

Manufacturing Tooling Introduction

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What is tool design?

- ◆ It is a specialized area of manufacturing engineering which comprises the analysis, planning, design, construction and application of tools, methods and procedures necessary to increase manufacturing productivity.

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Tool?

- ◆ Work holding tools – Jigs and Fixtures
- ◆ Cutting tools
- ◆ Sheet metal dies
- ◆ Forging dies
- ◆ Extrusion dies
- ◆ Welding and inspection fixtures
- ◆ Injection molds

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Catalogue description

- ♦ Integrated treatment of tool design, specification and application by the use of standard tooling data. Prerequisites: 330:008; 330:024; 330:170 or 330:172; junior standing.

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Synopsis

- ♦ Manufacturing processing requirements in industrial practice.
- ♦ The importance of tooling in manufacturing
- ♦ Design aspects related to some tooling such as jigs and fixtures, press tools, cutting tools, inspection gages and welding jigs.

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Objectives

- ♦ Aspects related to manufacturing engineering as practiced in the shop floor.
- ♦ The emphasis would be more in understanding the various concepts and background information related to the design of tooling.

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Graduate students

- ◆ Graduate students registered for this course need to complete additional work as part of the department policy. Contact the instructor within the first week to get the additional work allocation.

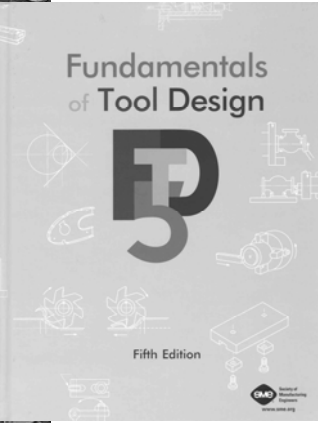

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Method of Instruction

- ◆ Lectures on the tooling design are given with enough practical and standard information to validate the basic concepts and their application.
- ◆ Design exercises would be used to demonstrate the principles.


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Text book

- ◆ David Spitzer (Chief Tech Rev.), **Fundamentals of Tool Design**, Fifth Edition, 2003, SME, ISBN 0-87263650-X


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References

- ♦ Donaldson, Lecain and Goold - "Tool Design", McGraw Hill, New York, 1976.
- ♦ Paquin and Crowley- Die Design Fundamentals, 1987, Industrial Press
- ♦ SME - Die Design Handbook, 3rd Edition 928 pages, 1990
- ♦ E. K. Henriksen - "Jig and Fixture Design Manual", Industrial Press, New York,


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Assessment

- ♦ Examinations (3): 40%
- ♦ Projects (8) 50%
- ♦ Class participation 10%


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Examinations

- ♦ Examinations during the semester are not comprehensive.
- ♦ Questions may be in the form of problems, short answers, fill in the blank and/or True/False.
- ♦ There will be no chance to makeup for the missed examinations, unless arrangements have been made **before** the examination that is considered reasonable by the professor.


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Participation

- ◆ Participation (attitude, punctuality, attendance, etc.) in the class in terms of regular attendance is an important component for your evaluation.
- ◆ As a responsible and mature individual you are expected to be present in all classes.


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Participation

- ◆ If you miss any particular class, then it becomes your responsibility to checkup with your colleagues about the coverage of that missed class.
- ◆ If you miss more classes, without any prior intimation or justification, then your final grade may be affected.

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Laboratory Work

- ◆ **P1:** Selection of tool materials
- ◆ **P2:** Cutting tool selection
- ◆ **P3:** Design a Jig (CAD)
- ◆ **P4:** Design a blanking die (CAD)
- ◆ **P5:** Design a bending die
- ◆ **P6:** Design a welding fixture (CAD)

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P3: Design a Jig (CAD)

Fig. 2) Drill jig with swinging bush plate & latch cam closure

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P4 Design a blanking die (CAD)

A simple blanking die.

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P5: Design a bending die

length = 10 inches
Hold 90° bend $\pm 1/2^\circ$
1/16 R
0.060
6
SAE 1020 steel

Figure 8-3. Part bent in the die of Figure 8-4.

Figure 8-4. Die design for part of Figure 8-3.

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P6: Design a welding fixture CAD)

First weld
Second weld
Locator blocks or stops

Figure 10-1. Simple welding fixture using gravity to help locate parts.

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Project Reports


- ♦ A number of projects with substantial weightage (50%).
- ♦ Use of CAD and standard components is an essential element in tool design.
- ♦ Use the facilities in Lab. 19 and 24 for the purpose.
- ♦ Most of the 3D models of the standard components used in the tool design would be available from the manufacturer's web sites.

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Projects

- ♦ Projects are evaluated based on individual's effort.
- ♦ However, it is suggested that a brainstorming with colleagues in the initial stages would be useful.
- ♦ This will help in identifying possible solutions and pitfalls in specific approaches.


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Project Submission

- ♦ The report is to be word processed and printed using a high quality mode.
- ♦ All the drawings are to be made by a CAD program (Solidworks, AutoCAD, Inventor, or ProEngineer) following the national standards and plotted.


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Project Submission

- ♦ Each of the project, after completion needs to be submitted on the due date specified.
- ♦ **No reminders!**
- ♦ Late submission will carry a penalty of 10% of the points per day.
- ♦ If there is a justifiable reason for late submission, please explain it to me well in advance so that I may consider it.

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Grade Scale

Percentage range	Grade	Percentage range	Grade
90 – 100	A	88 – 89	A-
86 – 87	B+	82 – 85	B
80 – 81	B-	78 – 79	C+
72 – 77	C	70 – 71	C-
68 – 69	D+	62 – 67	D
60 – 61	D-	< 60	F

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