

MECHANICS OF METAL FORMING
Semester II (Production Engineering) SUB CODE: MEPR201
Teaching Scheme (Credits and Hours)

Teaching Scheme				Total Credit	Evaluation Scheme					Total Marks
L	T	P	Total		THEORY		IE	CIA	PR. / VIVO	
Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	
4	0	2	6	5	3	70	30	20	30	150

LEARNING OBJECTIVES:

The objective of this course is

- To learn various concepts related to metal forming process
- To have detailed analysis of metal forming principle to be applied in actual practice.

LESSON PLANNING

SR.NO	CHAPTER NO	DATE/WEEK	%WEIGTAGE
1	1,2	1 st 2 nd 3 rd	20
2	3	4 th 5 th 6 th	20
3	4	7 th 8 th 9 th	20
4	5,6	10 th 11 th 12 th	20
5	7,8	13 th 14 th 15 th	20

Total hours (Theory): 60, Total hours (Practical): 30, Total hours: 90

DETAILED SYLLABUS

Chap . No.	Topic
1	Basics of metal forming: Mohr's circle - isotropic elasticity - yield theories
2	Plastic stress- strain relationship - plastic work - the principle of normality -incremental plastic strain.
3	Constitutive relationships: Mechanical properties - work hardening -compression test, bulge test, plane strain compression test - plastic instability in tension tests.
4	Strain rate - super plasticity - slab analysis for sheet drawing - Extrusion and forging
5	Forging: Upper bound solution for Extrusion - Indentation and plane strain forging, lower bound solution
6	Slip line field theory and its solution - Formability and its testing.
7	Sheet Metal forming: Bending theory, Cold Rolling theory - Hill's anisotropic plasticity theory - Hill's general yield theory
8	CAD/CAM applications in Extrusion, Forging and sheet metal Forming – Localized necking in biaxial stretching.

LIST OF PRACTICALS:

1	DEMONSTRATE THE CONCEPT OF SLIP LINE FIELD THEORY WITH IN DETAIL CASE STUDY.
2	ANALYSIS OF DIRECT CHILLED VERTICAL CONTINUOUS CASTING OF ALUMINUM ALLOYS
3	ANALYSIS OF DIRECT CHILLED VERTICAL CONTINUOUS CASTING OF MAGNESIUM ALLOYS
4	ANALYSIS OF UPPER BOUND THEORY WITH SHEET METAL FORMING WORK
5	ANALYSIS OF UPPER BOUND THEORY WITH WIRE DRAWING
6	ANALYSIS OF LOWER BOUND THEORY WITH OPEN DIE FORGING
7	ANALYSIS OF LOWER BOUND THEORY WITH CLOSED DIE FORGING
8	TO DESIGN AND OPTIMIZE THE BENDING PRESS FOR COLD ROLLING PROCESS OF "C" CHANNEL BY APPLICATION OF THE HILL'S THEORY TO ACHIEVE CLOSE TOLERANCES IN TERMS OF FLATNESS, TO PREVENT BUTT, CURL AND TO ACHIEVE ANTI WARP QUALITY
9	TO DESIGN AND OPTIMIZE THE BENDING PRESS FOR COLD ROLLING PROCESS OF I BEAM BY APPLICATION OF THE HILL'S THEORY
10	COMPUTATION OF NECKING IN BIAXIAL STRETCHING IN SHEET METAL FORMING

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all units while conducting teaching & examination.
- Attendance is compulsory in lectures and Tutorial.
- Viva Voce will be conducted at the end of the semester of 30 Marks.
- One internal exam of 30 marks is conducted as a part of Mid semester evaluation.

STUDENTS LEARNING OUTCOMES:

At the end of the course

- The students will gain an insight to metal forming principles, analysis of the process & its industrial application.

STUDENTS LEARNING OUTCOMES:

At the end of the course

- The students will gain an experience in the implementation of metal forming techniques concepts which are applied in the field of production.

Reference Books:

1. Hosford W.F and Caddell, R.M, "Metal Forming Mechanics and Metallurgy", Prentice Hall, 1983.
2. Narayanasamy R., "Theory of Plasticity", Ahuja Publications, 2000.
3. Scrope Kalpakjian, "Manufacturing processes for Engineering Materials", Addison Wesley, 1997.
4. Metal forming: Processes and Analysis – B. Avitzler-Tata-MGH
5. Mechanical Metallurgy – Dieter-MGH