GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

Course Curriculum

MANUFACTURING ENGINEERING - I
(Code: 3332001)

Diploma Programme in which this course is offered	Semester in which offered
Mechatronics Engineering	3rd Semester

1. RATIONALE

This subject provides knowledge regarding different types of manufacturing processes used to produce high quality products with optimum cost and time. It also provides a knowledge frame that can be used to suggest and manipulate vital process parameters related to different manufacturing processes so that the component thus produced can compete in today's global market. It also inculcates safety consciousness in the student required during manufacturing of a component.

2. COMPETENCY (Programme Outcome according to NBA Terminology)

The course content should be taught and with the aim to develop different types of skills so that students are able to acquire following competency:

- **Manipulate various process parameters related with different manufacturing processes effectively to produce a given component.**

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	
4	0	4	8	70	30	40	60	200

Legends: L -Lecture; **T -**Tutorial/Teacher Guided Student Activity; **P -**Practical; **C -** Credit; **ESE**-End Semester Examination; **PA** -Progressive Assessment

4. COURSE DETAILS

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
Unit – I Introduction to Manufacturing Processes	1a. Explain the basic manufacturing processes. 1b. Describe various mechanical properties involved.	1.1 Nature, role and scope of manufacturing processes. 1.2 Role of machining, forming, casting and joining processes in manufacturing of industrial components. 1.3 Recall mechanical properties of material. 1.4 Basic Principals of mechanical working.
Unit – II Metal Working Processes	2a. Compare the principles of hot and cold working Process. 2b. Describe the various metal working processes. 2c. Suggest appropriate forming process and basic parameters for a given industrial component.	2.1 Hot and cold working processes. 2.2 Rolling, Forging, Spinning, Drawing, Extrusion, Forming, Swaging, Bending, Embossing, coining, sand blasting, Working principle, Equipments used and their specifications, Process parameter
Unit – III Metal and Non-metal Casting Processes	3a. Justify the need of casting process. 3b.3b. Calculate pattern allowances. 3c. Explain the standard colour coding on pattern as well as core. 3d. Compare various casting methods. 3e. Suggest appropriate casting method suitable for a given industrial component. 3f. Identify casting defects, their causes to suggest remedies.	3.1 Types of foundries 3.2 Pattern: Importance, Types, Drawings and colour codes, Material, Making process, Allowances and their values 3.3 Cores:Types, Making materials and its properties, Testing, Sintering 3.4 Furnaces: Types, Working and applications 3.5 Moulding sand: Sand properties, Sand mixing, Sand binders 3.6 Moulding equipments, their major specifications, applications. 3.7 Types of mould, mould making, mould sintering and applications of mould, Salvage techniques, Recovery of sand. 3.8 Casting processes: Centrifugal, Die, Investment, Shell moulding, Special castings 3.9 Casting defects: Types, Causes, effects, remedies 3.10 Casting of non metallic material: Injection moulding, Blow moulding 3.11 Metal Melting and pouring process. 3.12 Finishing of casting: Need and Methods 3.13 Safety precautions in foundry.
Unit – IV Metal Joining Processes	4a. Appreciate the need of joining process to reduce cost and time. 4b. Explain different welding processes. 4c. Identify the area of application of a particular joining process.	4.1 Classification of Metal Joining Processes 4.2 Welding: Gas welding (Oxy-acetylene, Air-acetylene, oxy-hydrogen and LPG Oxygen), Arc welding (Carbon arc, metal arc, MIG, TIG, flux coated arc and Submerged arc), Resistance welding (Butt, spot, seam, rojection and percussion), Thermit welding, Forged welding, Working principle, setup sketch, specifications

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
	4d. Suggest appropriate process parameters based on given joining situation. 4e. Practice standard safety norms during any joining process.	of equipment, functions of each element, process parameters for various materials, and safety precautions. 4.3 Soldering: Working principle, Setup sketch, Specifications of equipment, tools and consumables, Functions of each element, Process parameters for various materials, Safety precautions 4.4 Brazing: Working principle, Setup sketch, Specifications of equipment, tools and consumables, Functions of each element, Process parameters for various materials, Safety precautions 4.5 Adhesive joining process, 4.6 Fastening process process 4.7 Recent trends in metal joining process: Electron Beam welding, LASER Beam Welding, Ultrasonic Welding, Working principle, setup sketch, specifications of equipment, functions of each element, Benefits, Limitations.

5 SUGGESTED SPECIFICATIONTABLE WITH HOURS and MARKS(THEORY)

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Introduction to Manufacturing Processes	04	04	03	00	07
II	Metal Working Processes	16	07	08	06	21
III	Metal and Non-metal Casting Processes	18	05	08	08	21
IV	Metal Joining Processes	18	05	08	08	21
Total		**56**	**21**	**27**	**22**	**70**

Legends: R = Remember; U = Understand; A = Apply and above levels (Bloom's revised taxonomy)

Note: This specification table shall be treated as only general guideline for students and teachers. The actual distribution of marks in the question paper may vary from above table.

6. SUGGESTED LIST OF STUDENT ACTIVITIES

i. Select four industrial components (approved by teacher) and list various methods of manufacturing used to produce these components.
ii. Select at least two components which are made by casting only. Also sate the type of casting method used.
iii. Prepare a list of household items which are prepared by joining processes.
iv. Prepare a list of plastic items which are produced using different types of casting methods. Also name the process used.

v. Using internet prepare a list of industries/workshops in the nearby area which are producing components by machining, casting and forming.
vi. Identify the type of manufacturing process used in making main component of a car engine.

7. SUGGESTED LIST OF PRACTICALS/EXERCISES

The practical/exercises should be properly designed and implemented with an attempt to develop different types of practical skills (Course Outcomes in psychomotor and affective domain) so that students are able to acquire the competencies (Programme Outcomes). Following is the list of practical exercises for guidance.

Note: Here only Course Outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of Programme Outcomes/Course Outcomes in affective domain as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.

S. No.	Unit No.	Practical/Exercises (Course Outcomes in Psychomotor Domain according to NBA Terminology)	Approx. Hours
1	II	Prepare a job using forging process. This includes cutting of raw material and preparation of pre forged parts.	06
2	II	Demonstration of spinning process with preparation of a job.	04
3	II	Visit a nearby sheet metal/press tool industry and prepare a two page report comprises of types of item produced, quantities, different sections, equipments used with specification and consumables.	--
4	II	Visit a nearby Rolling mill/Hot-Cold material processes, allied manufacturing processes industry and prepare a two page report comprises of types of item produced, quantities, different sections, equipments used with specification and consumables.	--
5	III	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.)	06
6	III	Prepare a pattern drawing, pattern and core from the given component/drawing.	06
7	III	Prepare a mould using prepared pattern, core and moulding sand.	06
8	III	Visit a nearby foundry and prepare a two page report comprises of types of item produced, quantities, different sections, equipments used with specification and consumables.	--
9	IV	Prepare a job using arc welding. This includes cutting of raw material and preparation of pre-weld parts. Minimum 4 parts should be taken and should include tags and continuous welding.	08
10	IV	Prepare a job using gas cutting and gas welding. This includes cutting of raw material and preparation of pre-weld parts. Minimum 3 parts should be taken and should include tags and continuous welding.	08
11	IV	Prepare a job using spot/seam resistance welding. This also includes cutting of raw material and preparation of pre-weld parts.	06
12	IV	Prepare a job using brazing. This also includes cutting of raw material and preparation of pre weld parts.	06
13	IV	Visit a nearby fabrication industry and prepare a two page report	--

S. No.	Unit No.	Practical/Exercises (Course Outcomes in Psychomotor Domain according to NBA Terminology)	Approx. Hours
		comprises of types of item produced, quantities, different sections, equipments used with specification and consumables.	

8. SPECIAL INSTRUCTIONAL STRETAGIES (If Any)

9. SUGGESTED LEARNING RESOURCES

A) List of Books

S. No.	Title of Books	Author	Publication
1.	Workshop Technology I and	J. A. Schey	Tata MacGraw Hill
2.	Workshop Technology I and 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.	Welding Engineering	B.E.Rossi	Jefferson Publications
7.	Audles Welding Guide	F.D.Graham	Wiley India
8.	Foundry Engineering	P.L.Jain	Tata MacGraw Hill
9.	Principle of Foundry	Jain and Gupta	National Book Trust, India
10.	Manufacturing Processes	S.E.Rusinoft	Times of India Press
11.	Production Technology	H.H.Marshall	Machinery Publishing
12.	Elements of Workshop Technology I and II	Hazra Choudhari	M.P.P
13.	Text book on Production Engineering	P.C.Sharma	S.Chand

B) List of Major Equipment:

C) List of Software/websites:

10. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. K.P.Patel**, HOD, Department of Mechanical Engineering, B.S.Patel Polytechnic, Kherva.
- **Prof. A.R.Patel**, Sr. Lect. Department of Mechanical Engineering, B.S.Patel Polytechnic, Kherva.
- **Prof. J.M.Patel**, Sr. Lect. Department of Mechanical Engineering, B.S.Patel Polytechnic, Kherva.

Coordinator and Faculty Members from NITTTR, Bhopal

- **Prof. S. K. Pradhan**, Associate Professor and Head Department of Mechanical Engineering
- **Prof. C. K. Chug**, Professor, Department of Electronics media