

GANPAT UNIVERSITY									
FACULTY OF ENGINEERING & TECHNOLOGY									
Programme		Diploma Engineering			Branch		Mechatronics Engineering		
Semester		III			Version		1.0.0.0		
Effective from Academic Year			2019-20		Effective for the batch Admitted in			June 2018	
Subject code		1ME2301	Subject Name		METAL CASTING, FORMING & JOINING PROCESSES				
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture (DT)		Practical (Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	2	0	5	Theory	40	60	100
Hours	3	0	4	0	7	Practical	60	40	100

Pre-requisites:
Students must have knowledge of workshop technology like metal fitting and different fitting tools, wood working skill and wood working tools, sheet metal working skill and tools, brazing overview, pipe fitting tools, different types of vices. Students must aware with operator safety and industrial safety guidelines.

Course Learning Outcomes:
The course content should be taught and implemented with an aim to develop different skills leading to the achievement of the following competencies and course learning outcomes: CO1. To understand need of manufacturing processes in mechanical engineering. CO2. To apply the drawing skill to convert in to production drawing. CO3. To develop production skill. CO4. To implement theory skill in to production. CO5. To Verify practical model with industrial machinery.

Course Content				
Name of UNIT	Unit Content	Unit Learning Outcomes	Marks	Hrs
UNIT – 1	1.1 Nature, role and scope of manufacturing processes.	1a. Explain the basic manufacturing processes.	05	04
Introduction To Manufacturing Processes	1.2 Role of machining, forming, casting and joining processes in manufacturing of industrial components.	1b Describe various mechanical properties involved.		
	1.3 Mechanical properties of material.			

UNIT – 2			18	13
Metal working processes	2.1 Concept, principles and differences of hot and cold working processes.	2.a Compare the principles of hot and cold working Process.		
	2.2 Classification of forming processes.	2.b Identify and explain various metal working processes.		
	2.3 Rolling, Forging, Spinning, Drawing, Extrusion, Swaging.	2.c Suggest appropriate metal working process and basic parameters for a given industrial component.		
	i. Types.			
	ii. Working principle.			
	iii. Equipments used and their specifications.			
	iv. Major parts of equipments and their construction of materials and functions.			

	v. Process parameters.			
	vi. Applications.			
UNIT – 3 Metal casting processes	3.1 Basic concept of foundry process.	3.a Appreciate the need of casting process.	16	13
	3.2 Types of foundries.	3.b Calculate pattern allowances.		
	3.3 Pattern:	3.c Interpret the standard color coding on pattern as well as core.		
	i. Importance.	3.d Suggest appropriate casting method suitable for a given industrial component.		
	ii. Types and materials of construction.	3.e Identify casting defects, their causes and suggest remedies.		
	iii. Allowances, their need and			

	normal values.			
	iv. Drawings and color codes.			
	v. Making process.			
	vi. Applications.			
	3.4 Cores:			
	i. Need.			
	ii. Types.			
	iii. Making materials and its properties.			

iv. Testing methods.

v. Sintering.

vi. Applications.

3.5 Types, working and applications of furnaces.

3.6 Molding sand:

i. Sand properties.

ii. Sand mixing.

iii. Sand binders.

3.7 Molding equipments, their major specifications and applications.

3.8 Types of mould, mould making, mould sintering and applications of mould.

3.9 Salvage techniques.

3.10 Recovery of sand.

3.11 Casting processes: basic principle, working, process parameters and applications.

i. Centrifugal.

ii. Die.

	<p>iii. Investment.</p>			
	<p>iv. Shell molding.</p>			
	<p>3.12 Casting defects -types, causes, effects and remedies.</p>			
	<p>3.13 Safety precautions in foundry.</p>			

UNIT – 4			03	02
Non metal moulding processes	4.1 Concept, basic principle, major parts, working and their materials of construction, process parameters and applications of:	4.a Suggest appropriate moulding method suitable for a given nonmetal industrial component.		
	i. Injection moulding.			
	ii. Blow moulding.			
	iii. Extrusion process.			
	4.2 Safety precautions.			
UNIT – 5			18	13
Metal joining processes	5.1 Introduction and classification.	5.a Appreciate the need of joining process to reduce cost and time.		
	5.2 Welding: working principle, setup sketch, specifications of equipment and consumables, functions of each element, process parameters for various materials, applications and safety	5.b Explain different		

	<p>precautions for:</p>			
	<p>i. Gas welding (Oxy-acetylene, Air-acetylene, oxy-hydrogen and LPG (Liquid Petroleum Gas)- oxygen).</p>	<p>welding processes.</p> <p>5.c Identify the area of applications of a particular joining process.</p>		
	<p>ii. Arc welding (Carbon arc, metal arc, MIG (Metal Inert Gas), TIG (Tungsten Inert Gas), flux coated arc and submerged arc).</p>	<p>5.d Suggest appropriate process and process parameters based on given joining situation.</p>		
	<p>iii. Resistance welding (butt, spot, seam, projection and percussion).</p>	<p>5.e Practice standard safety norms during any joining process.</p>		
	<p>iv. Thermit welding.</p>			
	<p>v. Forged welding.</p>			
	<p>5.3 Welding defects -types, causes, effects and remedies.</p>			

	<p>5.4 Working principle, setup sketch, specifications of equipment, tools and consumables, functions of each element, process parameters for various materials, applications and safety precautions for:</p>			
	<p>i. Soldering.</p>			
	<p>ii. Brazing.</p>			
	<p>5.5 Adhesive joining - process, applications.</p>			
	<p>5.6 Fastening process - process, applications.</p>			

List of Practical:
The practical should be carried out in such a manner that students are able to acquire different learning outcomes in cognitive, psychomotor and affective domain to demonstrate course learning outcomes.

No.	Unit	Name of Practical
1	2	<p>Prepare two jobs using hot forging/hot smithy process. This includes cutting of raw material and preparation of pre-forged parts.</p>

2	2	Demonstration of spinning process with preparation of a job.
3	2	Visit a nearby Rolling mill/Hot-Cold material processes, allied manufacturing processes industry and prepare a two-page report comprises of details (type, material, process, etc.) of items produced, quantities, different sections, equipments used with specification, process parameters being used and consumables.
4	3	Demonstration of metal melting, metal pouring, metal casting and casting finishing. Also demonstrate and prepare a report on casting defects. (Use wax in place of molten metal for the purpose of demonstration.)
5	3	Prepare a pattern drawing, pattern and core from the given component/drawing.
6	3	Prepare a mould using prepared pattern, core and moulding sand. Also pour molten metal and get the casting.
7	3	Visit a nearby foundry and prepare a two-page report comprises of details (type, material, process, etc.) of items produced, quantities, different sections, equipments used with specification, process parameters being used and consumables.
8	4	Prepare at least two jobs containing minimum 4 parts in each using arc welding. This

		includes cutting of raw material and preparation of pre-weld parts and use tacks and continuous welding in each job.
9	4	Prepare at least two jobs using gas cutting and gas welding. This includes cutting of raw material and preparation of pre-weld parts. Minimum 3 parts for each job should be taken and should include tacks and continuous welding.
10	4	Prepare a job using spot/seam resistance welding. This also includes cutting of raw material and preparation of pre-weld parts.
11	4	Prepare two jobs, one using soldering and another using brazing. This also includes cutting of raw material and preparation of pre-weld parts.
12	4	Visit a nearby fabrication industry and prepare a two-page report comprises of types of item produced, quantities, different sections, equipments used with specification and consumables.

List of Instruments / Equipment / Trainer Board	
1	Foundry shop and tools
2	Welding shop and welding apparatus
3	Mechanical press dies and punches.
4	Brazing and soldering tools
5	Safety were and lab log book for students.

List of Reference Books			
No	Title of Reference Books	Authors	Publication

1	Workshop Technology I & II	J. A. Schey	Tata MacGraw Hill Education
2	Workshop Technology I & II	Raghuwanshi	Dhanpat Rai and Sons
3	Workshop Technology I, II &	W. A. J. Chapman	Arnold
4	Manufacturing Processes	M. L. Begman	Wiley India
5	Production Technology	R.K. Jain and S.C. Gupta	Khanna publication
6	Production Technology	H.H. Marshall	Machinery Publishing Company
Link of Learning Web Resource			
1	https://nptel.ac.in/courses/112107089/		
2	https://nptel.ac.in/courses/112106153/		
3	https://nptel.ac.in/courses/112107144/13		
4	https://nptel.ac.in/courses/112108150/4		

CO'S AND PO'S MAPPING

PO'S/CO'S		CO1	CO2	CO3	CO4	CO5
PO1	Proficiently applies concepts, theories and techniques of the relevant natural, physical sciences and knowledge in mathematics.	SLI	SUB	SLI	SLI	SLI
PO2	Use basic principles of statics, dynamics, fluid mechanics, and engineering materials, strength of materials engineering standards and manufacturing processes to aid in the design, characterization, and analysis and troubleshooting of mechanical system.	SLI	SUB	SUB	SUB	SUB
PO3	Apply their engineering knowledge, critical thinking and problem solving skills in professional engineering practice or in non engineering fields, such as law, medicine or business.	MED	SUB	SUB	SUB	SUB
PO4	Continue their intellectual development, through, for example, graduate education or professional development courses.	MED	MED	SUB	SUB	SUB
PO5	Use of appropriate computer languages, modern tool and application software that pertain to Mechanical engineering technology systems.	MED.	MED.	MED.	MED.	MED.
PO6	Ability to identify problems, conducts experiments, gather data, analyze data and produce results.	SLI.	MED.	MED.	SUB.	SUB.
PO7	Retain the intellectual curiosity that motivates lifelong learning and allows for a flexible response to the rapidly evolving challenges of the 21st century	NONE	MED.	MED.	SUB.	SUB.
PO8	Design a system component or process to meet desired need within realistic constraints, such as economic, environmental and social.	MED.	SUB.	SUB.	SUB.	SUB.
PO9	Values the need for, and demonstrates, ethical conduct and professional accountability.	NONE	NONE	NONE	NONE	NONE
PO10	Demonstrates effective communication to professional and wider audiences.	SLI	SLI	SLI	SLI	SLI
PO11	Appreciates entrepreneurial approaches to engineering practice.	MED.	MED.	MED.	SUB.	SUB.
PO12	Apply commitment to quality, timeliness, and continuous improvement.	SLI	MED.	MED.	MED.	MED.