Indian Institute of Technology Mandi
Proposal for a New Course

Course Number: CE-554
Course Name: Prestressed Concrete Structures
Credits: 3-0-0-3
Prerequisites: (i) Strength of Materials and Structures (CE301 or equivalent), (ii) Design of Reinforced Concrete Structures (CE351 or equivalent)
Intended for: UG (4^{th} year), PG
Distribution: Discipline Elective (UG) / Elective (PG)
Semester: Odd/Even

1. **Preamble:** The concept of the prestressing has many advantages over the conventional methods. The prestressed concrete components are far superior than the conventional reinforced concrete components provided a skilled workmanship is ensured. This course will help to develop the concepts of prestressing and design of prestressed concrete members for using them regular structural design. Apart from the conceptual development of the theory, the course will also brief the standard design procedures for prestressed concrete components as per the provisions of Indian Standard (IS 1343: 2012) to make the participants familiar with the industry design practices. Participants will be encouraged to develop computational tools (e.g. computer code, spreadsheets etc.) for analysis and design of typical prestressed concrete components.

2. **Course Modules with Quantitative Lecture Hours:**

Module 1: **(3 lecture hours)**
Introduction: History of development, material and basic concept of prestressing, System of prestressing, Need and types of prestressing, Codes and Standards.

Module 2: **(6 lecture hours)**
Analysis of prestressed members: Basic assumptions, Analysis procedure, Prestress line and internal resisting couple, Concept of load balancing, Stresses in tendons, De-bonding and draping of prestressing tendons, Camber of prestressed member, Indeterminate prestressed concrete structures, Circular prestressing.

Module 3: **(3 lecture hours)**
Losses of prestress: Nature of losses of prestress, Consideration of allowable losses in design.

Module 4: **(6 lecture hours)**
Deflection of prestressed concrete members: Importance of deflection control, Influencing factors, Short term and long term deflection, Deflection of cracked members.

Module 5: **(7 lecture hours)**
Prestressed concrete members under flexure, shear and torsion: Flexural failure and strength analysis, Strain compatibility, Shear and torsion in prestressed members.

Module 6: **(3 lecture hours)**

Stress transfer in pretensioned members, Anchorage zone stress in post-tension members, Bursting/ end-block stresses, Transmission and transfer lengths.

Module 7: **(8 lecture hours)**

Design of prestressed concrete section: Limit state design criteria for prestressed concrete members, Design of section for flexure, Design of section for axial tension, Design of section for compression, Design of section for shear and torsion, Design for bond and bearing.

Module 8: **(6 lecture hours)**

Design of members: Design of pretensioned and post-tensioned flexural member, Design of prestressed beam and slab, Partially prestressed member.

3. Text books:

(i) N.K. Raju, (2012), "Prestressed Concrete', 5th Ed., McGraw Hill Education, New Delhi, India.

(ii) P. Dayaratnam (2016) "Prestressed Concrete Structures", 5th Ed., Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, India.

4. References:

(i) Michael P. Collins and Denis Mitchell (1994), "Prestressed Concrete Structures", Prentice Hall, New Jersey, USA.

(ii) N. Rajagopalan (2010), "Prestressed Concrete', 2nd Ed., Narosa Publishing House, New Delhi, India.

(iii) T. Y. Lin, N. H. Burns (2010), "Design of Prestressed Concrete Structures", Indian Student Edition, 3rd Ed., Wiley India Private Limited, India.

(iv) A. E. Naaman (2013) "Prestressed Concrete Analysis and Design – Fundamentals", Indian Ed., McGraw Hill Education, New Delhi, India.

(v) E. G. Nawy (2005) "Prestressed Concrete - A Fundamental Approach", 5th Ed., Prentice Hall International, New Jersey, USA.

(vi) IS 1343 (2012), "Prestressed Concrete - Code of Practice", Bureau of Indian Standards, New Delhi, India.

5. Similarity content declaration with existing courses:

Sl. No.	Course Code	Similarity Content	Approximate % of Content
1	NIL	-	-

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

Not Applicable.

Approvals:
Other faculty interested in teaching this course: Dr. Maheshreddy Gade, Dr. Kaustav Sarkar

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

Signature: Date:

Recommended / Not Recommended, with comments:

Chairman, CPC Date:

Approved / Not Approved:

Chairman, Senate Date: