

Course syllabus

Department of Civil Engineering, Indian Institute of Technology Madras

CE7019 - Gian 161003I07: Conceptual and structural design: lightweight structures

Credit Distribution: C:3 L:1 T:0 P:0 E:0 O:2 TH:0

Course Type: Theory

Description: To appreciate the principles of Conceptual and Structural Design. To learn how these principles can be applied to Lightweight Bridge Structures, Roofs and Shell Structures. To learn about new lightweight materials: Infra-lightweight Concrete and Carbon Fibres.

Course Content: The primary goal of the course is to provide a proper appreciation of integrated Conceptual and Structural Design (as an alternative to the conventional approach in which materials, analysis and design are treated separately), with applications to Lightweight Structures. The course addresses the following topics: (1) Introduction: "Gesamtkunstwerk", Conceptual and Structural Design (2) Bridges: Cable-supported Bridges, Footbridges, Integral Bridges (3) Lightweight Roofs: Cable nets, looped cable roofs, Membrane Structures (4) Doubly Curved Structures: Felix Candela and Concrete Shells, Glass roof (5) New Materials: Infra-lightweight Concrete and Carbon Fibres

Text Books: NIL

Reference Books

- Schlaich, J. and Bergermann, R., Lightweight Structures, Prestel Verlag, Germany, 2004.
- Schlaich, M., Challenges in Education: Conceptual and Structural Design, IABSE Symposium Budapest 2006 - Report, S. 22-28, Ungarn, ISBN 3-85748-114-5, 2006.
- Millais, M., Building Structures: From Concepts to Design, Routledge, 2005.
- Larsen, O.P. and Tyas, A., Conceptual Structural Design: Bridging the Gap between Architects and Engineers, Thomas Telford Ltd., 2003.
- Holgate, A., The Art of Structural Engineering: The Work of Jrg Schlaich, Edition Axel Menges, Stuttgart, Germany, 1997.
- Schlaich, M, Liu Y and Zwingmann, B., Carbon Fibre Reinforced Polymer for Orthogonally Loaded Cable Net Structures, Structural Engineering International (SEI), S. 34-42, Volume 25/1, IABSE, Feb. 2015.
- El Zareef, M., Conceptual and Structural Design of Buildings Made of Lightweight and Infra-lightweight Concrete, Shaker Verlag, Germany, 2010.
- Cassinello, P., Hckler, A. and Schlaich, M. Evolution of Lightweight Concrete, 2013.
- Eduardo Torroja, Strategy to Industrialise Housing in Post-World War II, Fundac Eduardo Torroja, Fundac Juanelo Turriano, S. 341-352, 1949.

Prerequisite: NIL