

TOOL DESIGN

(Professional Elective - II)

I Semester

Course Code: 19ME2155

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3	0	3

Course Outcomes: At the end of the course, the student will be able to

CO1: Describe tool design methods and punch and die manufacturing techniques.

CO2: Select material for cutting tools and gages; classify various cutting tools and gages and identify their nomenclature.

CO3: Describe the principles of clamping, drill jigs and computer aided jig design.

CO4: Design fixtures for milling, boring, lathe, grinding, welding; identify fixtures and cutting tools for NC machine tools.

CO5: Explain the principles of dies and moulds design.

UNIT-I

(10-Lectures)

Tool design methods: Introduction, design procedure, statement of the problem, needs analysis – tentative design solutions, finished design, drafting and design techniques in tooling drawings, punch and die manufacturing techniques.

Learning outcomes:

1. Determine various tool design methods. (L3)
2. Explain punch and dye manufacturing techniques. (L2)
3. Discuss tentative design solutions. (L2)

UNIT-II

(10-Lectures)

Tooling materials: Introduction, properties of tool materials, metal cutting tools, single point cutting tools, milling cutters, drills and drilling, reamer classification, taps, tap classification, the selection of carbide cutting tools, various heat treatments.

Gauges and gauge design: Fixed gauges, gauge tolerances, the selection of material for gauges.

Learning outcomes:

1. Determine the properties of tool materials. (L3)
2. Interpret types of cutting tools and their classification. (L2)
3. Describe the design of gauges and selection of material for gauges. (L2)

UNIT-III

(10-Lectures)

Design of jigs: Principles of clamping, drill jigs, chip formation in drilling, general considerations in the design of drill jigs, drill jigs and modern manufacturing, computer aided jig design.

Learning outcomes:

1. Discuss the principle of clamping. (L2)
2. Demonstrate the general considerations in drill jig design. (L3)
3. Analyze chip formation in drilling. (L4)

UNIT-IV

(10-Lectures)

Design of fixtures: Types of fixtures, vice fixtures, milling fixtures, boring fixtures, broaching fixtures, lathe fixtures, grinding fixtures, computer aided fixture design, welding fixtures, fixture design for NC machine tools, cutting tools for numerical control, tool holding methods for numerical control.

Learning outcomes:

1. Select appropriate type of fixtures. (L4)
2. Describe the tool holding methods. (L2)
3. Classify cutting tools for numerical control. (L4)

UNIT-V

(10-Lectures)

Design of dies and moulds: Die-design fundamentals, blanking and piercing die construction, pilots, strippers and pressure pads, presswork materials, bending dies, forming dies, drawing operations.

Mould design: Splits in mould, split locking, two-cavity and multi-cavity moulds, design details of injection moulds.

Learning outcomes:

1. Outline the die design fundamentals. (L4)
2. Recommend die design methods. (L5)
3. Describe the splits in mould. (L2)

TEXT BOOK:

1. Donaldson Cyrll, George H.LeCain and Goold V.C., *Tool Design*, TMH, 36th Reprint, 2006.

REFERENCE BOOKS:

1. Wilson F.W., *Fundamentals of Tool Design*, ASTME, Prentice Hall, India, 2010.
2. G.C. Sen and A. Bhattacharya, *Principles of Machine Tools*, New Central Book Agency, Kolkata, 2009.