GUJARAT TECHNOLOGICAL UNIVERSITY

PRODUCTION ENGINEERING

METAL FORMING TECHNOLOGY

SUBJECT CODE: 2162508

B.E. 6th SEMESTER

Type of course: Core

Prerequisite: Enthusiasm to learn the subject

Rationale: The present course intends to give the exposure of various methods of producing thread, gear manufacturing processes as well as semi automats and automats and Unconventional manufacturing processes for a product whose scale ranges from miniature to extra-large. Since metal forming process is an important manufacturing route to fabricate bulk storage and processing equipment's. The subject focuses on knowledge and understanding of various manufacturing techniques and equipment's, the underlying principles and their relative merits and demerits. It also helps them to understand the advancement of technology in manufacturing.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		PA (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	0	2	6	70	20	10	20	10	20	150

Content:

Sr. No.	Subject Contain	Total Hrs.	Wodule Weightage
1	**Introduction to Metal Forming:** Metallurgical aspects of metal forming, slip, twinning mechanics of plastic deformation, effects of temperature, strain rate, microstructure and friction in metal forming-yield criteria and their significance, Classification of Metal Forming Processes, Advantages and Limitations, Stress strain relations in elastic and plastic deformation, concept of flow stresses, deformation mechanisms, Hot and Cold Working Processes and Its Effect on Mechanical Properties.	15	25
2	**Rolling** Introduction and Classification, Types of Rolling Mills, Forces and Geometrical Relationships in Rolling, Calculation of Rolling Load, Roll Pass Design, Defects in Rolled Products. Other Related Processes like Roll Piercing, Ring Rolling, Pipe and tube production by rolling processes.	10	16
3	**Forging:** Introduction and Classification, operation and principle of Forging Processes and Equipment, Methods of forging, Open and Close Die	10	16

	Forging Processes, Defects, Structure and Properties of Forged Products. Force Analysis in forging. Other Related Processes like Cold Heading, Rotary Swaging, Sizing, Coining, Embossing and Roll Forging.		
4	**Extrusion:** Introduction and Classification, Extrusion Equipment, Forces in extrusion, Analysis of Extrusion Process, Extrusion of components including Seamless Pipes and Tubes. Extrusion of pipes by cold working, Other Related Processes like Impact Extrusion, Hydrostatic Extrusion, Piercing, Drawing, cupping and bending.	09	15
5	**Drawing:** Introduction and Classification, Wire Drawing, Rod Drawing, Tube Drawing, Deep Drawing, Analysis of Wire Drawing Process and Load Calculations.	08	14
6	**Sheet Metal Forming:** Principle, process parameters, equipment and application of the following processes: spinning, stretch forming, plate, V and edge bending, Curling, Ironing, Roll Bending, Metal Spinning. Press brake forming, explosive forming, Hydro forming, electro hydraulic forming, and magnetic pulse forming. High Velocity forming of metals and High energy Rate forming.	08	14

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
7	**7**	**21**	**21**	**14**	**0**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

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

Reference Books:

1. Textbook of Production Engineering by P. C. Sharma, S Chand
2. Production Technology Vol-II by O. P. Khanna & Lal, Dhanpat Rai
3. Fundamentals of Manufacturing Processes by Lal G K , Narosa
4. Advanced Machining Processes by V.K.Jain, Allied

Course Outcome:

After learning the course the students should be able to:

1. Identify various forming process.
2. Identify and determine various methods rolling processes
3. Identify and determine various methods to forging processes
4. Identify and determine various methods to extraction processes
5. Identify and determine various methods to Drawing processes
6. Identify and determine various methods to Sheet metal forming processes

List of Experiments:

1. To Study about Metal Forming techniques (02 hours)
2. To Study about Rolling (02 hours)
3. To Study about Forging (02 hours)
4. To Study about Extrusion (02 hours)
5. To Study about Drawing (04 hours)
6. To Study about Sheet Metal Forming (02 hours)
7. Industrial Visit with student's individual report (8 Hrs)

Design based Problems (DP)/Open Ended Problem:

1. Calculate Rolling Load & Design Roll Pass for the given data.
2. Calculate Force Analysis in forging for the given data.
3. Analyze Wire Drawing Process and prepare Load Calculations for the given component.

List of Open Source Software/learning website:

http://nptel.ac.in/

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.