Indian Institute of Technology Mandi
Proposal for a New Course

Course Number : CE555
Course Name : Advanced Design of Structures
Credits : 3-0-0-3
Prerequisites : (i) Design of Reinforced Concrete Structures (CE351) or Equivalent;
(ii) Design of Steel Structures (CE401) or Equivalent
Intended for : UG, PG (MS, MTech), PhD
Distribution : Specialization Core (MTech in Structural Engineering), Elective (UG, MS, PhD)
Semester : Odd/Even

Preamble: Design of new and innovative structures are one of the primary aim of any structural engineer. Although the design philosophy does not vary with structures but understanding the behavior of structures and structural components in more details are essential. Herein, in this course, it is amid to provide a detailed theoretical background of various design philosophies and their applications. Behavior of structural components and advanced modelling approaches will be covered. Special consideration will be given on understanding of various provision of national and international design guidelines for their practical applications. Moreover, computer aided analysis and design will be included as part of each module of the course.

Course Modules with Quantitative Lecture Hours:

Module 1: **(8 hours)**
Design philosophies; Probability distributions and modeling for loading and material strength; Advanced materials and their characteristics. Numerical examples on sampling and acceptance criteria; Reliability of structures.

Module 2: **(12 hours)**
Reinforced Concrete Structures: P-M, M-Φ relationships; P-M-V-T interaction; Strut-and-tie model; Design of deep beam and corbel; Design considerations for slab; Yield line theory; Strip theory; Design of shear walls; Compression field theory for shear design; Design against torsion; Durability design concept; Provisions form Indian Standards and international design guidelines. Development of computer code for interaction curves; Numerical examples on analyses and design of RC structural components using the advanced theories covered in the lecture; Computer simulation of behavior of RC structural components.

Module 3: **(8 hours)**
Steel Structures: Stability design; Torsional buckling (pure, flexural and lateral); Design of beam-columns; Provisions form Indian Standards and international design guidelines. Numerical examples on analyses of steel structures and design of components using the advanced theories covered in the lecture.

Text Books:

(i) N. Subramaniam (2008), "Design of Steel Structures", 1st edition, Oxford University Press, India.

(ii) N. Subramanian (2013), "Design of Reinforced Concrete Structures", 1st edition, Oxford University Press, India.

References:

(i) J.K. Wight, J.G. MacGregor (2016), "Reinforced Concrete: Mechanics and Design", Sixth edition, Pearson Education, India.

(ii) C.G. Salmon, J.E. Johnson and F.A. Malhas (2009), "Steel Structures: Design and Behavior Emphasizing Load and Resistance Factor Design, Pearson Education, 5th edition, 2009.

(iii) T. Pauley, M.J.N. Priestley (1992), "Seismic Design of Reinforced Concrete and Masonry Buildings", John-Wiley & Sons.

(iv) A.H. Nilson, D. Darwin, C.W. Dolan (2015), "Design of Concrete Structures", 15th edition, McGraw-Hill Education, USA.

(iii) D. Menon, S. Pillai (2009), "Reinforced Concrete Design", 3rd edition, McGraw Hill Education, India.

Similarity content declaration with existing courses:

Sl. No.	Course Code	Similarity Content	Approximate % of Content
1	CE351	Design philosophies; material characteristics	<5%
2	CE401	Concept of steel structure design; material behavior	<5%

Justification for new course proposal if cumulative similarity content is > 30%:

Not Applicable.

Approvals:

Other faculty interested in teaching this course: Dr. Kaustav Sarkar, Dr. Rajnish Sharma

Proposed by: Dr. Sandip Saha School: School of Engineering (SE)

Signature: Date: 01.05.2018

Recommended / Not Recommended, with comments:

Chairman, CPC Date:

Approved / Not Approved:

Chairman, Senate Date:

Responses to comments received during 16th Senate meeting.

(1) The credit distribution has been changed to 3-0-0-3 from 2-1-0-3.

(2) The tutorial modules have been merged with the lecture components within the individual modules with an aim to provide more flexibility to the instructor.