



DEPARTMENT OF Civil Engineering

COURSE PLAN – PART I			
Name of the programme and specialization	M.Tech. (i)Structural Engineering (ii) Construction Technology & Mgmt.		
Course Title	Advanced Concrete Technology		
Course Code	CE680	No. of Credits	3
Course Code of Pre-requisite subject(s)	Nil		
Session	September 2021	Section (if, applicable)	-
Name of Faculty	Dr. J. KARTHIKEYAN	Department	Civil Engineering
Official Email	jk@nitt.edu	Telephone No.	0431-2503176
Course Type	<input type="checkbox"/>	Elective course	
<b>Syllabus (approved in BoS)</b>			
<p>Introduction to concrete – mineral and chemical admixtures – structure of hydrated cement paste - calcium aluminate cement - cement production quality control - transition zone in concrete - measurement of workability by quantitative empirical methods - concrete properties: setting and hardening.</p> <p>Concrete design mix for higher grades.</p> <p>Strength-porosity relationship – failure modes in concrete – plastic and thermal cracking – maturity concept to estimate curing duration – creep, shrinkage and thermal properties of concrete.</p> <p>Classification of causes of concrete deterioration – permeability of concrete – durability concept: pore structure and transport process – Alkali-aggregate reactivity.</p> <p>Non-destructive testing methods – semi-destructive testing methods – concreting under special circumstances – special materials in construction – concreting machinery and equipment – sustainability in concrete – future trends in concrete technology.</p> <p><b>Text Books:</b></p> <ol style="list-style-type: none"><li>1. P. Kumar Metha and Paulo.J.M.Monteiro. Concrete: Microstructure, Properties and Materials, Mc Graw Hill, 4<sup>th</sup> Edition, 2014.</li><li>2. John Newman and Ban Send Choo, Advanced Concrete Technology Part 1 to 4, Butterworth-Heinemann, 1<sup>st</sup> edition, 2003.</li><li>3. A. M. Neville., Properties of Concrete, Wiley Publication, final edition, 1996.</li><li>4. A.R. Santhakumar, Concrete Technology, Oxford University Press, 2006</li><li>5. All relevant IS code books like IS 10262:2019, IS 456:2000, IS 269:2015, IS 383:2016 etc.</li></ol>			



### COURSE OBJECTIVES

1. To familiarize the structure of hydrated cement paste and cement production quality control.
2. To understand the transition zone, behaviour of fresh and hardened properties of concrete.
3. To expose the higher grade concrete design mix and to know the maturity concept.
4. To know the durability concepts.
5. To study the NDT, Semi-destructive test, special concreting methods and its future trends.

### MAPPING OF COs with POs

Graduates of the P.G. in Structural Engineering Programme will be able to:

1. Acquire in-depth knowledge of structural Engineering, including wider and global perspective, with an ability to discriminate, evaluate, analyse and synthesize existing and new knowledge, and integration of the same for enhancement of knowledge.
2. Analyse complex structural engineering problems critically, apply independent judgement for synthesizing information to make intellectual and/or creative advances for conducting research in a wider theoretical, practical and policy context.
3. Think laterally and originally, conceptualize and solve structural engineering problems, evaluate a wide range of potential solutions for those problems and arrive at feasible, optimal Solutions after considering public health and safety, cultural, societal and environmental factors in the core areas of expertise.
4. Extract information pertinent to unfamiliar problems in structural engineering through literature survey and experiments, apply appropriate research methodologies, techniques and tools, design, conduct experiments, analyse and interpret data, demonstrate higher order skill and view things in a broader perspective, contribute individually/in group(s) to the development of scientific/technological knowledge in one or more domains of engineering.
5. Create, select, learn and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex structural engineering activities with an understanding of the limitations.
6. Possess knowledge and understanding of group dynamics, recognise opportunities and contribute positively to collaborative-multidisciplinary scientific research, demonstrate a capacity for self-management and teamwork, decision-making based on open-mindedness, objectivity and rational analysis in order to achieve common goals and further the learning of themselves as well as others.
7. Demonstrate knowledge and understanding of structural engineering and management principles and apply the same to one's own work, as a member and leader in a team, manage projects efficiently in respective disciplines and multidisciplinary environments after consideration of economic and financial factors.
8. Communicate with the engineering community, and with society at large, regarding complex engineering activities confidently and effectively, such as, being able to comprehend and write effective reports and design documentation by adhering to appropriate standards, make effective presentations, and give and receive clear instructions.



9. Recognize the need for, and have the preparation and ability to engage in life-long learning independently, with a high level of enthusiasm and commitment to improve knowledge and competence continuously.
10. Acquire professional and intellectual integrity, professional code of conduct, ethics of research and scholarship, consideration of the impact of research outcomes on professional practices and an understanding of responsibility to contribute to the community for sustainable development of society.
11. Observe and examine critically the outcomes of one's actions and make corrective measures subsequently, and learn from mistakes without depending on external feedback.

<b>Course Outcomes</b> At the end of the course student will be able to	<b>Programme Outcomes (PO)</b> (Enter Numbers only)
1. familiar with structure of hydrated cement paste, cement production quality control, concrete properties	<b>1 to 5, 8, 10</b>
2. design the concrete mix for higher grades	<b>1 to 7</b>
3. ensure the maturity and time-dependent properties of concrete.	<b>1 to 7</b>
4. determine the causes of concrete deterioration and durability parameters.	<b>1 to 6</b>
5. know about the special materials and future trends in concrete technology	<b>1 to 5, 8</b>

**COURSE PLAN – PART II**

**COURSE OVERVIEW**

Advanced Concrete Technology is one of the most important theory course for the postgraduate students of structural engineering and Construction Technology and Management. This course emphasizes the advanced concepts of concrete technology. Further, by going through the course one would develop adequate understanding and to know the importance of concrete and its cement based materials. This course enables the students to have an in-depth knowledge on not only with material properties and its behavior but also in the higher grade concrete design mix with durability concept mainly dealing with pore structure and transport process.

**COURSE TEACHING AND LEARNING ACTIVITIES**

<b>S.No.</b>	<b>Week/Contact Hours</b>	<b>Topic</b>	<b>Mode of Delivery (online)</b>
1	11 to 12 hours	Introduction to concrete –structure of hydrated cement paste –mineral and chemical admixtures- CAC (calcium aluminate cement) - cement production quality control - transition zone in concrete - measurement of workability by quantitative empirical methods-concrete properties: setting and hardening.	PPT



2.	3 to 5 hours	Concrete design mix for higher grades	PPT
3.	5 to 7 hours	Strength-porosity relationship – failure modes in concrete – plastic and thermal cracking – maturity concept to estimate curing duration – creep, shrinkage and thermal properties of concrete.	PPT
4.	6 to 7 hours	Classification of causes of concrete deterioration – permeability of concrete – durability concept: pore structure and transport process – Alkali-aggregate reactivity.	PPT
5.	6 to 8 hours	Non-destructive testing methods – semi-destructive testing methods – concreting under special circumstances – special materials in construction – concreting machinery and equipment – sustainability in concrete – future trends in concrete technology.	PPT

**COURSE ASSESSMENT METHODS**

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Internals - I	Last week of October 2021	1 hour 15 mins	30
2	Internals -II	Last week of November 2021	1 hour 15 mins	30
3	Seminar	First/Second week of December 2021	20 mins/student	10
4	Final Assessment	Last week of December 2021	2 hours	30
CPA	Compensation Assessment* (if necessary)	Third week of December 2021		30

**COURSE EXIT SURVEY : Students have to fill the feedback for the subject concerned when they produce the hall ticket for the end semester exam through their MIS**

**COURSE POLICY :** The pass mark for this course is 40 out of 100. Students securing below 40% will be treated as fail and 'F' grade will be awarded.

The students must take the above mentioned internals/exam seriously and score well. Students have to take Internals, Seminar and end semester examination mandatorily as per the scheduled date and time mentioned by the teacher. If a student is unable to take any one of the internals (Internals 1 or 2 or seminar) due to some genuine reasons. He/she should inform the teacher well in advance and one CPA will be given to them (i.e. before the end semester exam). Only for genuine cases, CPA will be given and it is upto the teacher who



handles the course. If a student is absent for the end semester examination, he/she will be given 'X' grade even if he leaves in genuine reason. For such students, re-exam will be conducted during the month of April/ May 2022 and so on for 30 marks ( 2 hours duration) and mark range/ grading system assigned for his/her batch will be followed.

## **ATTENDANCE POLICY** (A uniform attendance policy as specified below shall be followed)

- At least 75% attendance in each course is mandatory.
- A maximum of 10% shall be allowed under On Duty (OD) category.
- Students with less than 65% of attendance shall be prevented from writing the final assessment and shall be awarded 'V' grade.

## **ACADEMIC DISHONESTY & PLAGIARISM**

- Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.
- Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.
- The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.
- The above policy against academic dishonesty shall be applicable for all the programmes.

## **ADDITIONAL INFORMATION, IF ANY**

### **Other important/General Instructions to the students:**

1. Be attentive in the class, clear your subject doubts and interact very well in the class work session and do not miss any class work session unwantedly.
2. Use of mobile phones are strictly prohibited in the class rooms/exam hall. Programmable calculators are not allowed in the examination hall.
3. Take only the relevant code books and design charts to the exam as per your teachers instruction and do not write anything in these code books/charts.
4. Copying in the examination or any other malpractices cannot be tolerated and the student will be detained and F grade will be awarded. Strict disciplinary action will be taken on such type of students.

## **FOR APPROVAL**

Course Faculty

J. Karthikeyan

CC- Chairperson

Nisha

HOD

C. J. R.  
Head  
Department of Civil Engineering  
National Institute of Technology  
Tiruchirappalli - 620 015



**Guidelines**

- a) The number of assessments for any theory course shall range from 4 to 6.
- b) Every theory course shall have a final assessment on the entire syllabus with at least 30% weightage.
- c) One compensation assessment for absentees in assessments (other than final assessment) is mandatory. Only genuine cases of absence shall be considered.
- d) The passing minimum shall be as per the regulations.

B.Tech. Admitted in				P.G.
2018	2017	2016	2015	
35% or (Class average/2) whichever is greater.		(Peak/3) or (Class Average/2) whichever is lower		40%

- e) Attendance policy and the policy on academic dishonesty & plagiarism by students are uniform for all the courses.
- f) Absolute grading policy shall be incorporated if the number of students per course is less than 10.
- g) Necessary care shall be taken to ensure that the course plan is reasonable and is objective.