

Ramgarhia Polytechnic College, Phagwara



Mechanical Engineering Department

Head of Department:	Er. Gaurav Kumar
Name of the Faculty:	Er. Jaspreet Singh Sekhon
Discipline:	Mechanical Engineering Department
Semester:	3 rd
Subject:	Workshop Technology-I
Lesson Plan Duration:	16 Weeks












RATIONALE

Diploma holders are responsible for supervising production processes to achieve production targets and for optimal utilization of resources. For this purpose, knowledge about various manufacturing processes is required to be imparted. Hence the subject of workshop technology.

Learning Outcomes

After undergoing this course, the students will be able to:

- CO1. Fabricate welding joints using gas welding arc welding, TIG, MIG/MAG welding of mild steel and stainless steel materials.
- CO2. Select suitable (most appropriate) process electrodes, various parameters of process for given job
- CO3. Explain principle of operations of modern welding processes
- CO4. Inspect various welding joints, castings, forgings
- CO5. Prepare pattern for given job
- CO6. Select material and type of patterns, cores
- CO7. Prepare sand moulds manually and on machine.
- CO8. Select type of moulding sand, adhesives, compact, strength and parameters of sand for given job.
- CO9. Cast a mould.
- CO10. Identify a suitable furnace, alloying elements
- CO11. Carry out deburring of castings
- CO12. Test the properties of moulding sand (permeability, Strength, refractoriness, adhesiveness, cohesiveness)
- CO13. Operate forging machine, press, spinning machine
- CO14. Explain the principle of rolling, extrusion and drawing process.

PO ⇒	PO1	PO2	PO3	PO4	PO5	PO6	PO7
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CO1							
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CO14							

Syllabus

Units	Details	Hours
1.	<p>Welding</p> <p>1.1 Welding Process Principle of welding, Classification of welding processes, Advantages and limitations of welding, Industrial applications of welding, Welding positions and techniques, symbols. Safety precautions in welding.</p> <p>1.2 Gas Welding Principle of operation, Types of gas welding flames and their applications, Gas welding equipment - Gas welding torch, Oxy acetylene cutting torch, Blow pipe, Pressure regulators, Filler rods and fluxes.</p> <p>1.3 Arc Welding Principle of operation, Arc welding machines and equipment, A.C. and D.C. arc welding, Effect of polarity, current regulation and voltage regulation, Electrodes: Classification, B.I.S. specification and selection, Flux for arc welding. Requirements of pre heating, post heating of electrodes and work piece. Welding defects and their testing methods.</p> <p>1.4 Other Welding Processes Resistance welding: Principle, advantages, limitations, working and applications of spot welding, seam welding, projection welding and percussion welding, Atomic hydrogen welding, Shielded metal arc welding, submerged arc welding, Welding distortion, welding defects, methods of controlling welding defects and inspection of welded joints.</p>	(18 hrs)

	<p>Welding defects and inspection.</p> <p>1.5 Modern Welding Methods Methods, Principle of operation, advantages, disadvantages and applications of, Tungsten inert gas (TIG) welding, other welding process, Metal inert gas (MIG) welding, Thermit welding, Electro slag welding, Electron beam welding, Ultrasonic welding, Laser beam welding, Robotic welding.</p>	
2.	<p>Pattern Making Types of pattern, Pattern material, Pattern allowances, Pattern codes as per B.I.S., Introduction to cores, core boxes and core materials, Core making procedure, Core prints, positioning of cores.</p>	(03 hrs)
3.	<p>Moulding and Casting 3.1 Moulding Sand Properties of moulding sand, their impact and control of properties viz. permeability, refractoriness, adhesiveness, cohesiveness, strength, flow ability, collapsibility, Various types of moulding sand, Testing of moulding sand. Safety precautions in foundry.</p> <p>3.2 Mould Making Types of moulds, Step involved in making a mould, Molding boxes, hand tools used for mould making, Molding processes: Bench molding, floor molding, pit molding and machine molding, Molding machines squeeze machine, jolt squeeze machine and sand slinger.</p> <p>3.3 Casting Processes Charging a furnace, melting and pouring both ferrous and non ferrous metals, cleaning of castings, Principle, working and applications of Die casting: hot chamber and cold chamber, Investment and lost wax process, Centrifugal casting.</p> <p>3.4 Gating and Riser System Elements of gating system, Pouring basin, sprue, runner, gates, Types of risers, location of risers, Directional solidification.</p> <p>3.5 Melting Furnaces Construction and working of Pit furnace, Cupola furnace, Crucible furnace – tilting type, Electric furnace.</p> <p>3.6 Casting Defects Different types of casting defects, Testing of defects: radiography,</p>	(18 hrs)

	magnetic particle inspection and ultrasonic inspection.	
4.	<p>Metal Forming Processes</p> <p>4.1 Press Working - Types of presses, type of dies, selection of press die, die material. Press Operations-Shearing, piercing, trimming, punching, notching, shaving, gearing, embossing, stamping</p> <p>4.2 Forging - Open die forging, closed die forging, Press forging, upset forging, swaging, up setters, roll forging, Cold and hot forging</p> <p>4.3 Rolling - Elementary theory of rolling, Types of rolling mills, Thread rolling, roll passes, Rolling defects and remedies</p> <p>4.4 Extrusion and Drawing - Type of extrusion- Hot and Cold, Direct and indirect. Pipe drawing, tube drawing, wire drawing</p>	(06 hrs)
5.	<p>Plastic Processing</p> <p>5.1 Industrial use of plastics, situation where used.</p> <p>5.2 Injection moulding-principle, working of injection moulding machine.</p> <p>5.3 Compression moulding-principle, and working of compression moulding machine.</p> <p>5.4 Potential and limitations in the use of plastics</p>	(03 hrs)

Reference Books:

1. Workshop Technology by BS Raghuvanshi : Dhanpat Rai and Sons Delhi
2. Elements of Workshop Technology by SK Choudhry and Hajra : Asia Publishing House
3. Welding Engineering by RL Aggarwal and T Manghnani; Khanna Publishers, Delhi
4. A Text Book of Production Engineering by PC Sharma; S Chand and Company Ltd. Delhi
5. Foundry Technology by KP Sinha and DB Goel; Roorkee Publishng House, Roorkee.
6. A Text Book of Manufacturing Science and Technology by A Manna, Prentice Hall of India, Delhi.

Delivery/Instructional Methodologies

Sr.No.	Description
1.	Chalk and Talk
2.	PowerPoint Presentation

Assessment Methodologies

Sr. No.	Description	Type
1.	Student Assignment	Direct
2.	Test	Direct
3.	Board Examination	Direct
4.	Student Feedback	Direct

Gaps in the syllabus - to meet industry/profession requirements

S.NO.	DESCRIPTION	PROPOSED ACTIONS	PO MAPPING
	N/A	N/A	N/A

Topics beyond syllabus/advanced topics

Units	Details	Hours
N/A	N/A	N/A

Web Source References

Sr. No.	URL
1.	https://nptel.ac.in/

Lesson Plan

Week	Theory		Practical	
	Lecture Day		Practical Day	07hrs per week

1 st	1 st	Principle of welding, Classification of welding processes, Advantages and limitations of welding, Industrial applications of welding, Welding positions and techniques, symbols. Safety precautions in welding.	1.	Welding Shop Job 1. Preparing gas welding joint in vertical/Horizontal position joining M.S. Plates Job 2. Exercise on gas cutting of mild steel plate with oxy-acetylene gas torch.
	2 nd			
	3 rd	Principle of operation, Types of gas welding flames and their applications, Gas welding equipment - Gas welding torch		
2 nd	4 th	Oxy acetylene cutting torch, Blow pipe, Pressure regulators, Filler rods and fluxes	2.	Job 3. Exercise on gas welding of cast iron and brass part or component. Job 4. Exercise on preparation of T Joint by arc welding
	5 th	Principle of operation, Arc welding machines and equipment, A.C. and D.C. arc welding, Effect of polarity, current regulation and voltage regulation, Electrodes		
	6 th			
3 rd	7 th	Classification, B.I.S. specification and selection, Flux for arc welding. Requirements of pre heating, post heating of electrodes and work piece. Welding defects and their testing methods.	3.	Job 5. Exercise on spot welding/seam welding Job 6. Exercise on MIG and TIG welding
	8 th			
	9 th	Resistance welding: Principle, advantages, limitations, working and applications of spot welding		
	10 th	seam welding, projection welding and percussion welding, Atomic hydrogen		Job 7 Exercise on arc welding
	11 th			

4 th	12 th	welding, Shielded metal arc welding, submerged arc welding, Welding distortion, welding defects	4.	pipe joint MS.
	13 th			
5 th	14 th	methods of controlling welding defects and inspection of welded joints. Welding defects and inspection.	5.	Pattern making Job 1. Preparation of solid/single piece pattern. Job 2. Preparation of two piece/split pattern
	15 th			
	16 th			
6 th	17 th	Methods, Principle of operation, advantages, disadvantages and applications of, Tungsten inert gas (TIG) welding, other welding process, Metal inert gas (MIG) welding, Thermit welding, Electro slag welding	6.	Job 3. Preparation of a pattern on wooden lathe Job 4. Preparation of a self cored pattern
	18 th			
		REVISION		
7 th	19 th	1st Sessional Test (Tentative) Electron beam welding, Ultrasonic welding, Laser beam welding, Robotic welding. Types of pattern, Pattern material, Pattern allowances.	7.	Viva, Revision Job 5. Preparation of a core box Foundry Shop Job 1. Preparation of mould with solid pattern on floor. Job 2. Preparation of floor mould of solid pattern using cope
	20 th			
	21 st			
8 th	22 nd	Pattern codes as per B.I.S., Introduction to cores, core boxes and core materials, Core making procedure, Core prints, positioning of cores	8.	Job 3. Preparation of floor mould of split pattern in cope and drag of moulding box. Job 4. Moulding and
	23 th			

	24 th	Properties of moulding sand, their impact and control of properties viz.		casting of a solid pattern of aluminum
9 th	25 th	permeability, refractoriness, adhesiveness, cohesiveness, strength, flow ability, collapsibility, Various types of moulding sand, Testing of moulding sand. Safety precautions in foundry.	9.	Job 6. A visit to cast iron foundry should be arranged to have first hand knowledge of cast iron melting pouring and casting.
	26 th			
	27 th			
10 th	28 th	Types of moulds, Step involved in making a mould, Molding boxes, hand tools used for mould making, Molding processes: Bench molding, floor molding, pit molding and machine molding, Molding machines squeeze machine, jolt squeeze machine and sand slinger.	10.	Job 5. Preparing a mould of step pulley and also preparing core for the same. Job 7. Testing of moisture contents and strength of moulding sand.
	29 th			
	30 th			
11 th	31 st	Charging a furnace, melting and pouring both ferrous and non ferrous metals, cleaning of castings, Principle, working and applications of Die casting: hot chamber and cold chamber, Investment and lost wax process, Centrifugal casting	11.	Forging Shop/Fitting Shop/Sheet Metal Shop Job 1. Preparation of single ended spanner by hand/machine forging. Job 2. Preparation of simple die
	32 nd			
	33 rd			
12 th	34 th	PTM	12.	REVISION, Viva
	35 th	2nd Sessional Test (Tentative)		
	36 th	Elements of gating system,		Job 3. Demonstration of

		Pouring basin, sprue, runner, gates,		spinning process on lathe and spinning a bowl on a lathe machine.
13 th	37 th	Types of risers, location of risers, Directional solidification, Construction and working of Pit furnace, Cupola furnace, Crucible furnace – tilting type, Electric furnace	13.	Job 4. Demonstration of grinding process on lathe machine and grinding a job on a lathe machine
	38 th			
	39 th	Different types of casting defects, Testing of defects: radiography, magnetic particle inspection and ultrasonic inspection.		
14 th	40 th	Press Working - Types of presses, type of dies, selection of press die, die material.	14	Job 5. Preparation of utility item out of G.I. sheet.
	41 st			
	42 nd	Press Operations-Shearing, piercing, trimming, punching, notching, shaving, gearing, embossing, stamping, Forging - Open die forging, closed die forging, Press forging, upset forging, swaging, up setters, roll forging, Cold and hot forging, Rolling		
15 th	43 rd	- Elementary theory of rolling, Types of rolling mills, Thread rolling, roll passes, Rolling defects and remedies, Extrusion and Drawing - Type of extrusion- Hot and Cold, Direct and indirect. Pipe drawing, tube drawing, wire drawing	15.	Job 5. Preparation of utility item out of G.I. sheet.
	44 th			
	45 th			
	46 th	Industrial use of plastics, situation where, used.		PTM, Viva, check practical note book
	47 th	Injection moulding-principle, working of injection moulding		

16 th		machine, Compression moulding-principle, and working of compression moulding machine, Potential and limitations in the use of plastics	16.	and jobs
	48 th	3rd Sessional Test (Tentative/VIVA.		