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## COURSE OUTLINE

*Review of selected topics from solid and structural mechanics: (2)*

- Deformation of a beam using direct integration method
- Direct integration method using singularity functions
- Stress and strain transformation equations
- Various yield criteria

*Numerical and symbolic operations using Mathematica: (2)*

- Introduction to Mathematica - basic operations
- Solution of simultaneous equations (application to slope-deflection method)
- Solution of ODEs (application to direct integration method)
- Simple matrix operations (application to flexibility matrix method)

*Idealizations and approximations in structural modelling: (1)*

- Idealizations in material modelling
- Idealizations in structural geometry, support conditions and connections
- Idealizations in member structural behaviour

*Matrix structural analysis using SAP2000: (3)*

- Analysis of determinate and indeterminate trusses in 2D
- Analysis of continuous beams and frames in 2D
- Analysis of space (building) frames

*Finite element analysis using Abaqus: (2-3)*

- Analysis of a simple beam using line, shell and solid elements
- Elastic buckling analysis of a column
- Analysis of a plate with a hole: stress concentration

Figures in parentheses denote approximate lecture hours for each topic.

## BOOKS

### Reference Books

Hibbeler, R.C., *Structural Analysis (5<sup>th</sup> Ed.)*, Pearson Education India, 2005.

Popov, E.P. *Engineering Mechanics of Solids (2<sup>nd</sup> Ed.)*, Prentice-Hall India, 2006.

*Users Manuals* for Mathematica, SAP2000 and Abaqus

## COURSE WEBSITE

[www.civil.iitb.ac.in/~sghosh/CE327/](http://www.civil.iitb.ac.in/~sghosh/CE327/)

## COURSE REQUIREMENTS

### Attendance

A **minimum of 80% attendance** in instruction/lab. hours is required from each student as per the institute regulations.

### Tutorials Problems

Tutorial problems will be assigned in (almost) every class. Generally, solutions are due in class on the same date. Permission of the instructor will be needed for a late submission.

### Homework Problems

In addition to class problems some homework problems will also be assigned which will be typically due in a week's time.

### Grading

Class assignments	70%
Homework assignments	10%
Viva-voce	20%
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Total	100%