



# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal - 500 043, Hyderabad, Telangana

## COURSE CONTENT

PRESTRESSD CONCRETE STRUCTURES								
<b>VII Semester: CE</b>								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACEC40	Elective	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
<b>Contact Classes: 45</b>	<b>Tutorial Classes: Nil</b>	<b>Practical Classes: Nil</b>			<b>Total Classes: 45</b>			
<b>Prerequisite:</b> Reinforced Concrete Structures Design and Drawing								
<b>I. COURSE OVERVIEW:</b>								
<p>A prestressed concrete structure is different from a conventional reinforced concrete structure due to the application of an initial load on the structure prior to its use. In prestressed concrete high strength concrete and high strength steel are combined such that the full section is effective in resisting tension and compression. This is an active combination of the two materials. This subject provides students an understanding and ability to analyse and design prestressed concrete structural elements. The primary topics includes the concept and principles of prestressing, methods of prestressing concrete, stress limits, losses of prestress, selection of section, serviceability and strength requirements. Students will also be able to complete analysis and design procedure of simply supported prestressed concrete non-composite and composite beams.</p>								
<b>II. COURSE OBJECTIVES:</b>								
<b>The student will try to learn:</b>								
<ol style="list-style-type: none"> <li>I. The concepts of prestressed concrete structures and the behavior of these structures subjected to loads for the design purpose.</li> <li>II. The design of structural elements necessary for creating efficient and economic prestressed concrete structures.</li> <li>III. The design and drawing of multi storeyed industrial and residential structures including bridges for creating high performance and durable structures.</li> </ol>								
<b>III. COURSE SYLLABUS:</b>								
<b>MODULE –I: INTRODUCTION (9)</b>								
<p>Historic development- General principles of pre-stressing pre-tensioning and post tensioning- Advantages and limitations of Prestressed concrete- General principles of PSC- Classification and types of pre-stressing materials- high strength concrete and high tensile steel their characteristics. Methods and Systems of prestressing: Pre-tensioning and Post-tensioning methods and systems of prestressing like Hoyer system, MagnelBlaton system, Freyssinet system and Gifford- Udall System- Lee McCall system.</p>								
<b>MODULE -II: LOSSES OF PRESTRESS (9)</b>								
<p>Loss of pre-stress in pre-tensioned and post-tensioned members due to various causes like elastic shortage of concrete, shrinkage of concrete, creep of concrete, relaxation of stress in steel, slip in anchorage, frictional losses.</p>								

**MODULE -III: FLEXURE (9)**

Analysis of sections for flexure, beams pre-stressed with straight, concentric, eccentric, bent and parabolic tendons- stress diagrams, Elastic design of PSC beams of rectangular and I section Kern line, Cable profile and cable layout.

Shear: General Considerations, Principal tension and compression, improving shear resistance of concrete by horizontal and vertical pre-stressing and by using inclined or parabolic cables, Analysis of rectangular and I beam for shear, Design of shear reinforcements- Bureau of Indian Standards (BIS) Code provisions.

**MODULE -IV: TRANSFER OF PRE-STRESS IN PRE-TENSIONED MEMBERS (9)**

Transmission of pre-stressing force by bond, Transmission length, Flexural bond stresses, IS code provisions, Anchorage zone stresses in post tensioned members, stress distribution in End block, Analysis by Guyon, Magnel, Zielinski and Rowe's methods, Anchorage zone reinforcement, BIS Provisions.

**MODULE -V: COMPOSITE BEAMS AND DEFLECTIONS (9)**

Different Types: Propped and Unpropped, stress distribution, Differential shrinkage, Analysis of composite beams, General design considerations.

Deflections: Importance of control of deflections, Factors influencing deflections, short term deflections of uncracked beams, prediction of longtime deflections, BIS code requirements.

**IV. TEXT BOOKS:**

1. N. Krishna Raju, "Pre-stressed Concrete", Tata McGraw Hill Book Education Pvt. Ltd, 6<sup>th</sup> Edition, 2018.
2. N. Rajagopalan, "Prestressed Concrete", Alpha Science International Ltd, 2<sup>nd</sup> edition, 2005.

**V. REFERENCE BOOKS:**

1. T.Y. Lin and Burn, "Design of Pre-stress Concrete Structures", John Wiley, New York, 3<sup>rd</sup> Edition, 2010.
2. S. Ramarnrutham, "Prestressed Concrete", Dhanpat Rai & Sons publishing, Delhi, 1<sup>st</sup> Edition, 2003.

**VI. WEB REFERENCES:**

1. <https://nptel.ac.in/courses/105/106/105106117/>
2. [https://odp.inflibnet.ac.in/index.php/module\\_details?course=pre-stressed%20concrete%20structures&source=swayam&subsource=NPTEL](https://odp.inflibnet.ac.in/index.php/module_details?course=pre-stressed%20concrete%20structures&source=swayam&subsource=NPTEL)

**VII. E-TEXT BOOKS:**

1. [https://books.google.co.in/books?id=pT88BAAAQBAJ&printsec=frontcover&source=gbs\\_ge\\_summary\\_r&cad=0#v=onepage&q&f=false](https://books.google.co.in/books?id=pT88BAAAQBAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false).