

ME306: METAL FORMING PROCESSES
CREDITS = 5 (L=3, T=0, P=2)

Course Objective:

Illustrate capabilities and applications of metal forming processes.

Teaching and Assessment Scheme:

Teaching Scheme			Credits	Assessment Scheme				
L	T	P		Theory		Practical		Total Marks
			ESE	CE	ESE	CE		
3	0	2	5	70	30	30	20	150

Course Contents:

Unit No.	Topics	Teaching Hours
1	<u>Introduction to Manufacturing Processes:</u> Manufacturing process- A transformation process, basic objectives, Difference between Cast and Wrought products, Definition and broad classification of manufacturing processes with typical examples of applications.	03
2	<u>Introduction to Metal forming:</u> Characteristics of metal forming and applications in general, Classification of metal forming processes according to stresses with typical examples, Other types of classifications.	03
3	<u>Theory of Metal Forming:</u> Theory of Plastic deformation, Strain hardening, Effect of Temperature, Composition and Strain rates on metal forming, Recovery, Recrystallization and Grain Growth, Characteristics and applications of Hot working and Cold working.	06

Unit No.	Topics	Teaching Hours
4	<u>Forming Processes:</u>	06
	Working principle, characteristic features, capabilities and application of Compressive forming processes like, Rolling, Forging and Extrusion.	04
	Working principle, characteristic features, capabilities and application of Combined Tensile & Compressive forming processes like, Wire drawing, Tube drawing, Deep drawing or Cupping and Redrawing, Spinning.	02
	Working principle, characteristic features, capabilities and application of Tensile forming processes like, Stretch forming, Expanding or Bulging. Erichsen Cupping test.	03
	Working principle, characteristic features, capabilities and application of Forming by Bending like, V-bend, U-bend, Roll bending, Straightening. Bend allowance and bend length, Springback in bending and methods to counter springback, Defects in bending and remedies.	04
	Working principle, characteristic features, capabilities and application of Forming by Shearing: Blanking, Punching, Notching, Mechanism of Shearing, Punch & die design for Blanking and Punching operations, Estimation of shearing load and press capacity, Efficient utilization of sheet.	04
	Working principle, characteristic features, process variables, capabilities and application of High Energy Rate Forming processes like, Explosive forming, Hydro Forming, Magneto forming etc.	
5	Overview of Tooling and Equipments used for metal forming, Safety in Press working.	03
6	Formability of some metal forming processes, Friction and Lubrication in metal forming, Common defects in metal forming.	04
TOTAL		42

List of References:

1. Kaushish, J. P., "Manufacturing Processes", 2nd Edition, PHI Learning Pvt. Ltd, 2010
2. Rao, P. N., "Manufacturing Technology: Foundry, Forming And Welding", Tata McGraw Hill
3. Ghosh, Amitabh & Mullick, "Manufacturing Science", 2nd edition, EWP
4. Juneja, B. L., "Fundamentals of Metal Forming", 1st Edition, New Age International (P) Ltd., 2007
5. Kalpkjian, S, & Schmid Stevens, "Manufacturing Engineering & Technology" 7th Edition, Pearson, 2013
6. Black, J. T., & Kohser, Ronald A.; "DeGarmo's Materials and Processes in Manufacturing", 10th edition, John Wiley & Sons, Inc., 2007

Course Outcomes (COs):

At the end of this course students will be able to ...

1. Determine major process/processes of manufacturing used for given application.
2. Explain when and why metal forming is chosen compared to other compatible methods.
3. Analyze effect of parameters influencing metal forming and compare hot working and cold working with applications.
4. Explain capabilities and applications of bulk metal forming processes and sheet metal work.
5. Outline tooling and equipments required for important metal forming processes.
6. Examine effects of friction & lubrication and causes of common defects in metal forming.