

# **RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL**

## **New Scheme Based On AICTE Flexible Curricula**

### **Mechanical Engineering, VIII-Semester**

#### **Departmental Elective ME 802(A) Automobile Engineering**

#### **COURSE OBJECTIVES**

The students will be made to learn.

- The anatomy of the automobile in general.
- The location and importance of each part of automobile.
- The functioning of the engine and its accessories, gear box, clutch, brakes, steering, axles and wheels, suspension, frame, springs and other connections.
- The effect of automobile emissions on environment and how to control pollution.

#### **Course Contents:**

**Unit-I:** Chassis & Body Engg: Types, Technical details of commercial vehicles, types of chassis, layout, types of frames, testing of frames for bending & torsion on unutilized body frame, vehicle body and their construction, driver's visibility and methods for improvement, safety aspects of vehicles, vehicle aerodynamics, optimization of body shape, driver's cab design, body materials, location of engine, front wheel and rear wheel drive, four wheel drive.

**Unit-II:** Steering System: front axle beam, stub axle, front wheel assembly, principles of types of wheel alignment, front wheel geometry viz. camber, Kingpin inclination, castor, toe-in and toe-out, condition for true rolling motion, centre point steering, directional stability of vehicles, steering gear, power steering, slip angle, cornering power, over steer & under steer, gyroscopic effect on steering gears.

**Unit-III:** Transmission System: Function and types of clutches, single plate, multi-plate clutch, roller & spring clutch, clutch lining and bonding, double declutching, types of gear boxes, synchroniser, gear materials, determination of gear ratio for vehicles, gear box performance at different vehicle speed, automatic transmission, torque converters, fluid coupling, principle of hydrostatic drive, propeller shaft, constant velocity universal joints, differential gear box, rear axle construction.

**Unit-IV:** Suspension system : Basic suspension movements, Independent front & rear suspension, shock absorber, type of springs: leaf spring, coil spring, air spring, torsion bar, location of shackles, power calculations, resistance to vehicle motion during acceleration and braking, power & torque curve, torque & mechanical efficiency at different vehicle speeds, weight transfer, braking systems, disc theory, mechanical, hydraulic & pneumatic power brake systems, performance, self-energisation, air-bleeding of hydraulic brakes, types of wheels and tyres, tyre specifications, construction and material properties of tyres & tubes.

**Unit-V:** Electrical and Control Systems: Storage battery, construction and operation of lead acid battery, testing of battery, principle of operation of starting mechanism, different drive systems, starter relay switch, regulator electric fuel gauge, fuel pump, horn, wiper, lighting system, head light dazzling, signaling devices, battery operated vehicles, choppers, importance of maintenance, scheduled and unscheduled maintenance, wheel alignment, trouble Shooting probable causes & remedies of various systems, microprocessor based control system for automobile, intelligent automobile control systems.

**Unit-VI:** Emission standards and pollution control: Indian standards for automotive vehicles- Bharat I, II, III, IV, Euro I to Euro VI norms, fuel quality standards, environmental management systems for automotive vehicles, catalytic converters, fuel additives, and modern trends in automotive engine efficiency and emission control.

**References:**

1. Crouse , Automotive Mechanics TMH.
2. Srinivasan S; Automotive engines; TMH
3. Gupta HN; Internal Combustion Engines; PHI;
4. Joseph Heitner, Automotive Mechanics, Principles and Practices, CBS Pub.
5. Kripal Singh, Automotive Engineering Khanna Pub.
6. Newton & Steeds , Automotive Engineering
7. Emission standards from BIS and Euro –I to Euro-VI

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## **New Scheme Based On AICTE Flexible Curricula**

### **Mechanical Engineering, VIII-Semester**

#### **Departmental Elective ME 802(B) Tribology And Maintenance Engineering**

##### **Course Objectives**

After studying this course, students will be able to learn;

- The basic principles governing the tribology and apply them to reduce friction and wear in mechanical machines and structures.
- About lubrication, lubricants, mechanism of lubrication
- About Nano tribology, Instrumental tests, Bearings, Clutches and Brakes

**Chapter 1:** Introduction, history of tribology, early scientific studies of - friction, wear and lubrication. Tribo-Surface preparations and characteristics. Surface contacts, Hertz contact stresses, residual stress, surface fatigue, creep, stress relaxation, fracture mechanics, elastic, viscoelastic and plastic behavior of materials. Choice of materials.

**Chapter 2:** Friction, laws of friction, rolling/sliding friction, theory of adhesion and abrasion, different mechanisms of friction, stick slip characteristics, interface temperature, thermal analysis, Molecular mechanical theory of friction, operating conditions and system parameters, calculations of coefficient of friction, design of friction devices.

**Chapter 3:** Wear, different types of wear mechanisms, adhesive, abrasive impact, percussion erosion, fretting wear calculations of wear rate, two body/ three body wear, wear prevention, wear of metal cutting and metal forming tools, wear mapping of materials, cavitation, surface fatigue, corrosion, performance levels classifications and specifications of lubricants

**Chapter 4:** Lubrication, lubricants and additives, composition and properties of lubricants, maintenance of oil and emulsions, industrial hygiene aspects, technical regulations for lubricants. boundary/ mixed and fluid film lubrication, industrial methods of lubrications, SAE, BIS, ASTM, IP, DIN Standards, oil testing's, wear and chemistry of lubricants.

**Chapter 5:** Nano tribology, Instrumental tests,. Bearings, clutches and brakes, slide units, dynamic seals, Automobile applications, machine tools/ press machines applications. Other applications and case studies.

##### **Evaluation:**

Evaluation will be continuous an integral part of the class as well through external assessment.

**References:**

1. Principles and applications of tribology, Bharat Bhushan, John Wiley & sons, ISBN 0471 594075.
2. Tribology,, - lubrication ,friction and wear, I V Kragelsky and V V Alisin, Mir publication, ISBN 1860582885.
3. Applied Tribology,MMKhonsari and E. R. Booser, John Wiley, ISBN 04712830

**Tutorial topics:**

1. Testing equipments of tribology.
2. Various industrial applications of tribology.
3. NEMS and MEMS applications
4. Solid, liquid and mist/ gas lubricants.
5. Surface coatings.
6. Chemical analysis of materials
7. Various simulations
8. AFM/ FFM , SFA, STM, studies.

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## **New Scheme Based On AICTE Flexible Curricula**

### **Mechanical Engineering, VIII-Semester**

#### **Departmental Elective ME 802(C) Machine Tool Design**

##### **Course Objectives**

After studying this course, students will be able to :

- Understand the Kinematics of Machine Tools.
- Work with different drive systems
- Design Concepts of Metal working Tools.
- Do Design of Jigs, Fixtures and Gauges

**Unit I** Basic Features and Kinematics of Machine Tools: Features of basic machine tools; construction and operation, types of machine tools, machine tools motions, transmission-rotation in to rotation, rotation in to translation, kinematic-structures of machine tools: elementary, complex and compound structure, kinematic-features of gear shapers and gear hobbing machine.

**Unit II** Regulation of Speed: Design of gear boxes- need for variation of speed, selection of speed range, laws of stepped regulation, standardization of speeds, speed diagram, analysis of productivity loss, kinematic advantage of GP, structural diagrams, ray diagram and speed chart.

Gear Drives: Belt and cone pulley, slip gear type, north gear drive, draw key gear drive, clutch type, mechanical step less drives, electrical drives; hydraulic drive.

**Unit III** Design of Metal working Tools: Design of press working tools, shearing, piercing, blanking, dies, compound die design principles for forging dies, bending, forming drawing dies, tooling for forging design principles for forging dies, drop forging, upset forging, design principles and practice for rolling, roll press design.

**Unit IV** Design of Jigs and Fixtures: Principles of location, locating method and devices, principles of clamping, clamping devices, drilling jigs, types, drill bushes, fixture and economics, types of fixture, milling, grinding, broaching, assembly fixtures indexing jig and fixtures, indexing devices.

**Unit V** Design of Gauges and Inspection Features: Design of gauges for tolerance for dimensions and form inspection; dies and mould design for plastics & rubber parts: compression molding, transfer molding, blow molding.

**References:**

1. Mehta N.K.; Machine Tool Design and Numerical Control; TMH
2. Sen G.C, Bhattacharya A; Principles of Machine Tools; New Central Book Agency.
3. Donaldson; Tool Design T.M.H.
4. Jain KC and Chitale AK; Text Book Of Production Engineering; PHI Learning
5. Juneja, Sekhon and Seth; Fundamentals of Metal Cutting and Machine Tools; New Age.
6. Krar SF, Gill AR, Smid P; Technology of Machine Tools;TMH
7. Sharma P.C; Production Engineering; Chand S
8. Wilson; Fundamentals of Tool Design; ASTME
9. Paqwin J.R; Die Design Handbook; The Industrial Press-NY
10. ASTME; Die Design Hand Book; McGraw Hill
11. Archinov; Metal Cutting & Cutting Tool Design; MIR Publishers
12. Moscow Kempster M.H.A; Introduction to Jig and Tool Design; FLBS

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## **New Scheme Based On AICTE Flexible Curricula**

### **Mechanical Engineering, VIII-Semester**

#### **Departmental Elective ME 802(D) Production Planning and Control**

##### **OBJECTIVES**

After studying this course, students will be able to;

- To understand the various components and functions of production planning and control such as work study, product planning, process planning, production scheduling, Inventory Control.
- To know the recent trends like manufacturing requirement Planning (MRP II) and Enterprise Resource Planning (ERP)
- To learn work study,time study, work measurement

##### **Unit-I**

Introduction: Types and characteristics of production systems Objective and functions of Production, Planning & Control, Place of production, Planning in Engineering, manufactures organization. Preplanning: Forecasting & Market Analysis. Factory Location & Layout, Equipment policy and replacement. Preplanning production, capacity planning.

##### **Unit II**

Work Study : Method study, basic procedure-Selection-Recording of process – Critical analysis, Development – Implementation – Micro motion and memo motion study – work measurement – Techniques of work measurement – Time study – Production study – Work sampling – Synthesis from standard data – Predetermined motion time standards.

##### **Unit-III**

Production Planning: Aggregate Planning, MPS, Material Resource Planning, Selection of material methods, machines & manpower. Routing, Scheduling and Dispatching and its sheets & charts, ProductionLineBalancing.

##### **Unit-IV**

Production and Inventory Control: Progress control through records and charts. Types of inventories, Inventory Classification. Inventory Control under constraints Economic lot (batch) size. Trends in purchasing and store keeping, JIT production MRP II, comparison of Push & Pull systems, ERP, CAPPC.

##### **Unit-V**

Productivity: Importance, Productivity patterns, productivity measurements & ratios, improvement-maintenance process. 3 Human Factors & Ergonomics: Human abilities, Training & motivation safety programs,workplacedesign&workingconditions.

**Reference Books :**

1. Elements of Production Planning & Control –Eilon
2. Production Planning & Control – Jain and Agarwal
3. Operations Management – Buffa and Sarin.
4. Project Management, S.C. Sharma, Khanna Publishing House
5. Production System – J.L. Riggs.
  
6. Industrial Engineering and Production Management : Martand Telsang, First edition, S. Chand and Company, 2000.
  
7. Theory and Problems in Production & Operations Management: Chary. S.N, Tata McGraw Hill, 1995