

Syllabus of B. Tech. in Mechanical Engineering

Semester VII

ME1701-P

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.

**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. (4 lectures)

### Frame

Layout of a chassis; types of chassis frames and bodies, their constructional features, loading points, testing of frames and materials. (3 lectures)

### 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. (7 lectures)

### 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. (5 lectures)

### Wheels and Tires

Types of wheels and tires. Tire construction, functions of tires, solid and pneumatic tires, tire inflation pressure, tire wear and their causes; repair of the tire and tube (4 lectures)

### 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. (6 lectures)

### Suspension system

Objects and requirements, Types of suspension systems, suspension spring, front and rear suspension systems; Independent suspension system; shock absorber. (3 lectures)

### 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. (6 lectures)

### 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. (2 lectures)

### 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. (3 lectures)

### Wiring for Auto Electrical Systems

Wiring diagrams of typical wiring systems and wire loops (2 lectures)

**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 modelling & 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 cam 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).