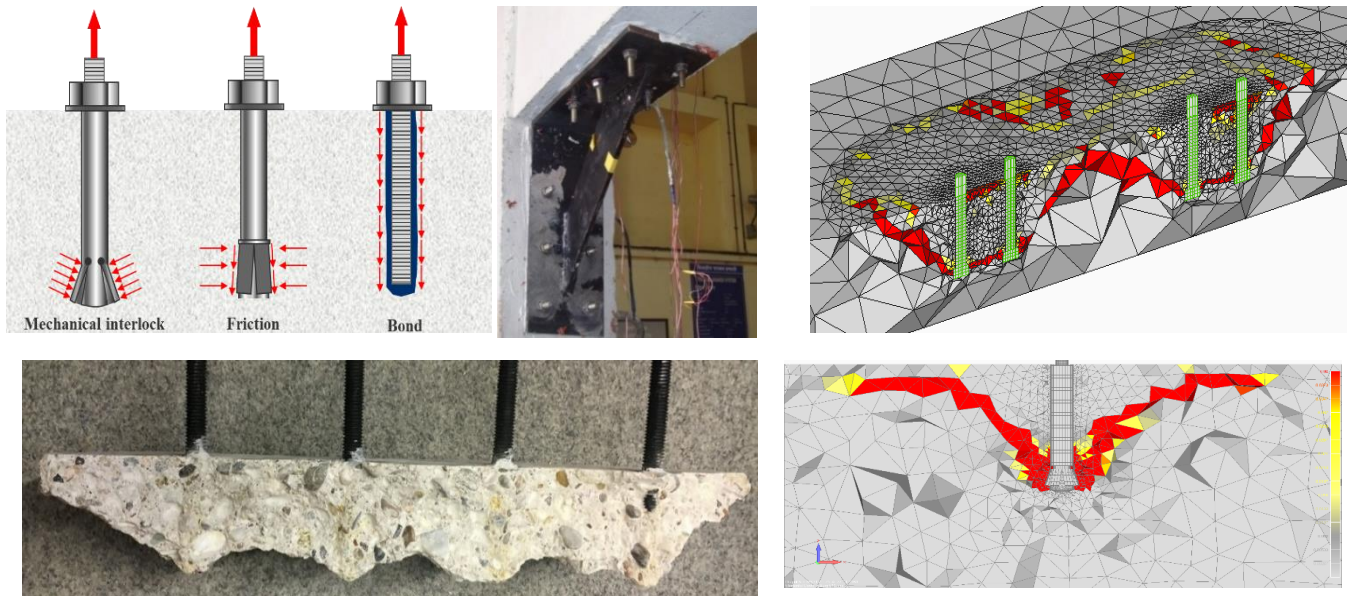


# Design of Anchorages in Concrete Construction and their Role in Structural Strengthening

July 22<sup>nd</sup> to Aug 1<sup>st</sup>, 2019

## Overview

Anchorages using embedded plates with the cast in headed studs, anchor channels or post-installed mechanical or adhesive anchors are extensively used in the construction industry to connect non-structural or structural components to the parent concrete structures. The typical usage of such anchorages includes connecting the equipment, piping, and machinery, structural bracing, structural strengthening, facades, etc. The fulfillment of the desired objectives of the systems connected using such anchorage is largely dependent on the behavior of anchors. A good fastening includes the right selection of anchor type for given loading scenario, proper design, and correct installation. Using an anchor not suitable for an application not only might render the anchorage useless but also may lead to devastating results due to anchorage failure. Specifically, the designer must consider the behavior of anchorages in conditions of cracked concrete as well as under demanding loading scenarios such as seismic loads, high temperature, long term loads, etc. Therefore, a designer must be equipped with the appropriate knowledge about the selection, design methods and installation procedure for the anchors to produce safe and reliable connections. Over the past few decades, a significant amount of research work has been done on the behavior of anchorages which has led to the development of the international codes and standards for the design of anchorages. A big majority of this work has been performed at the Institute of Construction Materials, University of Stuttgart.



This course will provide a detailed coverage on the type of anchors available and their behavior under different conditions, qualification and assessment criteria for the anchors, design rules for anchorages according to international standards, behavior and design of post-installed reinforcing bars, seismic behavior and design of anchorages as well as application of anchorages in strengthening of existing structures. It will also cover the recent advances in the field of anchorages such as anchorages with supplementary reinforcement, anchorages in special concrete (e.g., steel fiber reinforced concrete), anchorages under impact loads, as well as advanced numerical modeling concepts for anchorages. It also aims to demonstrate the correct installation procedure for different types of anchorages and train the practitioners on the right selection and design of anchorages for different loading conditions. The fundamentals taught in this course will be augmented by the laboratory experiments on anchorages to give hands-on experience to the designers and practitioners about the real behavior of anchorages. This course will be taught by internationally acclaimed academics, researchers and fastening industry specialists. The course will be planned and offered as per the norms set by IIT Hyderabad.

### **Dr. Akanshu Sharma, Professor, University of Stuttgart, Germany**



Dr. Akanshu Sharma is currently working as a Junior Professor at the Institute of Construction Materials, University of Stuttgart. University of Stuttgart is the world leader in the field of anchorage technology, and Prof. Sharma is working extensively on the field of innovative strengthening solutions with fastenings. His research interests include Seismic assessment and strengthening of RC frame structures; Anchorage in concrete construction; Fire performance of RC structures; Impact behavior of RC structures etc. He has authored more than 120 research papers. He is the technical secretary for the fib TG 2.9 (Fastenings to structural concrete and masonry) committee, a member of fib TG 2.5 (Bond and material models) and a member of the German national committee for the design of concrete structures under fire loads. He is a reviewer for several international journals. Earlier, he worked as a Scientific officer at Bhabha Atomic Research Centre, Mumbai from 2004 to 2013. During this time, he received the fellowship for Indo-German collaborative project through which he pursued his Ph.D. at the University of Stuttgart and was awarded the doctorate with honors.

**Dr. KVL Subramaniam, Professor, IIT Hyderabad**

Prof. Subramaniam's research expertise is in the areas of fracture mechanics, material characterization using destructive and non-destructive methods, health monitoring and repair & strengthening of structures. He has published several papers on fracture mechanics and repair of concrete structures. He has also served as a consultant on various projects related to strengthening. He is a fellow of ASCE and ACI, USA and serves on several international committees on concrete structures.



**Dr. S. Suriya Prakash, Associate Professor & Course Coordinator, IIT Hyderabad**

Dr. Suriya Prakash's research expertise on structural concrete behaviour and strengthening of civil infrastructure. He worked with Structural Group Inc., a renowned firm in strengthening design and construction using advanced construction materials. He has authored more than thirty journal papers on the behavior of reinforced concrete/ prestressed concrete. He has also extensively worked on the strengthening of prestressed/precast elements with FRP composites. He has been collaborating with the University of Stuttgart on Anchor behavior of strengthened concrete elements. He is a member of ASCE and ACI, USA.

<b>Course Dates</b>	July 22nd to Aug 1st, 2019, Number of participants for the course will be limited to fifty.
<b>Modules</b>	Module 1: Introduction to anchorage in concrete construction Module 2: Behavior and design of anchors under tension loads Module 3: Behavior and design of anchors under shear loads Module 4: Anchorages with supplementary reinforcement Module 5: Behavior and design of anchors under inclined loads Module 6: Seismic behavior, qualification, and design of anchors Module 7: Design of anchorages for the strengthening of structures Module 8: Anchorages in special concretes and under special loads Module 9: Examination, Certificate Distribution, and Feed-Back Session
<b>You Should Attend If...</b>	<ul style="list-style-type: none"><li>• Executives, engineers, and researchers from the construction industry such as design offices, contractors, engineers from various state and central government laboratories.</li><li>• Student students at all levels (BTech/MSc/MTech/Ph.D.), research scholars, faculty from reputed academic institutions and technical institutions.</li></ul>
<b>Fees</b>	<p>The participation fees for taking the course is as follows:</p> <ul style="list-style-type: none"><li>• Participants from abroad: US \$500</li><li>• Industry/ Research Organizations: Rs. 20,000 (Including 18%GST)</li><li>• Academic Institutions: Rs. 16,000 (Including 18%GST)</li><li>• Graduate Students/ Research Scholars: Rs. 2000</li><li>• Students from India belonging to the reservation category (SC/ST): 1000 INR</li><li>• No fee for IIT Hyderabad Students</li></ul> <p>The above fee includes all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges. The participants will be provided with accommodation on payment basis. Additional fee of Rs. 5000 shall be paid for lunch and refreshments offered during the course.</p>

**Course Coordinator:**

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Course link: [https://www.iith.ac.in/~gian/GIAN-CIVIL\\_ACCS/index.html](https://www.iith.ac.in/~gian/GIAN-CIVIL_ACCS/index.html)