National Institute of Technology Jamshedpur
Jamshedpur – 831 014, JHARKHAND
Department of Production and Industrial Engineering Engineering

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Course Handout

Autumn Semester Session 2020-21 **Date: 25/08/2020**
Batch: B.Tech 5th Semester (Production and Industrial Engineering)
Course code: PI1505 **Credits: 4**
Course Title: Design of Production Tooling
Instructor in-Charge: Dr. Dinesh Kumar

Course Description

Unit I: Work holding device: Purpose and function of work holder, Principles of jig and fixture design, Method of location, 3-2-1 Method of location, Principles of pin locations, Locating devices, Type of clamping devices, Jig bushes, Types of jigs, Classification of fixtures, Milling fixtures, Turning fixtures, Boring fixtures
Unit II: Press work die design: Classification of presses, Classification of dies, Centre of pressure, Cutting action in die, Die clearances, Cutting forces in die, Stock stop pilots.
Unit III: Konckout piercing die design, Blanking die design, Compound die design, Scrap-strip layout for blanking, Evolution of progressive die.
Unit IV: Drives in machine tools, Selection of range of spindle speeds, Setting upper limit and lower limit of centre lathe, Standard value of range ratio, Upper and lower limit of milling machines, Principle of stepped regulation.
Unit V: Speed loss in G.P., Number of steps in speed range, Number of practical subdivisions for obtaining a desired number of steps, Rules for layout of gear boxes having sliding clusters, Types of structure, Ray diagrams, Decision making for the best ray diagram of a gear box, Determining the number of teeth in gears, Strength of gear teeth, Determination of modules, Design of gear boxes, Mechanical step less drives.

Scope: The course aims at providing the basic concepts to design the production tools such as; jigs, fixtures, punching die, deep drawing die, progressive die and gear box of universal lathes.

Objectives
At the end of this course, the student will be able to

- ✓ classify the jigs and fixtures, their parts and will design the drilling jigs and milling fixtures.
- ✓ recognize the mechanism of sheet metal punching/blanking, significance of die-punch clearance, classification of presses and will design the blanking and deep drawing dies.
- ✓ identify and differentiate various machine tool drives and will design the gear box for stepped regulated lathes.

Course outcomes
CO1: Students will design the jigs and fixtures.
C02: Students will design and analyse the blanking die.
CO3: Students will analyse the optimum spindle speed regulation of a machine tool.
CO4: Students will design and analyse the gear box of a machine tool.

Text Books

- **T1:** P.C. Sharma, Production Engineering, 11th Edition, S. Chand Publication, New Delhi
- **T2:** N. K. Mehta, Machine Tool Design and Numerical Control, 3E, Tata McGraw Hill, New Delhi,2012.
- **T3:** K. Venkataraman, "Design of Jigs Fixtures & Press Tools", Tata McGraw Hill, New Delhi, 2005.

Reference Books

- **R1:** Joshi, P.H. "Jigs and Fixtures", Second Edition, Tata McGraw Hill Publishing Co., Ltd., New Delhi, 2004
- **R2:** Donaldson, Lecain and Goold "Tool Design", III rd Edition Tata McGraw Hill, 2000
- **R3:** G. C. Sen and A. Bhattacharya, Principles of machine tools, New Central Book Agency, 2009

Course Plan

Lecture No.	Topics to be covered	Reference
1-2	Work holding device: Purpose and function of work holder, Principles of jig and fixture design, Method of location	**T1, T3, R1**
3-5	3-2-1 Method of location, Principles of pin locations, Locating devices, Type of clamping devices	**T1, T3, R1**
6-9	Jig bushes, Types of jigs, Classification of fixtures, Milling fixtures, Turning fixtures, Boring fixtures	**T1, T3, R1**
10-11	Classification of presses, Classification of dies	**T1, T3, R1**
12-14	Centre of pressure, Cutting action in die, Die clearances, Cutting forces in die, Stock stop pilots	**T1, T3, R1**
15-18	Konckout piercing die design, Blanking die design, Compound die design	**T1, T3, R1**
19-20	Scrap-strip layout for blanking, Evolution of progressive die	**T1, T3, R1**
21-23	Drives in machine tools, Selection of range of spindle speeds, Setting upper limit and lower limit of centre lathe, Standard value of range ratio, Upper and lower limit of milling machines, Principle of stepped regulation	**R3**
24-26	*:* Speed loss in G.P., Number of steps in speed range, Number of practical subdivisions for obtaining a desired number of steps	**T2**
27-29	Rules for layout of gear boxes having sliding clusters, Types of structure, Ray diagrams, Decision making for the best ray diagram of a gear box	**T2, R3**
30-32	Determining the number of teeth in gears, Strength of gear teeth, Determination of modules, Design of gear boxes, Mechanical step less drives	**T2, R3**

Consultation Hours: 9 am-5pm (all days)

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