

TEACHING & EVALUATION SCHEME

DISCIPLINE: MECHANICAL								SEMESTER:- VI		
Sl. No.	Subject	Teaching Scheme			Evaluation Scheme					Total Marks
		L	T	P	Theory			Practical		
					End	Internal Assignment		End	Sessional	
	Theory				Exam	Class Test	Assignment	Exam		
1	EIM	4	1		80	15	5			100
2	Automobile Engg.	4	1		80	15	5			100
3	Environmental Pollution Control	4	1		80	15	5			100
4	Adv. Manf. Pro. & CAD/CAM	4	1		80	15	5			100
5	Elective	4	1		80	15	5			100
	Power Plant Engg.									
	Non Conventional Energy									
	Mechatronics									
	Practical									
1	Mech. Engg. Lab.-IV			4				50	50	100
2	CAD Lab			4					50	50
3	Project & Viva			6				50	50	100
	TOTAL	20	5	14	400	75	25	100	150	750

AUTOMOBILE ENGINEERING

Periods/Week : 4+1

Exam : 3hr

Total periods : 60

End exam Th : 80 marks

IA : 20marks

Total 100 marks

Topic wise distribution of periods

Sl. No	Topic	Periods
01	Introduction	03
02	Auto Engines	07
03	Auto electric System	07
04	Transmission System	12
05	Braking system	06
06	Front axel and steering	08
07	Frame, suspension and wheel	05
08	Cooling and lubrication	06
09	Fuel and ignition system	06
	Total Period	60

RATIONALE:

Automobiles are the principal mode of transport system. Their manufacture and maintenance gives a major scope for employment. Many entrepreneur pass out go for servicing of automobiles or trading/ manufacturing of auto components. Thus automobile engineering is an important subject to be in the regular curriculum of the mechanical engineers.

COURSE CONTENT (in terms of specific objectives):**1.0 Introduction**

- 1.1 Define automobile
- 1.2 Classify auto vehicles
- 1.3 Show the layout of automobile chassis with major components (line diagram)

2.0 Auto engine

- 2.1 State the manufacturer's specification of auto engines of motorcycle, scooter, car, & bus one from each
- 2.2 State the constructional and placement features of engine: motorcycle, scooter, car and bus
- 2.3 State the classification of engines basing on working principle, fuel used, position of cylinder, arrangement of cylinder

3.0 Auto electric system

- 3.1 Draw and explain the wiring diagram of
 - 3.1.1 Horn circuit
 - 3.1.2 Lighting circuit
 - 3.1.3 Cut-out circuit
 - 3.1.4 Voltage current regulator circuit

- 3.1.5 Flasher circuit
- 3.2 Explain the working of generator
- 3.3 Explain the working of starter motor
 - 3.3.1 Bendix type
 - 3.3.2 Over running clutch type
- 3.4 Explain ignition timing for petrol engine
 - 3.4.1 Explain the effect of advance and retard spark timing.
 - 3.4.2 State the common ignition troubles and its remedies.
- 3.5 Describe the construction of a sparking plug
 - 3.5.1 State and explain the specification of a spark plug.
 - 3.5.1.1 Define hot and cold plug.
- 4.0 Transmission system
 - 4.1 Explain the function and working of
 - 4.1.1 Single plate clutch used in Indian car.
 - 4.1.2 Multi plate clutch used in motor cycle.
 - 4.2 Explain the need of gear box in automobile
 - 4.3 Explain the working of 3 speed gear box.
 - 4.4 Explain the working of 4 speed gear box used in scooters.
 - 4.5 Differentiate between sliding mesh and synchromesh gear box.
 - 4.6 Explain the function of synchronizers with its components.
 - 4.7 Describe the working of a universal joint used in cars.
 - 4.7.1 Explain the need of a slip joint.
 - 4.8 Explain the construction of propeller shaft
 - 4.9 Explain the need of a differential
 - 4.9.1 State types of differential
 - 4.9.2 Explain the working of conventional type differential and state its limitation.
 - 4.9.3 State why a self locking type differential is used.
 - 4.10 Classify the rear axle used in automobile
 - 4.10.1 Explain with neat sketch the construction feature of rear axle used in Indian car.
- 5.0 Braking system
 - 5.1 Describe various types of braking system used in automobiles.
 - 5.1.1 Mechanical Brake (for Scooter)
 - 5.1.2 Hydraulic brake (for car)
 - 5.1.3 Air assisted hydraulic brake (for bus)
 - 5.1.4 Air brake (for Truck)
 - 5.2 Explain the working of
 - 5.2.1 Master cylinder
 - 5.2.2 Tandem master cylinder
 - 5.2.3 Slave cylinder
 - 5.2.4 Brake booster
 - 5.3 State the materials used for brake lining and its specification

- 6.0 Front axle and steering.
 - 6.1 Explain the function and operational details of front axle & stub axle.
 - 6.2 Define Ackerman principle of steering.
 - 6.3 State steering geometry.
 - 6.4 Explain the following.
 - 6.4.1 Toe-in
 - 6.4.2 Toe-out
 - 6.4.3 Caster
 - 6.4.4 Camber
 - 6.4.5 Kingpin inclination.
 - 6.5 Explain the steering linkage arrangement.
 - 6.6 Explain the working of power steering.
 - 6.6.1 State the advantages of power steering over conventional steering system.
- 7.0 Differentiate between different types of frames and frame construction.
 - 7.1 Describe the conventional suspension system for
 - 7.1.1 Rear axle
 - 7.1.2 Front axle
 - 7.2 Explain independent suspension system used in cars (coil spring and tension bars)
 - 7.3 Explain the working of a telescopic shock absorber.
 - 7.4 State tyre specifications.
 - 7.5 Explain the causes and remedies of tyre wear.
- 8.0 Engine cooling and lubrication.
 - 8.1 Describe necessity of engine cooling.
 - 8.2 Describe defects of cooling and their remedial measures.
 - 8.3 Describe the Function of lubrication.
 - 8.4 Describe the lubrication System of I.C. engine.
 - 8.5 Describe the Working principle of
 - 8.5.1 Oil pump.
 - 8.5.2 Oil filter
 - 8.5.3 Pressure release valve
- 9.0 Fuel and Ignition system
 - 9.1 Petrol engine
 - 9.1.1 Describe carburetion.
 - 9.1.2 Air fuel ratio.
 - 9.1.3 Describe the functioning of
 - 9.1.3.1 Solex carburetor
 - 9.1.3.2 Amat carburetor
 - 9.1.4 Describe the ignition system
 - 9.1.4.1 Battery ignition
 - 9.1.4.2 Magnet ignition
 - 9.1.5 Multipoint fuel injection system
 - 9.2 Diesel engine

- 9.2.1 Describe the working principle
 - 9.2.1.1 Fuel feed pump
 - 9.2.1.2 Injector
 - 9.2.1.3 Fuel filter
- 9.2.2 Describe the working principle of fuel injection system for multi cylinder engine.

RECOMMENDED BOOKS:

Text Book:

1. Automobile Engineering I & II by Dr Kirpal Singh, Standard Publisher Distributers.
2. Automobile Engineering by R.B.Gupta, Satya Prakashan.

Reference book:

1. Automobile Engineering by C.P.Nakra
2. Automotive Machinery by Joseph Heitmer, CBS Publishers
3. Automobile Engineering by Ramalingan, SCITECH Publication (India)PVT LTD.
4. Automotive Engine by W.H.Course, McGraw Hill
5. Automotive Transmission & power Train by W.H.Course, McGraw Hill
6. The Automobile : by Harbans Singh Reyat

ENVIRONMENTAL POLLUTION AND CONTROL (6th – Sem-MECH)

Period /Week: 5 (4+1)
Total Periods : 60

Examination: 3 hrs.
End Exam: 80 marks
I.A. : 20 marks
Total:-100 marks

Topic wise distribution of periods

Sl. No	Topic	Periods
1	Introduction to the subject of Environmental Studies	03
2	Human Environment and Ecological balance of Nature	07
3	Environmental Imbalances Caused by Human Activities and the need for Sustainable Development	06
4	Development of Energy from Various Sources and Their Environmental Impacts	10
5	Environmental Pollution Including Its Regional and Global Impacts	06
6	Air Pollution, Its Causes, Effects and Control Measures	06
7	Water Pollution- Causes, Effects and Control Strategies	06
8	Noise Pollution	06
9	Polymers and Their Eco-Friendliness	10
	TOTAL	60

Rationale:

Engineering basically means production of goods and services fulfill the desire of human beings. In this process a knowingly or substantially damage of the environmental has already been experienced in the form of global warning, climate change, ozone lay.

To create awareness and possible remedial measures, it is essential to know in details about the causes and effects of these unwanted events. Therefore, this is one of the most important subjects to be learned by an engineering student.

OBJECTIVES:

On completion of the courses the students will be able to

1. Desire different suitable Ecological & environmental factors responsible for balance of nature.
2. Describe the utilization of Natural resources for sustainable development.
3. Acquire knowledge on different energy sources and their environmental impact.
4. Acquire knowledge on various pollution like air, water, Noise, Land: their Causes, effects & control strategies.
5. Acquire knowledge on green technology & eco friendly materials

Course Content in detail:

- 1. Introduction to the Subject of Environmental Studies**
 - 1.1. Definition and Scope of Environmental Studies
 - 1.2. Interdisciplinary Nature of the 'Environmental Studies'
 - 1.3. Importance of Environmental Studies and the Need for Public Awareness
 - 1.4. Introduction to the Concept of Green Technology

- 2. Human Environment and Ecological balance of Nature**
 - 2.1. Ecology and Environment
 - Concept of an Ecosystem**
 - 2.2. Biosphere as an Ecosystem
 - Structure of an Ecosystem**
 - 2.3. The Biotic Component of an Ecosystem
 - 2.4. The Abiotic Component of an Ecosystem
 - The Ecological Balance in the Biosphere**
 - 2.5. Biosphere as an Ecosystem and Ecological balance in the Biosphere
 - Function of an Ecosystem**
 - 2.6. Food-Chains and Food-Webs of an Ecosystem
 - 2.7. Transfer of Energy from One Organism to the other in an Ecosystem
 - 2.8. The Biogeochemical Cycles of Circulation of Inorganic Nutrients (Elements and Minerals) between the Biotic and the Abiotic Components of an Ecosystem
 - 2.9. Terrestrial and Aquatic Ecosystems

- 3. Environmental Imbalances Caused by Human Activities and the Need for Sustainable Development**
 - 3.1. Human Activities Causing Environmental Imbalances and Pollution of the Environment
 - 3.2. Irreversible Impacts of Human Activities on the Environment
 - 3.3. Necessity of Sustainable Development to Minimise the Adverse Environmental Impacts of Human activities
 - 3.4. Sustainable Development
 - 3.5. Status of Sustainable Development in India

- 4. Development of Energy from Various Sources and Their Environmental Impacts**
 - 4.1. Definition and Importance of Energy
 - 4.2. Sources of Energy
 - 4.3. Definition and Importance of Solar Energy
 - 4.4. Development of Solar Energy

Wind Energy

4.5 Definition and Development of Wind Energy

Tidal Energy

4.6 Definition and Utilization of Tidal Energy

Ocean Thermal Energy

4.7 Ocean Thermal Energy Conversion(OTEC) Systems

Geothermal Energy

4.8 Introduction and Development of Geo-Thermal Energy

4.9 Use of High Temperature Geothermal Resources for Generation of Electricity

4.10 Use of Low Temperature Geothermal Resources for Direct Use of Heat Energy

4.11 Use and Potential of Geothermal Energy

Hydro-Electric Energy

4.12 Definition, development and Importance of Hydro-Electric Power

4.13 Advantages of Hydro-Power

4.14 Status of Hydro Power Development in India and the World

Biomass Energy

4.15 Definition and Utilization of Biomass Energy

4.16 Production of Bio-gas and Gobar-gas from Biomass

Thermal Power

4.17 Definition and Production of Thermal Power

4.18 Environmental Impacts of Thermal Power Plants

Nuclear Power

4.19 Radioactive Isotopes or Radionuclide

4.20 Nuclear Fission and Generation of Nuclear Power

4.21 Status of Production of Nuclear Power

4.22 Drawbacks of Nuclear Power and Their Adverse Environmental Impacts

Hydrogen as an Alternative Future Source of Energy

4.23 Hydrogen as an Energy Source

Energy Conservation

4.24 Necessity, Importance and Methods for Conserving Energy

5 Environmental Pollution Including Its Regional and Global Impacts

Definition of Environmental Pollution

Categorisation of the Environmental Pollution and Pollutants

Local, Regional, and Global Extent of Environmental Pollution and Consequential Challenges

Acid Rain- A Regional Environmental Challenge

Ozone Depletion- A Global Environmental Challenge

Global Warming and Climate Change- A Global Environmental Challenge

Role of an Individual in Prevention of Environmental Pollution

6. Air Pollution, Its Causes, Effects and Control Measures

- 6.1 Definition and Introduction
- 6.2 Natural and Man-made Air Pollution
- 6.3 History and Present Status of Air Pollution
- 6.4 Various Pollutants Causing Pollution of Air
- 6.5 Causes of Air Pollution
- 6.6 Effects of Air Pollution

METHODS OF CONTROLLING AIR POLLUTION

- 6.7 Controlling Air Pollution from Industrial Activities(Factories)
- 6.8 Controlling Air Pollution from Automobiles

7. Water Pollution- Causes, Effects and Control Strategies

- a. Introduction and Definition of Polluted Water
- b. Various Types of Pollutants Causing Water Pollution
- c. Sources of Water Pollution
- d. Methods of Treating Industrial Wastewaters
- e. Water Borne and water Induced Diseases
- f. Strategies for Controlling Water Pollution

8. Noise Pollution

- 8.1 Definition and Introduction
- 8.2 The Effects of Noise
- 8.3 Measurement of Sound
- 8.4 Noise Rating System
- 8.5 Noise Level Standards in India
- 8.6 Sources of Noise and their Noise levels
- 8.7 Noise Abatement and Control

9. Polymers and Their Eco-Friendliness

- 9.1 Polymers and Their Types
- 9.2 Thermoplastic and Thermosetting Resins
- 9.3 Growth and Use of Polymers in Modern World
- 9.4 Environmental Degradation of Polymers
- 9.5 Biodegradable Polymers
- 9.6 Photodegradable Polymers
- 9.7 Hydro- Biodegradable Polymers
- 9.8 Biopolymers and Bioplastics
- 9.9 Thermal Degradation of Plastic During Recycling

Recommended Books:**Text Book:**

1. Environmental Studies and Green Technologies by S.K.Garg and Dr. Ranjini Garg, Khanna Publishers.
2. Introduction to Environmental Engineering and Science by Gilbert M. Masters, PHI Publication.

Reference Book:

1. Understanding Environmental Pollution by M.K.Hill, Cambridge University Press.
2. Environmental Pollution and Control Engineering by Rao C. S, Wiley Eastern Limited, India.
3. Environmental Science and Engineering by Anandan et.al, SCITECH Publication (India)PVT LTD.

Advanced Manufacturing Process and CAD / CAM(6th Sem-MECH)

Periods/Week : 4+1(5)

Exam : 3hr

Total periods :60

End exam Th : 80 marks

IA : 20marks

Total 100 marks

Topic wise distribution of periods

Sl. No	Topic	periods
01	Automation	05
02	Numerical Control	20
03	Robot Technology	10
04	Flexible Manufacturing System	08
05	CAD / CAM and CIM	17
	Total Period	60

RATIONALE:

Today Indian Industries are faced with global Competition and hence the need for improving their manufacturing processes and techniques to the latest world standards.

COURSE CONTENTS (in terms of specific objectives)

1.0 Automation

- 1.1 Define Automation
- 1.2 List types of Automation
- 1.3 Explain need for Automation

2.0 Numerical Control

- 2.1 Define Numerical
- 2.2 Explain the co-ordinate System.
- 2.3 Describe the types of NC co-ordinate
 - 2.3.1 Point – to – point
 - 2.3.2 Straight Cut
 - 2.3.3 Contouring
- 2.4 Describe the component of NC system.
- 2.5 Explain the NC system with block diagram.
- 2.6 Describe the economics of NC system.
- 2.7 NC part programming
 - 2.7.1 Preparatory function and G code
 - 2.7.2 Miscellaneous function and M-code.
 - 2.7.3 Reference Point
 - 2.7.3.1 Machine Zero
 - 2.7.3.2 Work zero
 - 2.7.3.3 Tool zero & Tool offset
 - 2.7.4 Simple part program for lath & milling.
- 2.8 Explain the Extension of NC with the block diagram.

- 2.8.1 DNC (Direct numerical Control)
- 2.8.2 CNC (Computer numerical Control)
- 2.8.3 Adaptive Control
- 3.0 Robot Technology
 - 3.1 Explain Robot anatomy.
 - 3.2 Describe Robot Configuration
 - 3.3 Explain the accuracy and repeatability of Robot.
 - 3.4 List various types of end effectors.
 - 3.5 Explain the application of various sensors.
 - 3.5.1 Tactical Sensor
 - 3.5.2 Proximity Sensor
 - 3.5.3 Optical Sensor
- 4.0 Flexible Manufacturing System (FMS)
 - 4.1 Need for FMS
 - 4.2 Explain the components of FMS
 - 4.2.1 Processing Station
 - 4.2.2 Material handling & storage
 - 4.2.3 Computer Control System.
- 5.0 CAD / CAM and CIM.
 - 5.1 CAD
 - 5.1.1 Define CAD
 - 5.1.2 Benefits of CAD
 - 5.1.3 CAD hardware
 - 5.2 CAM
 - 5.2.1 Define CAM
 - 5.2.2 Benefits of CAM
 - 5.3 CIM
 - 5.3.1 Concept
 - 5.3.2 Background.
 - 5.3.3 CIM Hardware.
 - 5.3.4 CIM Software.

BOOKS:

- 1) CAD /CAM Mikel P.Groover.
- 2) CAD / CAM / CIM R.Radhakrishan.
- 3) CAD / CAM Principle & application Dr. P.N. Rao.
- 4) CAD / CAM : Kuldeep Kumar Sareen

Power Plant Engineering (ELECTIVE)

Periods/Week : 4+1(5)

Exam : 3hr

Total periods : 60

End exam Th : 80 marks

IA : 20marks

Total 100 marks

Topic wise distribution of periods

Sl.no	Topic	Periods
01	Introduction	03
02	Steam Power Plant	30
03	Nuclear power plant	07
04	Diesel engine power plant	06
05	Gas turbine power plant	08
06	Hydel power plant	06
	Total Period	60

RATIONALE:

Bulk power used in industries and for domestic purposes are generated in power plants. A large number of diverse and specialized equipment and system are used in a power plant should have this specialized elective course.

COURSE CONTENT (in terms of objectives):**1.0 Introduction****1.1 Describe sources of energy**

- 1.1.1 Fuels such as coal and oil
- 1.1.2 Nuclear fuels
- 1.1.3 Flowing stream of water
- 1.1.4 Solar rays
- 1.1.5 Wind
- 1.1.6 Terrestrial heat
- 1.1.7 Ocean tides and waves
- 1.1.8 Geothermal energy

1.2 Explain concept of power station

- 1.2.1 Central power station
- 1.2.2 Captive power station

1.3 Classify power plant

- 1.3.1 Coal based thermal power plant
- 1.3.2 Nuclear power plant
- 1.3.3 Diesel power plant
- 1.3.4 Gas turbine power plant
- 1.3.5 Hydel power plant
- 1.3.6 Wind mill
- 1.3.7 Tide power plant
- 1.3.8 Geothermal power plant

1.3.9 Direct energy conversion system.

2.0 Steam Power Plant

2.1 Steam power cycle

- 2.1.1 Describe parameters of power cycle such as thermal efficiency, work ratio
- 2.1.2 Explain Rankine cycle with P-V, T-S & H-s diagram
 - 2.1.2.1 Thermal efficiency
 - 2.1.2.2 Work done & work ratio, specific steam consumption
 - 2.1.2.3 Simple Problems
- 2.1.3 Explain reheat cycle with P-V, T-S & H-S diagram
 - 2.1.3.1 Thermal efficiency
 - 2.1.3.2 Work done & work ratio, specific steam consumption
 - 2.1.3.3 Simple Problems
 - 2.1.3.4 Methods of reheating such as gas reheating, live steam reheating and combined gas & live steam reheating
 - 2.1.3.5 Advantages and disadvantages of reheat cycle
- 2.1.4 Explain regenerative cycle
 - 2.1.4.1 Types such as direct contact heater, indirect contact heater, drain pump method, cascade system
 - 2.1.4.2 Efficiency & work done of direct contact heating cycle and indirect contact heating cycle
 - 2.1.4.3 Simple problems

2.2 Steam generating unit

- 2.2.1 Explain the lay out of steam power plant
- 2.2.2 Describe the elements of steam power plant
 - 2.2.2.1 Economizer with advantages
 - 2.2.2.2 Super heater and super heat control method
 - 2.2.2.3 Air pre heater (Regenerative & recuperative type) with advantages
 - 2.2.2.4 Feed water heater with advantages
 - 2.2.2.5 Pulverized fuel systems (central & unit system) with their advantages & disadvantages
 - 2.2.2.6 Draught systems (Natural draught, Forced draught & balanced draught) with their advantages & disadvantages

2.3 Steam prime movers

- 2.3.1 State the function of a prime mover
- 2.3.2 State the advantages & disadvantages of steam turbine
- 2.3.3 Explain principle elements of steam turbine
 - 2.3.3.1 Nozzles

- 2.3.3.2 Blades
- 2.3.3.3 Rotors
- 2.3.3.4 Shaft
- 2.3.3.5 Casing
- 2.3.3.6 Shaft seals
- 2.3.3.7 Diaphragms
- 2.3.3.8 Bearings and bearing lubrication system
- 2.3.4 Explain compounding of steam turbine
 - 2.3.4.1 Velocity compounding
 - 2.3.4.2 Pressure compounding
 - 2.3.4.3 Pressure – velocity compounding
 - 2.3.4.4 Governing of steam turbines
 - 2.3.4.5 Nozzle control governing
 - 2.3.4.6 Throttle governing
 - 2.3.4.7 Bypass governing
- 2.3.5 Describe the performance of steam turbine
 - 2.3.5.1 Thermal efficiency
 - 2.3.5.2 Stage efficiency
 - 2.3.5.3 Gross efficiency
 - 2.3.5.4 Reheat factors
 - 2.3.5.5 Simple problems
- 2.4 Steam condensing equipment.
 - 2.4.1 State the function of condenser
 - 2.4.2 Classify condensers
 - 2.4.2.1 Jet condenser or mixing type condenser (High level & low level condenser)
 - 2.4.2.2 Surface condenser or non mixing type condenser (Down flow & Central flow surface condenser)
 - 2.4.3 State the advantages of using condenser
 - 2.4.4 State the function of condenser auxiliaries such as hot well, condenser extraction pump, air extraction pump, cooling water, circulating pump, compensated tower
 - 2.4.5 Describe surface condenser
 - 2.4.6 Explain the requirement of a good condensing system
 - 2.4.7 State the function and types of cooling tower
 - 2.4.7.1 Describe the various types of cooling tower
 - 2.4.7.2 Natural draft cooling tower (Spray fill type, packed type, Hyperbolic type)
 - 2.4.7.3 Mechanical draft cooling tower as forced draft & induced draft (both counter and cross flow)
- 2.5 Coal Handling System.
 - 2.5.1 Describe briefly coal conveying in a thermal power plant & its components
 - 2.5.1.1 Paddle feeders

- 2.5.1.2 Conveyors
- 2.5.1.3 Crushers
- 2.5.1.4 Stacker, Reclaimer
- 2.5.1.5 Coal feeders
- 2.5.1.6 Milling Plants (Types of Advantages)

3.0 Nuclear Power Plant

- 3.1 Describe briefly atomic nuclei, Atomic number, mass number, isotopes, and equivalency
- 3.2 Explain fusion and fission reaction
- 3.3 Classify chain reaction
- 3.4 Classify nuclear fuel (Fissile & fertile material)
- 3.5 Explain nuclear reactor
 - 3.5.1 Components of nuclear reactor such as fuel, moderator, reflector, coolant, control rod
 - 3.5.2 Shielding & reactor vessel & their function
- 3.6 Explain the working principle of PWR and BWR power plant
- 3.7 Compare the nuclear and thermal plants
- 3.8 Explain the effects of nuclear radiation
- 3.9 Explain the disposal of nuclear waste

4.0 Diesel engine power plant

- 4.1 State the advantages and disadvantages of diesel plant
- 4.2 Explain essential of diesel power plant and their function
- 4.3 Explain briefly different systems of diesel power plant
 - 4.3.1 Fuel storage and fuel supply system
 - 4.3.2 Fuel injection system
 - 4.3.3 Air supply system
 - 4.3.4 Exhaust system
 - 4.3.5 Cooling system
 - 4.3.6 Lubrication system
 - 4.3.7 Starting system
 - 4.3.8 Governing system

5.0 Gas turbine power plant

- 5.1 Explain Brayton cycle
 - 5.1.1 P-V & T-s diagram
 - 5.1.2 Thermal efficiency and work done
- 5.2 State advantages and disadvantages of gas turbine plant over diesel power plant and thermal power plant
- 5.3 Classify gas turbine
- 5.4 Explain closed cycle gas turbine and open cycle turbine with P-V, T-S diagram & determine efficiency & power output
- 5.5 Describe the method of improving thermal efficiency
 - 5.5.1 Reheating
 - 5.5.2 Inter cooling
 - 5.5.3 Regeneration

- 5.6 Describe the components of gas turbine plant
 - 5.6.1 Compressor
 - 5.6.2 Intercooler & heat exchanger
 - 5.6.3 Combustion chamber
 - 5.6.4 Gas turbine
- 5.7 Simple problem on open plant
- 6.0 Hydel Power Plant
 - 6.1 Explain the considerations for site selection for hydro electric power plant
 - 6.1.1 Hydrological Investigations
 - 6.1.2 Topographical investigation
 - 6.1.3 Geological investigation
 - 6.2 Classify the general arrangement of storage type hydroelectric project and its operation
 - 6.2.1 On the basis of head (low head, medium head & high head)
 - 6.2.2 Nature of load (Base load plant & peak load plant)
 - 6.2.3 Water available (Run – off river plant, storage, pump storage plant, mini & micro hydel plant)
 - 6.3 Explain the general arrangement of storage type hydroelectric project and its operation
 - 6.4 State advantages and disadvantages of hydroelectric power plant

RECOMMENDED BOOKS:

1. Power Plant Engineering. – by P.K.Nag JMH
2. Power Plant Engineering – by Nagpal, Khanna Pub.
3. Power Plant Engineering – by Skrotzki and Vopat, McGraw Hill.

NON CONVENTIONAL SOURCE OF ENERGY (ELECTIVE)

Periods/Week : 4+1(5)

Exam : 3hr

Total periods :60

End exam

Th : 80 marks

IA : 20marks

Total 100 marks

Topic wise distribution of periods

Sl. no	Topic	Periods
01	Introduction	07
02	Solar radiation	08
03	Solar energy collection	10
04	Solar energy storage	08
05	Solar energy application	07
06	Wind energy	06
07	Tidal energy	07
08	Bio energy	07
	Total Period	60

RATIONALE:

With the depleting source of fossil fuel coupled with the thread of global warming, search for an alternative, clean and viable source of energy is now a world-wide concern. Research and application of non-conventional sources of energy is rapidly taking place in India also. This elective is important for those wish to pursue their career in this emerging field.

OBJECTIVES:

On the completion of the course, the student should be able to

1. Understand the need for alternate sources of energy.
2. Understand the solar radiation.
3. Describe the principle of conversion of solar radiation into heat.
4. Describe the methods of storing solar energy.
5. Understand the application of solar energy.
6. Understand the application of wind energy.
7. Understand the application of tidal energy.
8. Understand the application of bio-energy.

COURSE CONTENTS:

1.0 Introduction

- 1.1 Global energy scene, World energy consumption
- 1.2 Energy in developing countries. Indian energy scene, non-conventional renewable energy source, potential of renewable energy source

- 1.3 Pollution aspects of conventional sources of energy. Global warming and Green House effects
- 2.0 Solar radiation
 - 2.1 Solar constant
 - 2.1.1 Solar radiation at earth's surface
 - 2.1.2 Instruments for measuring solar radiation
 - 2.1.3 Pyranometer, Pyrheliometer
 - 2.1.4 Determination of solar radiation on earth surface on a particular day of a year
 - 2.1.5 Calculate monthly average & annual average of solar radiation
- 3.0 Solar energy collection.(No mathematical treatment)
 - 3.1 Principle of conversion of solar radiation into heat
 - 3.2 Liquid flat plate collectors, solar water heaters
 - 3.3 Solar air heater, parabolic collector
 - 3.4 Flat plate collectors with plane reflectors
- 4.0 Solar energy storage (No mathematical treatment)
 - 4.1 Methods of storing solar energy
 - 4.2 Solar pond, working principle and description of solar pond with a schematic diagram
 - 4.3 Application of solar pond
- 5.0 Solar energy application. (No mathematical treatment)
 - 5.1 Solar water heater: natural circulation type & forced circulation type
 - 5.2 Solar drier – cabinet type and convective type
 - 5.3 Solar cooker box type
- 6.0 Wind energy (No mathematical treatment)
 - 6.1 Introduction
 - 6.2 Power developed by wind forces on the blades of a wind mill
 - 6.3 Wind data – energy estimation
 - 6.4 Wind mill construction details & working principle
 - 6.5 Type of wind mill
- 7.0 Tidal energy
 - 7.1 Introduction
 - 7.2 Components of tidal power plant
 - 7.3 Methods of utilization of tidal energy
 - 7.4 Advantages & limitation of tidal power generation
- 8.0 Bio-energy
 - 8.1 Introduction to bio-mass, bio-mass conversion into energy
 - 8.2 Bio-gas generation, composition & properties of bio-gas
 - 8.3 Utilisation of bio-gas classification of bio-gas plants-Continuous & batch type
 - 8.4 The drum type bio-gas plants
 - 8.5 Floating gas holder and fixed dome type, construction details and working principle of fixed dome type and floating gas holder type bio-gas plants-

materials used for bio-gas generation-capacity of bio-gas plant-starting of bio-gas plant

RECOMMENDED BOOKS:

1. Non Conventional Energy Resources by B.H.Khan, TMH
2. Introduction to alternate sources of energy by TTTI Madras
3. Advantages in bio-gas technology by O.P.Chawla.

Mechatronics (Elective)

Periods/Week : 4+1(5)

Exam : 3hr

Total periods : 60

End exam Th : 80 marks

IA : 20marks

Total 100 marks

Topic wise distribution of periods

Sl. No	Topic	Periods
01	Introduction, Sensors	12
02	Actuation System (Mechanical, Electrical Pneumatic & Hydraulics)	12
03	Basic System Models, Input/output System	12
04	Programmable logic controller	12
05	Design Application in Mechatronics	12
	Total Period	60

Course Contents

1.0 Introduction, Sensors

1.1 System

1.1.1 Measurement System

1.1.2 Control System

1.1.3 Microprocessor based Controllers

1.2 Sensor.

1.2.1 Position & Proximity Sensors

1.2.2 Velocity and Motion sensor

1.2.3 Force sensor

1.2.4 Fluid pressure sensor

1.2.5 Flow sensor

1.2.6 Liquid level sensor

1.2.7 Temperature sensor

1.2.8 Light Sensor

1.3 Selecting System

2.0 Actuation System

2.1 Mechanical Actuation

2.1.1 Types of motion

2.1.2 Freedom and Constraints

2.1.3 Loading

2.1.4 Mechanical aspects of motor selection

2.2 Electrical Actuation

2.2.1 Switches and relay

2.2.2 Solenoid

2.2.3 D.C. Motors

- 2.2.4 A.C. Motors
- 2.2.5 Stepper Motor
- 2.2.6 Specification and Control of Stepper motor
- 2.2.7 Servo motors: D.C. & A.C
- 2.3 Pneumatic & Hydraulic
 - 2.3.1 Power Supplies
 - DCV
 - PCV
 - Cylinders
 - Rotary actuators
- 3.0 Basic System Model
 - 3.1 Mathematical Model
 - 3.1.1 Introduction
 - 3.1.2 Mechanical System building block
 - 3.1.3 Electrical System building block
 - 3.1.4 Fluid System building block
 - 3.1.5 Thermal System building block
 - 3.2 System Model
 - 3.2.1 Engineering System
 - 3.2.2 Rotational – Translational System
 - 3.2.3 Electro Mechanical System
 - 3.2.4 Hydro Mechanical System
 - 3.3 Interfacing
 - 3.3.1 Input / output parts
 - 3.3.2 Interface requirements. Buffer, Hand shaking, Polling and interrupts. Serial interfacing
 - 3.3.3 Introduction to PIA
- 4.0 Programmable Logic Controller.(PLC)
 - 4.1 Definition
 - 4.2 Basic Block diagram and structure of PLC
 - 4.3 Input Output processing
 - 4.4 PLC Programmable
 - 4.4.1 Ladder diagram
 - 4.4.2 PLC Mnemonics. Timer, Internal relays and Counters
 - 4.4.3 Shift register
 - 4.4.4 Master and jump Controls
 - 4.4.5 Data handling
- 5.0 Design, Application in Mechatronics
 - 5.1 Design Process Stages
 - 5.1.1 Traditional Vs Mechatronics design
 - 5.1.2 Possible design Solution
 - 5.1.3 Case studies
 - A pick-and-place robot, car park barrier. Automatic camera, Automatic Washing M/C

- 5.2 Sensors for Condition monitoring System of production system
 - 5.2.1 Example Vibration Monitoring, Temp. Monitoring
- 5.3 Mechatronics Control in Automated manufacturing
 - 5.3.1 Monitoring of Manufacturing Process
 - 5.3.2 On-line quality Monitoring

BOOKS:

1. W.Bolten Mechatronics.
2. R.K.Rajput A Text book of Mechatronics.
3. David G Alciatore Introduction to Mechatronics and Measurement Systems,
TMH

MEL- IV

Periods/Week : 4

Exam : 4hr

Total periods : 60

End exam

Pr : 50 marks

Ses. : 50marks

Total 100 marks

1. Checking the spark plug and setting the port and check the ignition in the spark plug.
2. Study the electrical system of automobile.
3. Study the differential mechanism and determine the differential ratio.
4. Study of barking system (Hydraulic /Air brake)
5. Study and demonstration of different circuit of carburetor.
6. Calibration of Bourdon's tube Pressure gauge.
7. Calibration of strain gauge.
8. Non-Destructive testing of welding.
9. Air pollution testing of CO₂, Co, HC, NOX

CAD Lab.

Periods/Week : 4

Total periods : 60

Sesional Marks – 50

1.0 2D Drafting.

1.1 Create Rectangle, Circle, Polygon.

1.2 Dimensioning.

1.3 Commands essential for creating 2D drawing.

2.0 3D drafting.

2.1 Create various drawing views of the 3-D parts.

2.2 Extrude the face / plane to get 3-D views.