



## RILEM EAC PhD Course Report

Title: Doctoral Course on Advanced Concrete Technology

Dates: Nov 18-23, 2019

Venue: Department of Civil Engineering, IIT Madras, Chennai 600036 (India)

### 1) Brief outline of course topic (photos from course can be included, if available)

The course outline included following topics:

- Portland cement chemistry
- Alternative cementitious materials
- Mineral and chemical admixtures
- Fresh and hardened properties of concrete
- Special concretes
- Concrete deterioration mechanisms
- Performance-based specifications
- Sustainability of concrete
- Non-destructive evaluation of concrete
- Rheology and 3D Printing of concrete

### 2) Who were the teachers-affiliations?

Dr. Piyush Chaunsali, IIT Madras  
Dr. Radhakrishna G. Pillai, IIT Madras  
Prof. Manu Santhanam, IIT Madras  
Prof. Ravindra Gettu, IIT Madras  
Prof. K. Ramamurthy, IIT Madras  
Prof. N Raghavan, IIT Madras  
Dr. Surender Singh, IIT Madras  
Dr. Alagappan Ponnalagu, IIT Madras  
Dr. Sivakumar Kandasami, L&T Construction, Chennai  
Dr. K. Balasubramanian, Hitech Concrete Solutions, Chennai

### 3) How many students attended (participants) —status (PhD, MSc, industry, etc.) Affiliations?

30 participants from industry and academia attended the course.

### 4) Number of Registered and unregistered students.

Number of registered participants: 30

### 5) Brief review of course scope, course content and lecture schedule.

#### *Course Scope :*

This course was designed to disseminate the knowledge on recent advances in science and technology of concrete. It is anticipated that the attendees learnt the underlying mechanisms and the techniques to achieve various properties of today's advanced concrete – by appropriate material selection, mix-design, and construction practices. The lectures and laboratory sessions were delivered with a blend of research- and practice- oriented viewpoints.

**Course Content:**

- Portland cement chemistry
- Alternative cementitious materials
- Mineral and chemical admixtures
- Fresh and hardened properties of concrete
- Special concretes
- Concrete deterioration mechanisms
- Durability-based design of concrete
- Performance-based specifications
- Sustainability of concrete
- Non-destructive evaluation of concrete

**Lecture Schedule:**

From	To	18-11-19	19-11-19	20-11-19	21-11-19	22-11-19	23-11-19
		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
8:30 AM	9:00 AM	PC - Introduction and course overview	Exam-1	Exam-2	Exam-3	Exam-4	Exam-5
9:00 AM	10:30 AM	PC - Cement manufacturing, chemistry, and hydration	RG - Special concretes	PC - Concrete deterioration mechanisms	NRG - Some interesting concrete structural applications	MS - Chemical admixtures and compatibility	MS - Rheology and 3D printing of concrete
10:30 AM	11:00 AM	TEA	TEA	TEA	TEA	TEA	TEA
11:00 AM	12:30 PM	PC - Mineral admixtures and fresh properties	KR- Foam and lightweight concrete	RGP - Service life estimation of reinforced concrete	SS- Sustainable Concrete Pavements	MS - Performance-based specifications	PC- Special cements
12:30 PM	2:00 PM	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH
2:00 PM	3:30 PM	RG -Mechanical properties; creep & shrinkage	RGP - Corrosion mechanism and prevention	RGP - Introduction to repair materials, repair practices, and testing	KB - Current Concrete NDT Practices in India and Case Studies	RG - Sustainability of concrete	Field Trip: 3D Printer
3:30 PM	4:00 PM	TEA	TEA	TEA	TEA	TEA	TEA
4:00 PM	5:00 PM	Lab Visit (to Env./Walk-in Chambers, casting yard (SCC/FRC/LW C demo), fresh properties)	Lab Visit (to Mechanical/ creep/ shrinkage/NDT testing facilities)	Lab Visit (Corrosion and durability)	SK - Achieving Concrete Durability: Beliefs, Myths and Reality	AP - Constitutive modeling of concrete	Closing and certificate distributions

NRG	Prof. N Raghavan
PC	Dr. Piyush Chaunsali
RG	Dr. Ravindra Gettu
RGP	Dr. Radhakrishna Pillai
MS	Dr. Manu Santhanam
KR	Dr. K Ramamurthy
SS	Dr. Surender Singh
AP	Dr. Alagappan Ponnalagu
KB	Dr. K Balasubramanian (Hitech)
SK	Dr. Sivakumar Kandasami (L&T)

**6) Financial support received.**

Through the registration fee amounting to approx. 300000 (Indian Rupee).

**7) Scientific (beyond EAC) Sponsorship.**

- Indian Concrete Institute
- Indian Institute of Technology Madras

**8) Were Course Evaluations submitted by participants?**

Yes

A few feedback comments by the participants:

*“Course covered all the aspects in the area of Advanced Concrete Technology from the basics at graduate level to research level topics. Demonstrations at labs were also informative.”*

*“Wonderful lectures with depth of ideas. I can apply these ideas into my research work.”*

*“Good content with practical applications.”*

*“The classes were so lively and interactive.”*

*“Started from the basics and drove all the way.”*

*“Knowledge was supported with evidences and practical interpretations.”*

*“Lectures were so enjoyable, innovative and though provoking.”*

**9) Evaluation of Learning Outcomes (Grading, etc) ECTS points, if applicable.**

Five examinations were conducted during the course. Top 25% of the participants were given certificates for distinction in the exams.

**10) Is it planned to continue the course in future (i.e. as a course series at regular intervals)?**

Once in 3 years. The next course will be planned (tentatively) in 2022.

**11) How was RILEM presented to participants?**

A presentation about RILEM was delivered by Prof. Ravindra Gettu (President, RILEM). Fifteen participants submitted the forms for 3-year free RILEM membership.

Name: Piyush Chaunsali

Date: Nov 28, 2019

*This summary report will be published on RILEM website (on the EAC page).*

*Please send separately the list of student participants (with their contact information) who attended the course to the General Secretariat for a special free membership of 3 years\*.*