors influencing vulnerability and risk. Risk management, assessment and evaluation.
Classification of disasters, causes and consequences – Natural disasters (cyclone, earth quake, tsunami, flood, drought, land slide, lightning, forest fire, volcanic eruption) and Human-induced disasters (Air, road & rail accidents, boat capsize, oil spill, building collapse, fire, industrial hazards, chemical hazards, explosion, war). Classification of disasters based on the origin (Water & climate based, geological origin, Chemical/industrial/nuclear disasters- Hazchem& MAH(Major Accident hazard) units, biologically related disasters, human induced disasters/accidents) - Case studies of each type of disaster.
Disaster management cycle - Operations in each phase – Pre-disaster phase (Planning, Preparedness, Prevention & Mitigation), Structural and Non-structural mitigation measures (Structural eg. Dams, embankment, stone walls, Installing early warning systems, disaster resistant constructions and non-structural - eg. Insurance, IEC-information-education-communication, land use zoning, preparedness plan, mock drills, costal shelter plantation) – Emergency phase (communication, evacuation, rescue search & relief operation, medical assistance) – Post disaster phase (Reconstruction and rehabilitation, economic & environmental aspects, Administrative & political aspects) - Relationship between disaster and development – Health and disaster management plan, holistic approach.
Disaster profile of India - Institutional frame work of disaster management in India (National, state and district level) – Hazard zonation map - New & emerging approaches in disaster management – Use of

information technology (GIS, GPS etc) in disaster management - Community based disaster preparedness - Disaster risk reduction - Safety audits, onsite and offsite emergency plans – Management of transportation accidents, use of TREM card.
Regulatory frame work and code of practice (Petroleum act-1934, Factories act-1948, Insecticide act-1968, Explosives act-1984, Environmental protection act-1986, Coastal regulation zone (CRZ) Act-1991, Disaster management Act-2005).

REFERENCE BOOKS

1.Environmental studies–From Crisis to Cure,R. Rajagopalan,Oxford UniversityPress, 2005
2.Environmental Science & Engineering, P. Anandan, R. Kumaravelan, Scitech.
3.Environmental Studies for Undergraduate courses, ErachBharucha, UniversitiesPress.
4.R.B.Singh (Ed). Disaster Management, Rawat Publication, New Delhi, 2000
5.H.K.Gupta (Ed). Disaster Management, Universities Press India, 2003

COURSE TITLE : ANALOG DEVICES AND CIRCUITS
COURSE CODE : 3031
COURSE CATEGORY : B
PERIODS/WEEK : 4
PERIODS/SEMESTER : 60
CREDITS : 4

TIME SCHEDULE

MODULE	TOPICS	PERIODS
1	Rectifiers Wave shaping Circuits	15
2	Amplifiers & Feedback Concept	15
3	Oscillators & Multivibrators	15
4	Operational Amplifiers Applications	15
	Total	**60**

Course Outcome:

Sl.	Sub	**On completion of this course the student will be able:**
1	1	To understand the working of rectifiers.
	2	To know the working of wave shaping circuits.
2	1	To understand different types of amplifier circuits.
	2	To understand the feedback concept.
3	1	To understand the oscillator circuits.
	2	To understand the multi-vibrator circuits.
4	1	To know the principle of operation of op-amp.
	2	To understand the applications of op-amp.

Specific Outcome:

MODULE I Rectifiers and Wave shaping Circuits

1.1.0 To understand the working of rectifiers.

1.1.1 To explain active and passive components.
1.1.2 To describe the construction and principles of Half-wave rectifying circuits with wave forms.
1.1.3 To describe the construction and principles of full wave-(Centre tap and Bridge) rectifying circuits with wave forms.
1.1.4 To determine the Peak inverse Voltage, Ripple factor, regulation and efficiency
1.1.5 To differentiate different types of rectifiers-half wave, full wave
1.1.6 To compare different types filter circuits and wave forms of rectifiers
1.1.7 To using capacitor input filter, Inductor &π Filter
1.1.8 To describe regulator using zener diode
1.1.9 To describe the working of regulator using 7805, 7905 ICs

1.2.0 To know the working of wave shaping circuits.

1.2.1 To categorize clipping circuits– (series, shunt, biased, Double Ended)
1.2.2 To categorize clamping circuits - (positive, negative,)
1.2.3 To differentiate clipping and clamping circuits

MODULE II Amplifiers & feedback concept

2.1.0 To understand different types of amplifier circuits.

2.1.1 To describe transistor as an amplifiers.
2.1.2 To describe circuit diagram and working of Common Base amplifier and Common emitter amplifier.
2.1.3 To categorize different schemes of amplifier coupling- Importance.
2.1.4 To discriminate R.C. coupled, transformer coupled and direct coupled amplifiers
2.1.5 To plot frequency responses of R.C coupled, transformer coupled and direct coupled amplifiers and write necessary justification.
2.1.6 To define lower and upper cut off frequencies, band width, and 3dB points.
2.1.7 To identify the importance of impedance matching in power amplifier.
2.1.8 To analyze the operation of a single stage amplifier.
2.1.9 To analyze the operation of Class A, Class B and class C amplifiers.
2.1.10 To describe the push pull amplifier.
2.1.11 To explain complimentary, symmetry, push pull amplifiers.

2.2.0 To understand the feedback concept

2.2.1 To define the concept of feedback.
2.2.2 To describe the positive and negative feedback.

MODULE III Oscillators & Multivibrators

3.1.0 To understand the oscillator circuits.

3.1.1 To describe the principle of oscillation.
3.1.2 To state the concept of Barkhausen's criterion.
3.1.3 To illustrate the conditions of sustained oscillation.
3.1.4 To describe the operation of the following oscillators.
a) Tuned collector
b) Hartley
c) Colpitts
d) R-C phase shift
e) Crystal

3.2.0 To understand the multi-vibrator circuits.

3.2.1 To explain astable multi vibrator circuits.
3.2.2 To explain mono stable multi vibrator circuits.
3.2.3 To explain bistable multi vibrator circuits.
3.2.4 To distinguish working of different multi vibrator circuits with wave forms-applications.
3.2.5 To describe the working of astable & mono stable multi vibrator circuits using IC 555.
3.2.6 To explain the Schmitt trigger circuit, meaning of UTP and LTP.
3.2.7 To list out the applications of Schmitt trigger.

MODULE IV Operational amplifiers & applications

4.1.0 To know the principle of operation of op-amp.

4.1.1 To illustrate the characteristics of an ideal operational amplifier.
4.1.2 To explain the concept of virtual ground.
4.1.3 To describe the characteristics of ideal op-amplifier.
4.1.4 To explain inverting & non inverting amplifiers using op-amplifier.

4.2.0 To understand the applications of op-amp.

4.2.1 To describe adder, subtractor using op-amplifier.
4.2.2 To describe Integrator, differentiator using op-amplifier.
4.2.3 To explain Op-Amp as comparator.
4.2.4 To identify the zero crossing detector, level detector, Schmitt trigger using op-amplifier.
4.2.5 To describe the working principle of half wave precision rectifiers.
4.2.6 To describe the working principle of full wave precision rectifiers.

CONTENT DETAILS

MODULE I

Introduction. Active and passive components-different types of resistors-different types of capacitors-inductors. Rectifiers - Regulators & wave shaping - Half wave - full wave(Centre tap and bridge type) rectifiers using diodes – wave forms – Peak Inverse voltage - ripple factor – regulation& efficiency - comparison of different types of rectifiers, filters – different types-capacitor input, inductor input & π filter-zener diode regulator- Regulator using 7805,7905 ICs-Clipping circuits – series – shunt – biased type – double Ended clipper circuits - Clamping circuits – positive -negative clamping circuits

MODULE II

Amplifiers - Principle of amplification , Common Base, Common Emitter Amplifiers using Transistors– Types of Amplifiers – Different scheme of coupling -R.C coupled and transformer coupled , direct coupled – frequency response – 3dB -upper and lower cut off frequencies – Bandwidth – concept of Voltage& Power amplifiers – Operation of single stage Amplifiers –Class A, B &C types –comparison of push pull amplifiers- working – advantage – complimentary symmetry push pull amplifier- working – feedback in amplifier – types of feedback (positive, Negative)-applications of feedback.

MODULE III

Oscillators and Multi vibrators - Concept of Barkhausen's criterion - condition for oscillations – Classifications of oscillators – tuned collector, Hartley , Colpitts , RC-Phase shift - multi vibrator circuits - astable, monostable Bistable multivibrators – applications. Astable& Monostable multivibrator using IC 555- Schmitt trigger – UTP and LTP –applications.

MODULE IV

Introduction to Operational amplifies - Characteristics of ideal and actual op-amp - concept of virtual ground – Input offset voltage, input offset current, input bias current, output offset voltage, CMRR Op-amp circuits- inverting amplifier, non-inverting amplifier (derivation needed), voltage follower, comparator, difference amplifier, summing amplifier, integrators, differentiators - Application of op-amp - Zero crossing detector, positive and negative voltage level detector – Schmitt trigger, Half-wave and full wave precision - Rectifier using Op-Amps.

TEXT BOOKS

1. V.K.Mehta. Principles of Electronics. S Chand &co.
2. R.S. Sedha. Applied Electronics. S Chand &co.
3. Ram Gayakwad. Op-Amps and Linear Integrated Circuits. Prentice hall India

REFERENCES

1. B.L.Theraja. Electrical Technology. Vol-IV: S Chand &co.
2. Kumar A. Anand. Fundamentals of Digital circuits: PHI Learning

COURSE TITLE : ELECTRICAL MEASURING INSTRUMENTS

COURSE CODE : 3032
COURSE CATEGORY : B
PERIODS/WEEK : 5
PERIODS/SEMESTER : 75
CREDITS : 5

TIME SCHEDULE

MODULE	TOPICS	PERIODS
1	Theory and Classification of Measuring Instruments	19
2	Measurement of Power and Energy	19
3	Measurement of Resistance, Inductance and Capacitance	19
4	Special Purpose Measuring Instruments	18
Total		**75**

Course Outcome:

Sl.	Sub	**On completion of this course the student will be able:**
1	1	To understand various types of electrical measuring instruments.
	2	To understand the theory of operation.
2	1	To comprehend with the construction and working of wattmeter.
	2	To comprehend with construction and working of energy meter.
3	1	To comprehend with the various methods for measurement of resistance.
	2	To comprehend with the methods for measurements of inductance and capacitance
4	1	To know various types of special purpose measuring instruments used for electrical measurements.
	2	To understand the working of digital meters for electrical measurements.

Specific Outcome:

MODULE I Theory and classification of measuring instruments

1.1.0 **To understand various types of electrical measuring instruments.**

1.1.1 To list various types of electrical measuring instruments.
1.1.2 To illustrate the mechanism for the production of deflecting torque.
1.1.3 To illustrate the mechanism for the production of controlling torque.
1.1.4 To illustrate the mechanism for the production of damping torque.
1.1.5 To state the effects of control and damping torque.

1.2.0 **To understand the theory of operation.**

1.2.1 To describe the construction of permanent magnet moving coil instrument.
1.2.2 To describe the working of permanent magnet moving coil instrument
1.2.3 To describe the construction of moving iron instruments.
1.2.4 To describe the working of moving iron instruments.
1.2.5 To describe the extension of the range of ammeter and voltmeter.
1.2.6 To distinguish between moving iron and moving coil instruments.
1.2.7 To state the applications of MI and MC instruments.
1.2.8 To explain how the rectifier type ammeter and voltmeter works.
1.2.9 To list the sources of error in measuring instruments and find remedies.

MODULE II Measurement of power and energy

2.1.0 To comprehend with the construction and working of wattmeter.

2.1.1 To draw the construction details of dynamometer type wattmeter.
2.1.2 To explain the principles of operation of dynamometer type wattmeter with neat sketch.
2.1.3 To identify the sources of errors in dynamometer type instruments.
2.1.4 To illustrate the correction factor and theory of compensated wattmeter.
2.1.5 To determine the multiplication factor of wattmeter.

2.2.0 To comprehend with construction and working of energy meter.

2.2.1 To describe the construction of single phase induction type energy meter.
2.2.2 To describe the working of single phase induction type energy meter
2.2.3 To identify the sources of errors in induction type energy meter.
2.2.4 To draw the schematic diagram of three phase energy meter.
2.2.5 To calibrate the energy meter and wattmeter.
2.2.6 To draw the connection diagram for the measurement of three phase power by two wattmeter method.

MODULE III Measurement of resistance, inductance and capacitance

3.1.0 To comprehend with the various methods for measurement of resistance.

3.1.1 To categorize the resistance in low, medium and high.
3.1.2 To describe the methods of resistance measurement by voltmeter ammeter method
3.1.3 To describe the methods of resistance measurement by potentiometer method.
3.1.4 To describe the methods for measurement of medium resistance by Wheat stone's bridge.
3.1.5 To derive the value of unknown resistance using above bridge.
3.1.6 To draw the circuit diagram of insulation Megger.
3.1.7 To describe the working principle of insulation Megger
3.1.8 To describe the working principle of earth Megger.
3.1.9 To distinguish between insulation Megger and earth Megger.
3.1.10 To list the range of earth resistance of various electrical installations viz. domestic, substation and generating station.
3.1.11 To describe the procedure of measurement of earth resistance by earth Megger and the fall of Potential method.
3.1.12 To explain different methods for locating cable fault.

3.2.0 **To comprehend with the methods for measurements of inductance and capacitance**

3.2.1 To describe the construction of bridges(Maxwell Bridge & Anderson bridge)
3.2.2 To explain the Working of bridges(Maxwell Bridge & Anderson bridge)
3.2.3 To describe the measurements of inductance using bridge.
3.2.4 To describe the measurements of capacitance using bridges.

MODULE IV Special purpose measuring instruments

4.1.0 To know various types of special purpose measuring instruments used for electrical measurements.

4.1.1 To describe the working of reed type and indicating type frequency meter.
4.1.2 To explain the single phase and three phase power factor meter.
4.1.3 To explain the connections of phase sequence indicator and synchroscope.
4.1.4 To describe the principle and operation maximum demand indicator
4.1.5 To Explain about TOD meter.
4.1.6 To describe the working principle of CRO with block diagram.
4.1.7 To list the applications of CRO.

4. 2.0 To understand the working of digital meters for electrical measurements.

4.2.1 To describe the working of digital voltmeter.
4.2.2 To describe the block diagram of digital frequency meter.
4.2.3 To distinguish between analog and digital meters.

CONTENT DETAILS

MODULE – I

Classification and theory of Indicating Instruments - Classification of measuring instruments-Essential torques of indicating instruments – deflecting - controlling and damping torque - working principle of permanent magnet moving coil, dynamometer type and moving iron type instruments –torque equations-comparison of MC and MI instruments- Rectifier type instruments. Extension of range of DC voltmeter and ammeter – calculate values of shunt and multiplier– multi range instruments. Common errors in instruments and their remedies.

MODULE – II

Measurement of Power and Energy - Construction of dynamometer type wattmeter – common errors and their remedies- multiplication factor –Working principle of single phase induction type energy meter – construction- common errors and their remedies. Construction of poly phase energy meters –2 elements and 3 element type. Calibration of energy meter by direct loading and phantom loading. TOD meter –functions-method of connection and use.

MODULE – III

Measurement of Resistance, Inductance and capacitance. Wheat stone bridge -simple problems. Difficulties in the measurement of high resistance– insulation Megger – working principle of Megger-measurement of earth resistance and soil resistivity by earth tester. Localization of cable fault- Varley and Murray loop methods. Bridges-Maxwell's bridge-Schering bridge. LCR meter- applications

MODULE – IV

Instruments for special measurements - Measurement of frequency –working of vibrating reed type and indicating type frequency meters. Measurement of power factor –working principle of PF meters-connection diagram of single phase and three phase PF meters. Working principle and connection diagram of synchroscope. Working principle and connection diagram of phase sequence indicator. Ramp type digital voltmeters-block diagram -working principle. Cathode ray oscilloscope-classification- block diagram of digital oscilloscope – applications of CRO - Observation of waveforms measurement of – voltage - frequency - time period - phase and phase angle.

REFERENCE BOOKS

1. A.K Sawhney. Electrical and Electronics measurements and Instrumentation: Dhanapath Ray & co.
2. J.B Gupta. Electrical measurements and measuring instruments: S K Kataria & sons.
3. R K Rajput. Electrical measurements and measuring instruments: S Chand & co.
4. Edward William Golding, Frederick Charles Widdis. Electrical measurements and measuring instruments: Pitman

COURSE TITLE : FUNDAMENTALS OF AC SYSTEMS

COURSE CODE : 3033
COURSE CATEGORY : B
PERIODS/WEEK : 4
PERIODS/SEMESTER : 60
CREDITS : 4

TIME SCHEDULE

MODULE	TOPICS	PERIODS
1	Principle of alternating voltage generation	15
2	Alternating current circuits	15
3	Polyphase circuits	15
4	Measurement of power in three phase circuits	15
	Total	**60**

Course Outcome:

Sl.	Sub	**On completion of this course the student will be able:**
1	1	To comprehend the method of generation of voltage.
2	1	To understand the parameters and its effect in alternating current system.
	2	To understand the different types of interconnection and its effects.
3	1	To comprehend the generation of poly phase voltages.
	2	To understand the interconnections of poly phase system.
4	1	To understand the power measurement in poly phase system.
	2	To understand the effect of power factor in system.

Specific Outcome

MODULE I Principle of alternating voltage generation

1.1.1 To describe the generation of alternating voltages.
1.1.2 To explain the advantage of AC supply system.
1.1.3 To derive the equations of alternating voltage and currents.
1.1.4 To identify term related to alternating current
   i. instantaneous value
   ii. maximum value
   iii. average value
   iv. RMS value
1.1.5 To explain the term form factor and crest factor.
1.1.6 To illustrate vector representation of alternating quantities.
1.1.7 To describe the addition of alternating quantities.
1.1.8 To describe the addition and substation of vectors.
1.1.9 To compute simple problems.

MODULE II Alternating current circuits

2.1.1 To illustrate AC through pure inductances.
2.1.2 To illustrate AC through pure capacitor.
2.1.3 To illustrate AC through resistance and inductor.
2.1.4 To illustrate AC through resistance, inductor and capacitor.
2.1.5 To compute simple problems.
2.1.6 To describe phasor algebra.
2.1.7 To describe series circuits
2.1.8 To describe parallel circuits
2.1.9 To describe resonance and Q factor.
2.1.10 To compute problems.

MODULE III Polyphase circuits

3.1.1 To describe the generation of poly phase voltages.
3.1.2 To illustrate phase sequence, numbering of phases, interconnection of phases.
3.1.3 To explain the advantages of poly phase system.
3.1.4 To distinguish star connection.
3.1.5 To distinguish delta connections.
3.1.6 To compare star and delta system.
3.1.7 To distinguish the balanced star/ delta and delta / star conversions.
3.1.8 To compare star and delta connected lighting load.

3.1.9 To differentiate single phase and three phase systems.
3.1.10 To compute simple problems.

MODULE IV Measurement of power in three phase circuits

4.1.1 To explain the power measurement in AC circuits.
4.1.2 To describe the various methods for power measurement in three phase circuits.
4.1.3 To describe three wattmeter method for power measurement.
4.1.4 To describe two wattmeter method for power measurement.
4.1.5 To describe single wattmeter method for power measurement.
4.1.6 To distinguish between balanced load and unbalanced load.
4.1.7 To illustrate power factor in leading and lagging.
4.1.8 To describe the method of finding reactive volt-ampere by using two wattcmeters.
4.1.9 To describe the method of finding reactive volt-ampere by using one wattmeter in balanced load
4.1.10 To describe the methods of improving power factor.
4.1.11 To identify various power correction equipment.

CONTENT DETAILS

MODULE – I

Single turn alternator - voltage equation - e=Blv sinθ -simple problems – Advantages of - system – instantaneous value, peak value - r.m.s ,average, form factor, peak factor, waveform – cycle - Time period – frequency - simple problems - Phasor representation of alternating quantities - vector diagrams using r.m.s. Values - Addition and subtraction of alternating quantities by vector method - simple problems in Vector.

MODULE – II

A.C through pure R, L,C-equation R ,X_L ,Xc, Impedance Z - Phasor Algebra - Mathematical representation of vectors - polar form, Rectangular form, Complex form and trigonometric forms -conversion from polar form to rectangular form and vice versa - Addition, subtraction, multiplication &division of alternating quantities in these forms - Series circuits - through R L, R C, and R, L C circuits – active, Reactive and Apparent power, Power factor, Resonance in R-L-C series circuits - problems in series circuits (In polar and rectangular form) - Parallel A.C circuits - phasor method - solving problems in RL and RC parallel circuit - Resonance in parallel circuit-conductance – susceptance.

MODULE – III

Generation of poly phase-Advantages of 3 Φ system over 1Φ system - phase sequence-interconnection - star/delta-advantages of star system – conversion from star/delta – problems in 3 phase – voltage & current relation in star/delta-power - problems

MODULE – IV

Power measurements in circuits - power factor - power measurements in balanced load by 1 wattmeter, 2 wattmeter, 3wattmeter – power, p.f, Reactive Volt-ampere- simple problems - Balanced and unbalanced load - Methods of improving p.f - vector diagram - p.f correction-simple problems

REFERENCES

1. B.L Thereja. Electrical Technology. Vol-I. S Chand & co.
2. Metha.V.K*, Rohit* Metha. Basic Electrical Engineering. S Chand & co.
3. Ashfaq Husain. Basic Electrical Engineering. Dhanapath Rai & co.

COURSE TITLE : MECHANICAL ENGINEERING

COURSE CODE : 3034
COURSE CATEGORY : B
PERIODS/WEEK : 4
PERIODS/SEMESTER : 60
CREDITS : 4

TIME SCHEDULE

MODULE	TOPICS	PERIODS
1	Fluid Pressure and Measurements	15
2	Energy in Fluid Motion	15
3	Steam Boilers and IC Engines	15
4	Water Turbines and Pumps	15
Total		**60**

Course Outcome:

Sl.	Sub	**On completion of this course the student will be able:**
1	1	To understand fluid pressure
	2	To understand fluid pressure measurements.
2	1	To understand Bernoulli's theorem
	2	To know flow through pipes
3	1	To understand the working of steam boilers.
	2	To comprehend the working of IC Engines
4	1	To comprehend the working of water turbines.
	2	To understand the working of water pumps

Specific Outcome:

MODULE I Fluid Pressure and Measurements

1.1.1 To state atmospheric pressure, gauge pressure and absolute pressure.
1.1.2 To compute the absolute pressure from the given gauge pressure.
1.1.3 To explain how pressure can be measured using piezometer.
1.1.4 To list different types of manometers.
1.1.5 To compute the pressure difference between two pipe lines running full capacity.
1.1.6 To calculate the pressure inside a pipe line running in full capacity using a U tube manometer and an inverted U tube manometer.
1.1.7 To illustrate the working of differential manometer.
1.1.8 To explain how to calculate the pressure difference between two points of a pipe line running full capacity.
1.1.9 To know various types of flows-uniform flow - non-uniform flow - streamline flow – turbulent flow - steady and unsteady flow.

MODULE 2 Energy in Fluid Motion

2.1.1 To state the energy in fluid motion.
2.1.2 To define the datum head, pressure head and velocity head.
2.1.3 To state Bernoulli's theorem and its limitations.
2.1.4 To explain the constructional details of venture meter.
2.1.5 To calculate the discharge through the venture meter.
2.1.6 To identify flow through pipes.
2.1.7 To understand Chezy's and Darcy's formula.
2.1.8 To define the Hydraulic gradient line and total energy line.
2.1.9 To explain the water hammer and its effects.
2.1.10 To define laminar flow and turbulent flow.

MODULE 3 Steam Boilers and IC Engines

3.1.1 To explain the functions of steam generators.
3.1.2 To classify the steam boilers such as fire tube boilers and water tube boilers.
3.1.3 To explain the working of a simple boiler.
3.1.4 To compare fire tube and water tube boilers.
3.1.5 To illustrate the working of steam turbines.
3.1.6 To explain the working principle of steam turbines.
3.1.7 To classify the steam turbines.

3.1.8 To illustrate the different types of turbines used in thermal power stations.
3.1.9 To list the classifications of IC engines.
3.1.10 To explain the working of two stroke and four stroke petrol engines.
3.1.11 To explain the working of two stroke and four stroke diesel engines.
3.1.12 To compare two stroke & four stroke.
3.1.13 To compare petrol & diesel engines.

MODULE 4 Water Turbines and Pumps

4.1.1 To classify the water turbines.
4.1.2 To illustrate the impulse turbines.
4.1.3 To illustrate the reaction turbines.
4.1.4 To state the water power, Break power and overall efficiency.
4.1.5 To illustrate the working of Pelton wheel.
4.1.6 To describe the working of Francis and turbine.
4.1.7 To describe the working of Kaplan turbine.
4.1.8 To know choice of turbine based on specific speed.
4.1.9 To list the classification of various pumps.
4.1.10 To illustrate the working of reciprocating pump.
4.1.11 To illustrate the working of centrifugal pump.
4.1.12 To compare the centrifugal pump & reciprocating pump.
4.1.13 To distinguish airlift and deep well pumps (Description only).
4.1.14 To select a suitable water pump.

CONTENTS

MODULE – I

Fluid pressure and measurement of atmospheric pressure - gauge pressure and absolute pressure Piezometer – manometer – U tube – Inverted U tube- differential manometer – (Simple problems) Flow of Fluids Types of flow – uniform flow - non-uniform flow - streamline flow – turbulent flow - steady and unsteady flow.

MODULE – II

Energy in fluid motion- datum head - pressure head - velocity head – total energy of fluid in motion – Bernoulli's theorem - limitations – Practical application of Bernoulli's theorem – Venturi meter, (Simple problems) Flow through pipes major and minor losses – Loss of head at entrance - due to sudden enlargement - due to sudden contractions - Loss of head at exit of pipe – Frictional loss in a pipe (Simple problems) . Chezy's and Darcy's formula – Discharge through parallel pipes connected to reservoir

(Simple problems)- Water Hammer and its effect (description only) – Laminar and turbulent flow – critical velocity.

MODULE III

Steam Boilers Functions – classifications – fire tube and water tube – water tube boilers – Simple boiler –Brief explanation with line sketches – steam turbines – advantages over steam engine – types – working principles of impulse and reaction turbines (use line sketches) - IC Engines - Two stroke and Four Stroke - comparison of Petrol and diesel engines

MODULE IV

Water Turbines- Classifications of turbines – impulse and reaction turbines –define- water power - break power - overall efficiency – Pelton wheel - description of working – Reactions turbines -Francis turbine and Kaplan turbines – specific speed - Choice of turbine based on specific speed. Pumps Classifications- reciprocating pumps - centrifugal pump working - foot valve - Multistage pumps- propeller- jet - Airlift and deep well pumps (Description only).Selection of kW rating motor- pump set based on head, quantity of discharge and discharge pressure.

REFERENCES

1. R.S. Khurmi. A Textbook of Hydraulics: Khanna Publishers
2. R.S. Khurmi. A Textbook of Thermal Engineering: Khanna Publishers

COURSE TITLE : ELECTRICAL WORKSHOP PRACTICE
COURSE CODE : 3037
COURSE CATEGORY : B
PERIODS/WEEK : 6
PERIODS/SEMESTER : 90
CREDITS : 3

Course Objectives:

Sl.	Sub	**On completion of this course the student will be able:**
1	1	To comprehend with various wiring methods.
	2	To understand various wiring circuits in domestic and industrial wiring system.
	3	To comprehend with Electrical wiring.
	4	To understand the various tests on installations.
	5	To comprehend earthing and earth resistance measurements.
	6	To comprehend with maintenance of domestic appliances.

LIST OF PRACTICALS

- Safety precautions.
- Draw the standard layout symbols and standard circuit diagram symbols.

1. Familiarization of Electrical wiring accessories.
2. Carry out rigid PVC surface conduit wiring to control:
    a) One lamp by one switch.
    b) Two lamps and a socket outlet by independent switches.
    c) One lamp from two different places (stair case) by two switches.
    d) One lamp from multiple places using intermediate switch (more than two places).

e) Lamps from different places (Godown wiring).
f) Lamps from different places independently and from one specific place by a Master switch.
g) Lamps from different places in series -parallel (Hospital wiring).

3. Test the working of following lamps.
    a) Fluorescent lamps (with electromagnetic and electronic ballast).
    b) Sodium vapour lamp.
4. Carry out rigid PVC surface conduit wiring which contains Main switch, RCCB. Fuses (MCB), and sub circuits for light load and power load and control switches.
5. Conduct testing of electrical installation (must be performed on a real existing installation like wiring in the college building.)
    a) Insulation resistance test between conductors using an insulation tester.
    b) Insulation resistance test between conductor and earth using an insulation tester.
    c) Polarity test.
6. Conduct soil resistivity test using an earth tester.
7. Measure the resistance of the existing earthing arrangement using an earth tester.
8. Conduct checking of armature winding using a Growler.
9. Dismantle and assemble following domestic appliances.
    a) Iron box
    b) Mixer grinder/ Power drilling machine.
    c) Single phase motor.
    d) Ceiling and table fans.

COURSE TITLE : MECHANICAL ENGINEERING LAB
COURSE CODE : 3038
COURSE CATEGORY : B
PERIODS/WEEK : 3
PERIODS/SEMESTER : 45
CREDITS : 2

Course Objectives:

Sl.	Sub	**On completion of this course the student will be able:**
	1	To understand the energy from flow of water through pipes.
	2	To comprehend with different types of engines.
	3	To understand the performance of water wheels.
	4	To understand the performance of engines.
	5	To analyze different pumps
	6	To understand different turbines

LIST OF EXPERIMENTS.

Draw standard piping symbols.

1. To verify Bernoulli's theorem using apparatus.
2. To determine the coefficient of;
    i. Discharge of notches.
    ii. Venturi meter.
3. To determine the Cd of orifice by falling head method & constant head method.
4. Load test on Pelton wheel.
5. To determine the efficiency of a centrifugal pump and to plot the various characteristics.
6. To perform load test (economic speed test) on diesel engine.
7. To conduct load test on;
    i. Francis turbine.
    ii. Kaplan turbine.
8. To determine the efficiency of a reciprocating pump.
9. To study different pumps.
10. To study different turbines

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COURSE TITLE : ELECTRICAL MEASUREMENTS LAB
COURSE CODE : 3039
COURSE CATEGORY : B
PERIODS/WEEK : 6
PERIODS/SEMESTER : 90
CREDITS : 4

Course Objective:

Sl.	Sub	**On completion of this course the student will be able:**
	1	To understand various types of electrical measuring instruments.
	2	To know the measuring procedure and compute the result.
	3	To know the verification of laws.
	4	To understand different methods of resistance measurements.
	5	To understand various methods of power measurements in single phase and three phase.
	6	To understand the methods of calibrating wattmeter and energy meter.
	7	To understand the procedure for identifying the winding terminals (transformer, alternator, Induction motors).

LIST OF EXPERIMENTS

1. To draw front panel of the following measuring instruments and document meter details.
    a. MI type voltmeter and Ammeter.
    b. MC type voltmeter and Ammeter.
    c. Wattmeter –LPF
    d. Wattmeter –UPF
    e. Energy meter (Both electro-mechanical and Static)

2. To measure resistance of tungsten filament lamp by Voltmeter-Ammeter method to find hot and cold resistance from the VI graph.
3. To verify Kirchhoff's laws.
4. To verify superposition theorem.
5. To measure the Impedance and resistance of a coil and compute Inductance, inductive reactance. Power factor and PF angle.
6. To measure the impedance, resistance, inductance, capacitance of RLC series circuit draw vector diagram.
7. To measure the power and PF of a single phase LPF load by 3 ammeters and draw the phasor diagram.
8. To measure the power and PF of a single phase LPF load by 3 Voltmeter and draw the phasor diagram.
9. To measure the power and PF of three phase balanced load by 2 wattmeter method .
10. To calibrate a wattmeter by direct loading at UPF -plot the error curve.
11. To calibrate the wattmeter by phantom loading at UPF -plot the error curve.
12. To calibrate the Energy meter by direct loading at UPF -plot the error curve.
13. To calibrate energy meter by phantom loading at UPF.
14. To calibrate energy meter by phantom loading at 0.866pf lag and lead.
15. To calibrate energy meter by phantom loading at 0.5 pf lag and lead.

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