PLASTIC ANALYSIS AND DESIGN

(Professional Elective –II)

Course Code: 19CE2254	**L**	**P**	**C**
	3	**0**	**3**

COURSE OUTCOMES:
Students will be able to:

CO 1: Learn Introduction and basic hypothesis, Virtual work in the elastic-plastic state.

CO 2: Learn Method of Limit Analysis, applicable to beams basic theorems of limit analysis, rectangular portal frames, gable frames, grids.

CO 3: Learn Limit design Principles, and method of combining mechanisms.

CO 4: Calculate of Deflection in Plastic beams and frames.

CO 5: Learn Minimum weight Design:

SYLLABUS:

UNIT I (10-Lectures)

Introduction and basic hypothesis: Concepts of stress and strain – relation of steel Moment curvature relation- basic difference between elastic and plastic analysis with examples- Yield condition, idealizations, collapse criteria- Virtual work in the elastic-plastic state- Evaluation of fully plastic moment and shape factors for the various practical sections.

LO1: Understand stress strain relation.

LO2 : Understand the basic concept in plastic.

UNIT II (10-Lectures)

Method of Limit Analysis: Introduction to limit analysis of simply supported, fixed beams and continuous beams, Effect of partially fixity and end, invariance of collapse loads, basic theorems of limit analysis, rectangular portal frames, gable frames, grids, superposition of mechanisms, drawing statistical bending moment diagrams for checks.

LO1 : Analyse beam using plastic theory.

LO2 : Learn the

UNIT III **(10-Lectures)**

Limit design Principles: Basic principles, limit design theorems, application of limit design theorems, trial and error method, method of combining mechanisms, plastic moment distribution method, load replacement method, continuous beams and simple frames designs using above principles.

LO1 : Understand application to limit state design.

LO2 : Solve problem of beams and frames.

UNIT IV **(10-Lectures)**

Deflection in Plastic beams and frames: Load deflection relations for simply supported beams, deflection of simple pin based and fixed based portal frames, method of computing deflections.

LO1: Find load deflection relation for beam.

LO2: Find load deflection relation for frames.

UNIT V **(10-Lectures)**

Minimum weight Design: Introduction to minimum Weight and linear Weight functions- Foulkes theorems and its geometrical analogue and absolute minimum weight design.

LO1: Understand minimum weight design.

LO2: Understand different theorem for minimum weight design.

TEXT BOOKS:

1. B G Neal, Plastic Methods of Structural analysis-, 3rd edition, Chapman and hall publications, 1977
2. B.C.Punmia, Ashok Kumar Jain, Arun Kumar Jain, –Comprehensive Design of Steel Structures‖, Laxmi Publications (P) Ltd.

REFERENCES

1. S K Duggal, –Limit state Design of Steel Structures‖, , McGraw Hill education, 2010
2. M R Shiyekar–Limit State Design of Steel Structures‖, PHI Publication, 3rd Edition.
3. C E Messennet, M A Seve, Plastic analysis and Design

4. A.S. Arya and J.L. Ajmani – Design of Steel Structures, Nemchand& Bros., Roorkee