

GUJARAT TECHNOLOGICAL UNIVERSITY

Production Engineering

B. E. SEMESTER: VI

Subject Name: **Metal Forming Processes**

Subject Code: **162503**

Teaching Scheme				Evaluation Scheme		
Theory	Tutorial	Practical	Total	University Exam (Theory) (E)	Mid Sem Exam (Theory) (M)	Practical (I)
3	0	2	5	70	30	50

Sr. No.	Course Contents	Total Hrs
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 It's Effect on Mechanical Properties.	08
2.	Fracture, Creep & Fatigue: Mode & Types of fractures and its influence in service life of part, concept of creep, method to improve creep resistance, Material suitable for high temperature application, failure of material by fatigue and its causes, Fatigue failure curves, fatigue tests of material & method to improve fatigue Resistance.	05
3.	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.	07

4.	Forging: Introduction and Classification, operation and principle of Forging Processes and Equipments, Methods of forging, Open and Close Die 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.	07
5.	Extrusion: Introduction and Classification, Extrusion Equipments, 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.	06
6.	Drawing: Introduction and Classification, Wire Drawing, Rod Drawing, Tube Drawing, Deep Drawing, Analysis of Wire Drawing Process and Load Calculations.	05
7.	Sheet Metal Forming: Principle, process parameters, equipments 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.	07

Text Books:

1. Metal Processes for Materials by Kalpakjian, Pearson
2. Metal Forming Processes by G. R. Nagpal, Khanna
3. Theory of Plasticity & Metal Forming by Sadhu Singh, Khanna
4. Metal working Technology by Narayanswamy, Prentice Hall

Reference Books:

1. Technology of Metal forming Processes by Surendra, PHI
2. Mechanics of Sheet Metal Forming by Marciniak, Elsevier
3. Mechanical Metallurgy by George Dieter, McGrawhill

