Syllabus of B. Tech. in Mechanical Engineering

**Semester VII**

**ME1701 COMPUTER AIDED DESIGN (3-1-0)**

Computer graphics hardware - interactive input and output devices, graphics software, output primitives and their attributes, line drawing and ellipse generating algorithms, interactive picture construction techniques, 2D geometric transformations, window, view port and· clipping, 3D display methods, 3D object representation - Bezier curves and splines, 3D geometric and modeling transformations, 3D viewing, wire frame, surface and solid modeling, kinematic analysis of open and closed loop mechanisms.

Purpose and applications of optimum design, formulation and classification of optimization problems, linear programming - simplex method, one dimensional minimization based on elimination and interpolation, unconstrained optimization ­direct search and descent methods, constrained optimization - penalty function method.

Introduction to geometric, dynamic, integer and quadratic programming, computer aided optimum design of machine elements like gears, bearings, shafts and springs.

**ME1702 NUMERIC CONTROL OF MACHINE TOOLS AND ROBOTICS (3-1-0)**

**I. NUMERIC CONTROL:**

Introduction to numerical control, components, axes of NC machine tools, open and close loop control, actuation and feedback systems. Point to point, linear and contouring systems. Tooling for NC systems. Steps in NC manufacturing. Machining and turning centers and their features. ATC and APC.

NC programming: Input media and coding formats. Manual part programming for lathe, drilling and milling machines, cutter diameter and length compensation. Computer assisted part programming languages APT, EXPAT, ADAPT, COMPACT. CAD/CAM approach of programming.

Computer numerical control, direct and distributed numerical control, adaptive control.

 **II. ROBOTICS:**

Industrial robots and their applications for transformational and handling activities. Configuration and motions. Actuators, sensors and end effectors. Features like work envelop, precision of movements, weight carrying capacity. Robot programming languages.

Vision systems. Introduction to intelligent robots.

**ME1703 AUTOMOBILE ENGINEERING (3-1-0)**

The Automobile

History of development, Automobiles industry in India and abroad, testing of automobiles, Resistances to motion and power requirement for propulsion.

Automobile Engines

Requirements and classification, materials, constructional details and manufacturing process of engine components. Exhaust manifolds-types-necessity, maintenance problems: Materials used.

Frame

Layout of a chassis; types of chassis frames and bodies, their constructional features, loading points, testing of frames and materials.

Transmission System

Necessity of Clutch in automobile, Types of clutches, clutch material, clutch lining. Fluid coupling, over running clutch, necessity and field of application. Gear boxes, Necessity of gear box, Construction details of sliding mesh, constant mesh, synchromesh and epicyclic gear boxes, Automatic transmission system:, Hydraulic torque converter.

Drive Line and Rear Axle

Propeller shaft, universal joints, Rear axle drives, Torque reaction, driving thrust, overdrive, Hotchkiss and torque tube drives; rear axle types and construction Principle of differential, types of differential.

Wheels and Tyres

Types of wheels and tyres. Tire construction; functions of tires, solid and pneumatic tires, tire inflation pressure, tire wear and their causes; repair of the tire and tube

Steering System

Steering wheel and steering column, Steering boxes, steering linkages, steering mechanisms, under and over steering. Front axle, Steering Geometry wheel alignment, wheel balancing, centre point steering; power steering.

Suspension system

Objects and requirements, Types of suspension systems, suspension spring, front and rear suspension systems; Independent suspension system; shock absorber.

Brakes

Necessity of brake, theory of brake shoe, Classification and function; self energizing brakes; lining materials, factors influencing operation of brakes such as operating . Temperature, using area etc.

Storage Battery

Charging, discharging and testing of battery, capacity and efficiency, method of charging from D.C. and A.C. mains, defects and remedies of battery of idle and new batteries; maintenance and storage of batteries.

Starter Motor

Battery motor starting system, series motor and its characteristics, consideration in selecting size of motor. Types of drives, starting and generating circuit, solenoid switches.

Wiring for Auto Electrical Systems

Wiring diagrams of typical wiring systems and wire loops.

HS2732 TECHNOLOGY MANAGEMENT Credit: 4

Technology Management:

Scope, components, and overview. Technology and environment, Technology and Society, Technology impact analysis, environmental, social, legal, political aspect, methods or technique for analysis and steps involved.

Technology Policy Strategy:

Science and Technology policy of INDIA, Implications to industry

Technology Forecasting:

Need, methodology and methods. Trend analysis, Analogy, Delphi, Scenario.

Technology Choice and Evaluation:

Methods of analyzing alternate technologies, Techno-economic feasibility studies, Need for multi-criteria consideration such as, social, environmental and political, Technology assessment.

Innovation, Diffusion and Technology Absorption:

Creating new/improved technologies, Innovation, Technology evolution, Technology life cycle and diffusion. Technology Absorption for acquired technology.

Technology Transfer and Acquisition:

Import regulation, Implication of “Uruguay Round” and WTO.

Technology Adoption and Productivity:

Adopting technology – human interaction, organizational redesign and re-engineering.

**ME2732 ENERGY ENGINEERING Credit: 4**

**Introduction**

Trends of energy consumption, developed and developing countries, sources of energy, conventional and renewable. Fossil fuel, availability and limitations. Need to develop new energy, sources-energy conservation methods, energy audit.

**Solar Energy**

Solar insulation calculations. Flat plate and concentrating collectors for liquid and gases, construction.

Collector Area Calculations

Heat removal factor

**Solar Systems**

Power plants low temperature and high temperature plants, solar driers, solar cookers, solar refrigeration systems.

**Wind Energy**

Types of rotors, horizontal axis and vertical axis systems, system design and site selection.

Biogas plants

Types, parameters affecting plant performance, plant design.

**Total Energy Conversion**

Total energy concepts, Tidal plants, Cogeneration plants, Geothermal plants.

**Direct Energy Conversion**

Fuel cells, Thermoelectric, Thermionic and MHD systems.

**Suggested Text Books and References**

* Garg, H.P. and Prakash, J., “Solar Energy-Fundamentals and Applications”,

Tata McGraw Hill Ltd., New Delhi, 1997.

* Sukhatme, S.P., “Solar Energy, Tata McGraw Hill Publishing Company Ltd. 1989.
* Duffie and Beckman, “Solar Energy Thermal processes”, John Wiley, 1974.
* Sutton, “Direct Energy Conversion, McGraw Hill, 1966.

ME1704-P COMPUTER AIDED DESIGN (0-0-3)

**List of Experiments**

1. Power transmission by interference feet.

2. Design of gears by ‘C Program’.

3. Selection of bearing.

4. Design of shaft.

5. Design of thick cylinder.

6. Design of spring.

7. ‘3 D modeling & analysis of stresses’

8. ‘C’ Program for design of Flange coupling.

**ME1705-P NUMERIC CONTROL OF MACHINE TOOLS & ROBOTICS**

 **(0-0-3)**

**List of Experiments**

1. Development of camp profile.

2. Development of drilling jig.

3. Development & machining of irregular shapes machine parts.

4. Determination of joint velocities of a robot.

**ME1706-P AUTOMOBILE ENGINEERING LAB (0-0-3)**

**List of Experiments**

1. To study & practice of “Steering system”.

2. To study & practice of “Ignition system”.

3. To study & practice of “Transmission system”.

4. To study & practice of “Suspension system”.

5. To study & practice of “Braking System”.

6. To study & analysis of “Chassis” (frame).

7. To study & analysis of lubrication & cooling system.

**HS1707-P GENERAL PROFICIENCY VII (0-0-0)**

Debate, Elocution, Extempore, Group Discussion, Panel Discussion, Presentation – Paper & oral, Allegation & clarification, Quiz / Brain Teaser, Survey Report / Project Report / Case Study, Dissertation, Mock Interview, Expository / Argumentative Report & National Service Scheme (NSS).