Lok Jagruti Kendra University
University with a Difference

Diploma in Automation & Robotics

LJ Polytechnic

Course Code: 025120303

Manufacturing Processes

Programme / Branch Name			Diploma in Automation & Robotics			
Course Name	Manufacturing Processes				**Course Code**	025120303
Course Type	HSSC	BSC	ESC	PCC	OEC	PEC

Legends: HSSC: Humanities and Social Sciences Courses BSC: Basic Science Courses
ESC: Engineering Science Courses PCC: Program Core Courses
OEC: Open Elective Courses PEC: Program Elective Courses

1. Teaching and Evaluation Scheme

Teaching Hours / Week				**Evaluation Scheme**			
L	**T**	**P**	**Total Credit**	**CCE**	**SEE (Th)**	**SEE (Pr)**	**TOTAL**
3	0	2	4	50	50	50	150

Legends:
L: Lectures T: Tutorial P: Practical
CCE: Continuous & Comprehensive Evaluation
SEE (Th): Semester End Evaluation (Theory)
SEE (Pr): Semester End Evaluation (Practical)

2. Prerequisites

- ✓ Material science
- ✓ Engineering Mathematics-I
- ✓ Engineering Mathematics-II

3. Rationale

Understand the basic working principles and the forming of primary manufacturing processes. Understand the appropriate manufacturing processes for the product to be made by casting. Understand different finishing operations (Grinding, Honing, Lapping etc). Identify terms, tools and machinery used in primary manufacturing processes. Identify the types of defects and define them. Know and Apply basic manufacturing processes for manufacturing different components concerning applications, economics and environmental impact. Perform cost analysis for the various manufacturing process to minimize the cost of processing the material.

4. Objectives

- ✓ Students will learn the fundamentals of conventional and non-traditional manufacturing processes and interpret product requirements to select and/or synthesize suitable manufacturing processes. Manufacturing is the backbone of any industrialized nation. Manufacturing is the basic area for any mechanical engineering technician. They should be introduced to the basic processes of manufacturing.
- ✓ This subject will help the student to be familiarized with working principles and operations like, casting, moulding, metal forming, and metal finishing etc. which are the basic manufacturing processes.
- ✓ This course provides the student with an introduction to industrial manufacturing from the viewpoint of mechanical technology.
- ✓ Successful completion of the course will provide the student with the benefits, limitations, and applications of different manufacturing preprocess and engineering materials for product

manufacturing. Each process is covered from a technical perspective; correct terms are introduced so that the student will be able to use the language of the engineer or technologist.

✓ The overall aim is to establish the technical knowledge for selection, planning, and estimating of manufacturing processes and systems.

5. Contents

Unit No.	Unit Name	Topics	Learning Outcome	% Weightage	Hours
1.	**Introduction to Manufacturing Processes**	1.1. Introduction 1.2. Concept of Manufacturing 1.3. Selecting Product Materials (Types of Materials,Propertis of Materials) 1.4. Classification of manufacturing processes 1.5. Modern Concepts of Manufacturing 1.6. Manufacturing Cost	• The student will learn about the core concept of manufacturing • The student will be having the capability of selecting suitable manufacturing processes to manufacture the products optimally. • The student will learn about different materials and select appropriate materials as per different manufacturing processes.	7	3
2.	**Metal Forming Processes**	2.1. Mechanical Working 2.1.1.Introduction 2.1.2.Principle of Recrystallization. 2.1.3.Hot working 2.1.4.Cold working 2.2. Metal Rolling 2.2.1.Principle of metal rolling 2.2.2.Basic components of a simple rolling process 2.2.3.Types of rolling mill. 2.3. Metal Drawing 2.3.1.Basic Principle of drawing of metals 2.3.2.Deep drawing of metals 2.3.3.Wire drawing 2.4. Extrusion 2.4.1.Definition 2.4.2.Classify the methods of	• Understand and apply the concept of recrystallization temperature which will help them for the selection of the metal forming process. • Analyze the effect of parameters influencing metal forming and compare hot working and cold working with applications. • Understand and apply the mechanism of deformation for different metal forming processes and develop the relation between input and output parameters of the process. • Understand	29	12

		extrusion 2.4.3.Advantage and disadvantage 2.4.4.Tube extrusion and impact extrusion 2.4.5.Application of extrusion processes 2.5. Forging 2.5.1.Types of forging 2.5.2.Die forging 2.5.3.Advantage of forming by forging 2.5.4.Limitations of forging 2.5.5.Press forging 2.5.6.Drop forging 2.5.7.Upset forging	capabilities and applications of bulk metal forming processes and sheet metal work. • Understand when and why metal forming is chosen compared to other compatible methods. • Students can identify the difference between forging, rolling and other extrusion processes. • Outline tooling and equipment required for important metal forming processes. • Understand the different types of defects, causes and apply their remedial measures in metal forming processes.		
3.	**Metal Castings Processes**	3.1. Introduction 3.2. Aims in making a casting 3.3. Classification of foundries 3.4. Patterns Making 3.4.1.Types of patterns 3.4.2.Materials used for patterns 3.4.3.Pattern allowances 3.4.4.Colour code for patterns 3.5. Moulding sand 3.5.1.Sand properties 3.5.2.Types of Sand 3.5.2.Sand mixing 3.5.3.Sand binders 3.5.4.Moulding machines 3.6. Core 3.6.1.Definition 3.6.2.Need 3.6.3.Types 3.6.4.Method of making cores 3.7. Concept of gating	• Analyze and access the use of casting processes in manufacturing and understand the working of various casting processes. • Learn and understand good foundry practice. • Apply theoretical and experimental techniques for the measurement of important outcomes of casting processes. • Understand and apply to manufacture for pattern and mould.	29	12

		3.8. Metal Casting Processes (Principle, Working and Application) i. Centrifugal Casting ii. Die Casting iii. Investment Casting iv. Shell Moulding 3.9. Non Metal Casting Processes (Principle, Working and Application) i. Injection Moulding ii. Blow Moulding iii. Extrusion Process 3.10. Casting defects 3.11. Modern trends in casting			
4.	**Grinding & Super-Finishing Processes**	4.1. Introduction of grinding 4.1.1.Definition & Principle of grinding 4.1.2.Cutting action of grinding wheel 4.2.Types of grinding operations 4.3.Types of grinding machines 4.4. Grinding wheels 4.4.1.Classification of grinding wheels 4.4.2.Marking system for grinding wheels 4.4.3.Glazing and loading of grinding wheels 4.4.4.Trueing and dressing of grinding wheels 4.5.Surface finish and surface roughness 4.6. Honing 4.7. Lapping 4.8. Super finishing	• Student will able to learn various grinding operations and machines. • The student will able to select appropriate grinding wheel for effective grinding as per grinding operations and machines. • The student will able to learn and explain different surface finishing processes.	19	8
5.	**Costing & Evaluation of Forming, Casting**	5.1. Introduction 5.1.1.Cost terminology associated with forging shop 5.1.2.Cost terminology associated with foundry shop	• Student will able to learn various types of cost connected with casting and forming processes. • The student will able to select proper cost of	16	7

		5.2. Factors affecting to cost estimation of forging 5.3. Procedure of cost estimation of forging 5.4. Factors affecting to cost estimation of casting 5.5. Procedure of cost estimation of casting	different processes. • The student will able to learn and explain that how to decide a cost of finished part.		
				Total Hours	**42**

6. List of Practicals / Exercises

The practical/exercises should be properly designed and implemented in an attempt to develop different types of skills so that students can acquire the competencies/Programme outcomes. Following is the list of practical exercises for guidance.

Sr. No.	Practical / Exercises	Key Competency	Hours
1.	Forging Practice	Learn to prepare jobs using hot forging/hot smithy.	4
2.	Pattern Making	Learn to make a drawing and making of pattern.	4
3.	Demonstration of metal melting in pit furnace & casting process.	To understand about melting of metal in furnace.	2
4.	Foundry Practice	Learn about tools of foundary and different processes of foundary.	6
5.	A visit to the foundry should be arranged to have first-hand knowledge of melting, pouring and casting	Learn about practical knowledge of casting.	6
6.	Each student will present and will prepare a report on: a.His/her observation for the jobs made. b.His/her experience during industrial visits. c.Process parameters and their effects.	Learn about how to represent technical topic in industry.	4
7.	Learning Activities	Select two industrial components (verified by teacher) and list various methods of manufacturing used to produce these components.	2
		Total Hours	**28**

7. Suggested Specification Table for Evaluation Scheme

Unit No.	Unit Name	Distribution of Topics According to Bloom's Taxonomy					
		R %	U %	Ap %	C %	E %	An %
1.	Introduction manufacturing processes	42	29	29	0	0	0
2.	Metal Forming Processes	18	18	28	18	0	18
3.	Metal Castings Processes	22	17	22	9	17	13
4.	Grinding & Super-Finishing Processes	9	9	25	9	9	39
5.	Costing & Evolution of Forming, Casting	33	0	33	12	22	0

Legends: R: Remembering U: Understanding
App: Applying C: Creating
E: Evaluating An: Analyzing

8. Textbooks

1) Manufacturing Processes, PHI Learning Private Limited, by J.P.Kaushish, 2nd Edition.
2) Production Technology, Khanna Publishers, by R.K.Jain, 17th Edition.ngineering Mechanics by R. S. Khurmi, S. Chand & Company Ltd., New Delhi.

9. Reference Books

1) Production Technology, Dhanpat Rai Publications, by O.P Khanna, 10th Edition.
2) Manufacturing & Technology: Foundry Forming and Welding, Tata McGraw Hill, by P.N.Rao, 3rd Edition.
3) Manufacturing, Engineering and Technology, Kalpakjian S., Schemid S., Addison Wesley

10. Open Sources (Website, Video, Movie)

1) https://www.youtube.com/channel/UCxqYDMfaQtfrMn6C9WlvPug
2) https://www.youtube.com/watch?v=Um_g8sQ_p3Y
3) https://www.youtube.com/watch?v=Um_g8sQ_p3Y
4) https://www.youtube.com/watch?v=otdVxjv-zzU
5) https://www.youtube.com/watch?v=aEe2patiyiE
6) https://www.youtube.com/watch?v=abMNt_QF-4A
7) https://www.youtube.com/watch?v=AXiDluxlXT0
8) https://www.youtube.com/watch?v=LWM6b8P0r3E
9) https://www.youtube.com/watch?v=ohkJg8JxFPY
10) https://www.youtube.com/watch?v=pd4Uk8vk09c
11) https://www.youtube.com/watch?v=Y75IQksBb0M