

Course syllabus

Department of Civil Engineering, Indian Institute of Technology Madras

CE7015 - Design of structures for ductility

Credit Distribution: C:9 L:3 T:0 P:0 E:0 O:6 TH:0

Course Type: Theory

Description: To facilitate understanding behaviour of members and structures under inelastic actions
- To enable design of structures (buildings and bridges) to exhibit ductile response.

Course Content: 1. Introduction to Ductility Need for ductility in structures: earthquake, impact and blast resistant designs Nonlinear Design Philosophies (Earthquake- Resistant design philosophy - contribution to ductility by four virtues; Blast resistant design philosophy - concept of structure toughness) 2. Analysis for Ductility Nonlinear behaviour of structures Review of design of members for combined effects of axial load, moment, shear and torsion Section classification (confinement of concrete; local buckling of steel) Levels of ductility (section, member and structure ductilities) Modeling non-linear response of structural components and systems Nonlinear static and dynamic analyses of structures (over-strength and deformation capacities at material, section, member and structure levels; collapse mechanisms and progressive collapse) 3. Design for Ductility Implications of capacity design concept on ductility Earthquake behaviour and design of steel and RC beam-column joints Ductility design of structural systems Blast-resistant design for overpressure and impact Influence of structural configurations on global ductility.

Text Books: NIL

Reference Books

- Arnold, C. and Reitherman, R, Building Configuration and Seismic Design, John Wiley & Sons Inc., 1982.
- Brzev, SN., Earthquake-Resistant Confined Masonry Construction, National Information Center of Earthquake Engineering, IIT Kanpur, 2008.
- Eibl, J., Concrete Structures under Impact and Impulsive Loading, Bulletin Information No. 187, Comit Euro-International du Bton (CEB), 1988.
- Englekirk, R.E., Steel Structures Controlling Behaviour Through Design, John Wiley & Sons, Inc., 1994.
- Dynamic Loading and Design of Structures, Edited by Kappos, A.J., Spon Press, 2002.
- Seismic Resistant Steel Structures, Edited by Mazzolani, F.M. and Victor, G., Springer-Verlag Wien, 2000.
- Mazzolani, FM, and Piluso, V, Theory and Design of Seismic Resistant SteelFrames, E&FN Spon, 1996.
- The Seismic Design Handbook, 2nd Ed., Edited by Naeim, F., Springer (India) Pvt. Ltd., 2001.
- Paulay, T., and Priestley, MJN., Seismic Design of Reinforced Concrete and Masonry Buildings, John Wiley & Sons, Inc., 1992.
- Penelis, G.G., and Kappos, A.J., Earthquake-resistant Concrete Structures, E & FN Spon, 1997.

- Priestley, MJN., Seible, F., and Calvi, G.M., Seismic Design and Retrofit of Bridges, John Wiley & Sons Inc., 1996.
- Tomaževic, M., Earthquake-resistant Design of Masonry Buildings, Imperial College Press, 1999.

Prerequisite: NIL