

PE6001 TOOL DESIGN (3 Credits)

Module 1

Jigs & Fixtures: Principal of design and construction, Location and clamping

Module 2

Basic concept for design of turning, Milling, Drilling & Indexing Jigs and fixtures

Module 3

Classification of dies, components of dies assembly, Simple dies, compound dies, combination dies and progressive dies

Module 4

Punch and die clearance, centre of pressure, calculation of blank diameter

Module 5

Design of tools for the production of holes, surfaces of revolution, and flat surfaces like single point tools,

Module 6

Form tools, drills, milling cutters

Module 7

Materials for cutting tools, cutting dies and forming dies, Economics of Tooling

Text Books

1. **Production Engineering Design (Tool Design)** Umesh Chandra & Surender Kumar, SatyaPrakashan, New Delhi
2. **Tool Design** C. Donaldson, G.H.Lecain and V.C.Goold, Tata McGraw Hill

Reference Books:

1. **Principles of Tool Design** S.K. Basu
2. **Jigs & Fixtures** Fred H. Colvin
3. **Handbook, Fundamentals of Tool Design** ASTM
4. **Basic Die Making** Osterguard E., Mc-Graw Hill Book Co.
5. **Metal Cutting & Tool Design** V.Arshinov, Mir Publication.
6. **Design and Production of Metal-Cutting Tools** P.Rodin, Mir Publishers, Moscow.
7. **Fundamentals of Tool Design** Frank W. Wilson
8. **Properties and Selection of Tool Material** Kortesoja, Victor A., ASM.

PE6003 MATERIAL DEFORMATION PROCESSES (3Credits)

Module 1

Basic deformation processes

Basic concepts of hot and cold working processes and forming operations.

Module 2

Theory of Plasticity

State of stress at a point, equilibrium equations, stress tensor, spherical tensor and deviator stress tensor, principal stress, deformation tensor

Engineering and true stress –strain, flow curve, idealized stress-strain model, plastic deformation equations, levy–mises equations, prandtl–reuss equations, strain hardening, strain rate and bauschinger effects

Module 3

Flow Rule and Yield Criterion

Velocity field and strain rate, compatibility equation, von – mises and tresca yield criterion, biaxial and triaxial yield surfaces, experimental verification of yield criterion, lode–stress parameter

Module 4

Friction and Lubrication

Interfacial friction laws–Coulombs friction law, constant shear factor law, composite friction law and hydrodynamic friction law, friction mechanism during plastic deformation, lubrication mechanisms–boundary, hydrodynamic and solid lubrication, metal working lubricants–types and characteristics

Module 5

Plain Strain Deformation Processes

Basic concepts of slip-line method, slab method (equilibrium technique) and energy method (upper bound technique), analysis of following deformation processes

Forging of strip: pressure distribution and forging load

Rolling of strip: pressure distribution, roll–separating force and driving torque

Module 6

Axi-Symmetric Deformation Processes

Analysis of following deformation processes:-

Forging of disc: pressure distribution and forging load

Extrusion of cylindrical rod: extrusion load and frictional power loss

Drawing of cylindrical wire: drawing load and maximum allowable reduction

Module 7

Emerging Deformation Processes

Isothermal forging, water hammer forging, liquid metal forging (squeeze casting), continuous extrusion (conform extrusion), hydro–static extrusion, hydro–dynamic wire drawing, spray forming, explosive forming

Textbooks:

1. **Principle of Industrial Metal Working** G.W. Rowe, Edward Arnold , London
2. **Principles of Metal Working** S. Kumar, IBH & Co., New Delhi

References

1. **Engineering Plasticity** R.A. C. Slater, Macmilan, USA
2. **Metal Working Processes and Analysis** B. Avitzur, McGraw Hill, USA

PE 6005 PRODUCTION PLANNING & CONTROL (3 Credits)

Module 1

Introduction to Production Planning and Control

Production system, type of manufacturing systems and their characteristics, objectives and functions of production planning and control

Module 2

Preplanning

Demand forecasting, common techniques of demand forecasting, estimating factors of production, product mix and batch size decisions, aggregate planning

Module 3

Production Planning

Routing, Loading and scheduling with their different techniques, dispatching, Progress Report, Expediting and corrective measures

Module 4

Inventory Control

Field and scope of inventory control, inventory types and classification, Inventory control models, static model, dynamic model both deterministic and stochastic, Economic lot size, reorder point and their application,

Module 5

Materials management & purchasing

ABC analysis, VED analysis, modern practices in purchasing and store Keeping, concept of productivity

Module 6

Facility design

facility design process, facility design problems and their analysis, Factors affecting the location and site selection, techno economic analysis, multi-plant location, Concept of location theory and models.

Module 7

Plant maintenance

Importance of maintenance in plant, types of maintenance, inspection decisions, economics of maintenance, evaluation of maintenance policy, terotechnology .

Text Books

1. **Production and Inventory control** G.W. Plossel
2. **Principles and Design of Production Control Systems**
E.D. Scheele, W.L. Westerman and R.J. Wimment
3. **Production Control Engineering** D. K. Corke
4. **Operation Research** KantiSwarup

PE 6007 MANUFACTURING AUTOMATION AND ROBOTICS (3 Credits)

Module 1

Manufacturing automation, components and types of automation, automation scenario and factory configuration, role of mechatronics in factory automation.

Module 2

Basic ideas, classification and structure of NC systems, NC-coordinate system, Constructional features and feedback devices for CNC machine tools, part programming and related languages, DNC and adaptive control.

Module 3

Electric and servo control in machine tools, stepper motor, PLC, transfer mechanism, buffer storage and control functions for transfer devices, feeding mechanism definition and concept, flexible automation.

Module 4

Computer integrated manufacturing, Flexible manufacturing systems: concept, need, structure & operation, objectives and benefits.

Module 5

Robot technology: basic elements, classification, physical configuration, basic robot motions, robot's specifications, end effector /grippers.

Module 6

Robot applications: application characteristics and areas such as material handling, welding, assembly, inspection, processing operation, spray painting etc

Module 7

Planning and implementation of robotized and FMS projects

Text Books

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| 1. Automation, Production System, and CIM | M.P. Groover |
| 2. CNC Machines | P. Radhakrishnan |
| 3. Robot Technology | M.P. Groover |

References

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| 1. Numerical Control of Machine Tools | Y. Koren |
| 2. Technology of CAD/CAM | A.K. Jha and S. Kumar |
| 3. Manufacturing Technology II | P.N. Rao |
| 4. Industrial Robots and CIM | Surender Kumar |
| 5. Robotics for Engineers | YoramKoren ,McGraw Hill ,USA |
| 6. Robot Technology Fundamentals | James G. Keramas |