

6th – semester-MECH

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	3
02	Auto Engines	7
03	Auto electric System	7
04	Transmission System	12
05	Braking system	6
06	Front axel and steering	8
07	Frame, suspension and wheel	5
08	Cooling and lubrication	6
09	Fuel and ignition system	6
	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 outs 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 For 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 For 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:

1. Automobile Engineering I & II by Dr Kirpal Singh, Standard Publisher Distributers.
2. Automobile Engineering by R.B.Gupta, Satya Prakashan.
3. Automobile Engineering by C.P.Nakra
4. Automotive Machinery by Joseph Heitmer, CBS Publishers
5. Automotive Engine by W.H.Course, McGraw Hill
6. Automotive Transmission & power Train by W.H.Course, McGraw Hill
7. The Automobile : by Harbans Singh Reyat

ENVIRONMENTAL POLLUTION AND CONTROL

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	Chapters	No of Periods
1	1 - 4	12
2	5 - 6	10
3	7- 10	16
4	11 -15	14
5	16 - 17	08

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 subject 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 & ecofriendly materials

Course Content in detail:

Chapter 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

Chapter 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

Chapter 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

Chapter 4. Sustainable Development and Utilization of Natural Resources

Water Resources

- 4.1. Water and Its Importance
- 4.2. Dams-Benefits and Problems
- 4.3. Conserving Water Resources

Mineral Resources

- 4.4. Definition of Minerals
- 4.5. Environmental Impacts of Mining and Its Associated Activities for Extraction and Use of Minerals

Forest Resources

- 4.6. Forests and Their Importance
- 4.7. Deforestation and Its Environmental Impacts
- 4.8. Sustainable Timber Extraction and Proper Management of Forests

Soil or Land Resources

- 4.9. Definition of Soil and Its Importance
- 4.10. Degradation of Land
- 4.11. Man Induced Landslides
- 4.12. Conservation of Soil(Land) and Its Protection from Water and Wind Erosion

Preservation and Management of Natural resources, for Sustainable Development

- 4.13. Role of an Individual in Conservation of Natural Resources
- 4.14. Equitable Use of Resources for Sustainable Life Styles

Chapter 5. Development of Energy from Various Sources and Their Environmental Impacts

- 5.1. Definition and Importance of Energy
- 5.2. Sources of Energy
- 5.3. Definition and Importance of Solar Energy
- 5.4. Development of Solar Energy

Wind Energy

- 5.5. Definition and Development of Wind Energy

Tidal Energy

- 5.6. Definition and Utilization of Tidal Energy

Ocean Thermal Energy

- 5.7. Ocean Thermal Energy Conversion(OTEC) Systems

Geothermal Energy

- 5.8. Introduction and Development of Geo-Thermal Energy
- 5.9. Use of High Temperature Geothermal Resources for Generation of Electricity

- 5.10. Use of Low Temperature Geothermal Resources for Direct Use of Heat Energy
- 5.11. Use and Potential of Geothermal Energy
 - Hydro-Electric Energy**
- 5.12. Definition, development and Importance of Hydro-Electric Power
- 5.13. Advantages of Hydro-Power
- 5.14. Status of Hydro Power Development in India and the World
 - Biomass Energy**
- 5.15. Definition and Utilization of Biomass Energy
- 5.16. Production of Bio-gas and Gobar-gas from Biomass
 - Thermal Power**
- 5.17. Definition and Production of Thermal Power
- 5.18. Environmental Impacts of Thermal Power Plants
 - Nuclear Power**
- 5.19. Radioactive Isotopes or Radionuclides
- 5.20. Nuclear Fission and Generation of Nuclear Power
- 5.21. Status of Production of Nuclear Power
- 5.22. Drawbacks of Nuclear Power and Their Adverse Environmental Impacts
 - Hydrogen as an Alternative Future Source of Energy**
- 5.23. Hydrogen as an Energy Source
 - Energy Conservation**
- 5.24. Necessity, Importance and Methods for Conserving Energy

Chapter 6. Environmental Pollution Including Its Regional and Global Impacts

- 6.1. Definition of Environmental Pollution
- 6.2. Categorisation of the Environmental Pollution and Pollutants
- 6.3. Local, Regional, and Global Extent of Environmental Pollution and Consequential Challenges
- 6.4. Acid Rain- A Regional Environmental Challenge
- 6.5. Ozone Depletion- A Global Environmental Challenge
- 6.6. Global Warming and Climate Change- A Global Environmental Challenge
- 6.7. Role of an Individual in Prevention of Environmental Pollution

Chapter 7. Air Pollution, Its Causes, Effects and Control Measures

- 7.1. Definition and Introduction
- 7.2. Natural and Man-made Air Pollution
- 7.3. History and Present Status of Air Pollution
- 7.4. Various Pollutants Causing Pollution of Air
- 7.5. Causes of Air Pollution
- 7.6. Effects of Air Pollution

METHODS OF CONTROLLING AIR POLLUTION

- 7.7. Controlling Air Pollution from Industrial Activities(Factories)
- 7.8. Controlling Air Pollution from Automobiles

Chapter 8. Water Pollution- Causes, Effects and Control Strategies

- 8.1. Introduction and Definition of Polluted Water
- 8.2. Various Types of Pollutants Causing Water Pollution
- 8.3. Sources of Water Pollution
- 8.4. Methods of Treating Industrial Wastewaters
- 8.5. Water Borne and water Induced Diseases
- 8.6. Strategies for Controlling Water Pollution

Chapter 9. Noise Pollution

- 9.1. Definition and Introduction
- 9.2. The Effects of Noise
- 9.3. Measurement of Sound
- 9.4. Noise Rating System
- 9.5. Noise Level Standards in India
- 9.6. Sources of Noise and their Noise levels
- 9.7. Noise Abatement and Control

Chapter 10. Soil Pollution

- 10.1. Soils. Their Formations and Horizons
- 10.2. Pollution of Soils and Sources of Pollution

Chapter 11. Solid waste Pollution

- 11.1. Solid Waste Pollution and necessity of State Disposal of Solid Wastes
- 11.2. Health Effects of Land and Other Pollutions caused by Improper Disposal of Solid wastes
- 11.3. Composition and Quantity of the Generated Municipal Solid Waste (MSW) or Refuse
- 11.4. Collection and Transportation of Municipal Solid Waste(MSW)
- 11.5. Separation for Recycling and Reuse of Plastics, Papers and Glasses From the Municipal Solid Waste (MSW)
- 11.6. Disposal of Municipal Solid Waste(MSW)
- 11.7. Classification of Industrial Solid Wastes, and Extent of Generation of These wastes in India
- 11.8. Storage, Transportation, and Disposal of Industrial Solid Wastes

Chapter12. Disposal of Hazardous Biomedical (Solid and Liquid) Wastes

- 12.1. Biomedical wastes and Their Impacts on Health and Environment

- 12.2. Legislative Laws on Management of Biomedical Wastes in India
- 12.3. Colour Coding of Biomedical Wastes and Their Collection in Different Coloured Bins or Bags
- 12.4. Collection of Sharp Wastes
- 12.5. Labelling for Identification of Bio-medical Wastes
- 12.6. Storage of Bio-medical wastes
- 12.7. Transportation of Bio-medical wastes to the Treatment and Disposal Sites
- 12.8. Treatment and Disposal of Biomedical Wastes

Chapter 13. Nuclear Hazard and Radioactive Pollution

- 13.1. Radioactive Disintegration and Radioactive radiations
- 13.2. Impact of Radioactivity on Biological Environment
- 13.3. Sources of radioactivity in the Environment
- 13.4. Classification of Radioactive Wastes and Their Disposal

Chapter 14. Marine Pollution- A Complex and Global Problem

- 14.1. Importance of Seas and Necessity of Preventing marine Pollution
- 14.2. Sources of Marine Pollution. Their Effects on Biological Life, and Control Measures

Chapter 15. The India's Environment (Protection) Act, 1986

- 15.1. Provisions of Indian Constitution Relating to Environmental Law And Their Interpretations by the Judiciary
- 15.2. The Environment (Protection) Act of 1986

Chapter 16. Chemical Toxicology

- 16.1 Toxic Chemical and Minerals in the Environment
- 16.2 Impact of Toxic Chemicals on Enzymes
- 16.3 Biochemical Effects of Arsenic
- 16.4 Biochemical Effects of Cadmium
- 16.5 Biochemical Effects of Lead
- 16.6 Biochemical Effects of Chromium
- 16.7 Biochemical Effects of Mercury
- 16.8 Biochemical Effects of Pesticides

Chapter 17. Polymers and Their Eco-Friendliness

- 17.1 Polymers and Their Types
- 17.2 Thermoplastic and Thermosetting Resins
- 17.3 Growth and Use of Polymers in Modern World
- 17.4 Environmental Degradation of Polymers
- 17.5 Biodegradable Polymers
- 17.6 Photodegradable Polymers

- 17.7 Hydro- Biodegradable Polymers
- 17.8 Biopolymers and Bioplastics
- 17.9 Thermal Degradation of Plastic During Recycling

Recommended Books:

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.
3. Understanding Environmental Pollution by M.K.Hill, Cambridge University Press.
4. Environmental Pollution and Control Engineering by Rao C. S, Wiley Eastern Limited, India.

6th – semester-MECH

Advanced Manufacturing Process and CAD / CAM

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	5
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

- 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.

- 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.

6th – semester-MECH
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.

6th – semester-MECH
MEL- IV

Periods/Week : 4
Total periods : 60

Exam : 4hr
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

6th – semester-MECH
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.