DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

M SCHEME

2015 -2016 onwards

III YEAR

V SEMESTER

ELECTIVE THEORY

32072 – PRESS TOOLS

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME

(Implements from the Academic year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING

Course Code : 1020

Subject Code : 32072

Semester : V

Subject Title : PRESS TOOLS

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester: 15 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
Press Tools	5	75	25	75	100	3 Hrs

Topics and Allocation of Hours:

Unit	Topics	Hours
I	Press working fundamentals, operations, and machinery	14
II	Press & press tool accessories and cutting dies	14
III	Bending and forming dies	14
IV	Drawing dies and dies for secondary operations	13
V	Fine blanking tool and specialized press tool applications	13
	REVISION AND TEST	7
	Total	**75**

RATIONALE:

Press working plays a vital role in the metal forming process. The study about the operations in the press work is important method of manufacturing.

OBJECTIVES:

- Explain the fundamentals of press working, to be familiar with the various press working operations and machines.
- Appreciate the safety practices in press working operations.
- Explain with the various press and press tool accessories
- Compare the different types of Die construction.
- Explain the various bending, forming and other miscellaneous press working operations.
- Demonstrate about the construction and operation of the different bending dies.
- Define the various drawing and other related processes
- Explain the construction and operating principle of drawing and combination dies.
- Explain the basic concepts and the advantages of fine blanking process
- Demonstrate the construction and working principle of various fine blanking dies.
- Appreciate the concepts of SMED and quick die changes and its advantages in bringing down the press set up time.
- Troubleshoot in various press tools.

PRESS TOOLS

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**PRESS WORKING FUNDAMENTALS, OPERATIONS, AND MACHINERY :** Shearing Theory-Critical stages of shearing, Features of a punched hole, features of the slug, burr. Clearance - Effects of Optimum, Excessive and Insufficient clearances, Clearance for blanking and Piercing, Land and Angular Clearance. Cutting Force – Methods to reduce cutting force, stripping force. Press working operations - Blanking, Piercing, Cutting off, Parting off,	14

	perforating, embossing, coining, bending, forming, drawing, curling, bulging, extrusion, swaging, trimming, and shaving. Safety in press working. Presses - Common types of Presses, Main parts of a typical power press, OBI Press, Specification of presses, Comparison of Mechanical, hydraulic and Pneumatic presses. Single action, double action and triple action presses. Press operating parameters – Tonnage, shut height, stroke, shut height adjustment, strokes per minute, die space. Special purpose presses – Press brake, transfer press, multi slide machine.	
II	**PRESS & PRESS TOOL ACCESSORIES AND CUTTING DIES** Press Feeding Mechanisms - Uncoilers, Straighteners and recoilers, Hand feed, hitch/grip feed, Roll feed, Hopper feeds, dial feeds, chutes, slides, magazine feeds. Ejection mechanism – Ejection by Gravity, air ejection, mechanical ejection, semi automatic and automatic ejection, Mechanical hands, ejection by next part. Parts and functions of a press tool - Punches, Dies, Stoppers, Trigger stops, Strippers – Fixed and Travelling, Gauges, Pilots-Methods of piloting, shanks -Strip layout, Economy factor. Cutting Dies - Construction and working of Blanking tool, Piercing tool, Progressive tool, Compound tool. Commercially available die components – Die sets, die set attachment devices, punches, die buttons, retainers, springs, fluid springs, die cushion and its types.	**14**
III	**BENDING AND FORMING DIES:** Bending of sheet metal – Bending theory, neutral axis, metal movement, spring back, methods of overcoming spring back. Bending Operations – Bending, flanging, hemming, curling, seaming, and corrugating. Types of Bending dies (construction and working principle) – V bending and its types, edge bending, U bending. Bending operations done using press brake. Forming dies – Construction and working principle of solid form dies, pad form dies, curling dies, embossing dies, coining dies, swaging dies, bulging dies, crimping, tube forming. Assembly dies - Riveting,	**14**

	tab stake, upset stake, crimping.	
IV	**DRAWING DIES AND DIES FOR SECONDARY OPERATIONS** Drawing operations – Shallow drawing, deep drawing. Analysis of cup drawing - Stages of drawing. Variables of drawing - Bending and straightening variables, friction variables, compression variables, stretch forming variables, analysis of draw speed. Draw dies & its construction and working principle – Conventional draw die, inverted draw die, redrawing and reverse drawing dies, drawing of square or rectangular shapes. Blank holders, blank holding pressure and its importance, air vents, drawing inserts, draw beads. Drawing with flexible tooling – Marform process, Hydro form process. Drawing defects, causes and remedies. Dies for secondary operations - Construction and working principle of Semi piercing dies, shear form dies, dies for formed contours, notching die, shaving die, side piercing die.	**13**
V	**FINE BLANKING TOOL AND SPECIALISED PRESS TOOL APPLICATIONS** Fine blanking - Definition and Applications of fine blanking, Working principle of fine blanking tool, V Ring, function of V ring. Comparison of fine blanking with blanking. Clearance and press force calculations. Fine Blanking Machines - Working principle, Ram movement, Mechanical drives, hydraulic drives, Machine force, Ring indenter force, counter force. Fine blanking tools - Compound die tooling system with sliding punch, compound die tooling with fixed punch. Specialized Press Tool Applications - Construction, advantage and applications of advanced multistage tooling, unit tooling, angular piercing tools, CNC turret press. Principle of Quick Die Change (QDC) – need and advantages. Single Minute Exchange of Dies (SMED) – concept need and advantages. Factors Affecting Tool Service Life - Introduction, Elements of Tool performance, Procedure for investigation of tool failure, Trouble shooting in press tools, effect of heat treatment on service life of tools.	**13**

Text Books:

1) Donald F. Eary. & Edward A. Reed, “Techniques of Press working sheet metal”, Prentice-Hall,Inc.,
2) Donaldson, “Tool Design”, Tata McGraw-hill Book Company.
3) Eugene ostergaard.D, “Advanced die making”, McGraw-Hill Book Company.

Reference Books:

1) Dr.John G.Nee, “Fundamentals of Tool Design”, Society of Manufacturing Engineers.
2) ASTME, "Tool Engineers Hand Book", McGraw-hill Book Company. .
3) Paquin.J.R, “Die design fundamentals”, Industrial Press Inc,.
4) Eugene ostergaard.D, “Basic die making”, McGraw-hill Book company,.
5) Ivana Suchy, “Hand book of Die Design”, McGraw-Hill Book company.
6) American Society of Metals – Hand book – Volume 4 (Forming)