



A Short-Term Online Course on  
***A Technical Overview of Public and Private Blockchains***  
7<sup>th</sup>-11<sup>th</sup> February 2022

### Host Institute and Department



Department of Computer Science and Engineering  
National Institute of Technology Andhra Pradesh,  
India

### Chief Patron



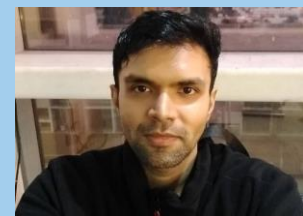
Prof. C.S.P. Rao  
Director  
NIT Andhra Pradesh

### Course Instructors



**Prof. Ramki Thurimella**

Prof. Ramki Thurimella is a Professor Emeritus in the Department of Computer Science at University of Denver. He is also the Ex-Director of Colorado Research Institute for Security and Privacy. He is presently serving as the Vice President Research in WANdisco., Inc. He obtained his PhD in Computer Science from the University of Texas at Austin and an MS in Computer Science from IIT Madras. His research interests include algorithms and information security.



**Dr. Karthick Seshadri**

Dr. Karthick Seshadri is an Assistant Professor in the Department of Computer Science and Engineering at National Institute of Technology, Andhra Pradesh. He possesses a teaching and research experience of about 14 years in academia and IT Industry. He has carried out several collaborative projects with Yahoo!, Honeywell, Nokia, LinkedIn, IDRBT, Iidiap Research Institute and IISc. His research interests include machine learning, data analytics, distributed computing and algorithms.

## Overview

In this short online course, a taxonomy based on trust is developed for blockchains. The course will provide an exposure to the evolution of trust and will draw parallels to significant societal developments in which information technology tools played a key role. This approach permits the participants to understand the origins of blockchains in a unique way, the excitement that currently permeates this space and the promise this technology holds for the future.

In addition to providing a comprehensive study, the course components will take a critical look at the architectural elements of public and private blockchains and discuss various trade-offs. In addition to demystifying the technology behind blockchains, the course will demonstrate that not all pieces of the blockchain puzzle are created equal. In particular, the course instructors will show that consensus mechanisms play a vital role in developing highly available distributed solutions and argue that given that foundation, building distributed applications becomes extremely easy. This argument is supported by presenting a case study involving the construction of a serverless gold exchange. This short course will be concluded by discussing possible topics for future research.

The participants of this course will understand the concepts outlined above, through lectures, case-studies and hands-on laboratory sessions.

## Objectives

The primary objectives of the course are as follows:

- i) Exposing participants to the current state-of-the-art of public & private blockchains,
- ii) Providing tools to the participants so that they can critically evaluate which problems could benefit from this technology and those that don't,
- iii) Providing exposure to architectural overview and drawing contrast between public & private blockchains,
- iv) Presenting practical problems and offering solutions through case studies in blockchains,
- v) Pointing several research and development efforts that are underway and some challenges that lie ahead.

## Course Details

Date	Lectures/Tutorials	Instructor	Hours
07-02-2022	Lecture 1: Motivation of Blockchains, Role played by trust, historical perspective of subversive technologies	Prof. Ramki Thurimella	2
	Lecture 2: Shift in computing paradigms towards distributed model. Challenges	Prof. Ramki Thurimella	1
	Tutorial 1: Problem solving session with examples: Heat Exchanger Networks, Heat-Integrated Distillation, Process Flowsheet Intensification	Prof. Ramki Thurimella	2
08-02-2022	Lecture 3 : Public Ledgers, Bit Coins, Smart Contracts, Fundamental Cryptographic primitives	Dr. Karthick Seshadri	1
	Lecture 4: Trusted-Third Party model and its limitations, case studies	Prof. Ramki Thurimella	2
	Tutorial 2: Installation, demonstration and comprehension of docker containers like Hyperledger Fabric and Ethereum	Dr. Karthick Seshadri	2
09-02-2022	Lecture 5 : Achieving consensus in trustless networks	Prof. Ramki Thurimella	1
	Lecture 6: Bitcoin creation, payment and double spending, P2P bitcoin network, Transactions and Consensus in a bitcoin network, Bitcoin Proofs of Work and Vulnerabilities, Bitcoin mining	Dr. Karthick Seshadri	1
	Tutorial 3: Problem solving session with examples: Merkle trees, immutability	Prof. Ramki Thurimella	2
10-02-2022	Lecture 7 : Proof X, Distributed consensus, private blockchains	Prof. Ramki Thurimella	1
	Lecture 8: Permissioned model for Blockchains, Usecases. RAFT, Lamport-Shostak-Pease BFT Algorithm for consensus	Dr. Karthick Seshadri	1
	Tutorial 4: Gold Exchange, future directions (Case Study)	Prof. Ramki Thurimella	2
11-02-2022	Lecture 9: Current challenges and limitations of blockchains.	Prof. Ramki Thurimella	1
	Lecture 10: Application development leveraging Blockchains, Understanding Hyperledger Fabric, Smart Contract Writing using Hyperledger Fabric and Ethereum	Dr. Karthick Seshadri	1
	Tutorial 5: Creation and deployment of a blockchain network using Hyperledger Fabric, Coding an Application that interacts with the network by executing transactions on the network.	Dr. Karthick Seshadri	2

## Modules

Module A: Motivation, Challenges, Public & Private blockchains: February 7 – February 8, 2022

Module B: Architectural Overview, Case Studies, R&D pointers: February 9 – February 11, 2022

## Date of Examination

**February 11, 2022**

## You Should Attend If...

- you are a Computer Science engineer or research scientist interested in Blockchains.
- you are working in IT industry as a Blockchain Architect, Blockchain Developer, Blockchain Network operator or a user.
- you are a student or faculty from an academic institution interested in learning the current state-of-the-art of public and private blockchains along with some of the seminal R&D efforts in Blockchains and the challenges that lie ahead.

## Registration Fees (All Modules)

**Participants from abroad: US \$300**

**Industry/ Research Organizations: Rs. 10000**

**Faculty from Academic Institutions: Rs. 5000**

**Research Scholars/Students: Rs. 2500**

The above fee includes all instructional materials and virtual laboratory use for tutorials and assignments.

**Number of participants for the course will be limited to fifty.**

## Mode of Registration and Fee Payment

Prospective attendees need to register for this course through the link <http://www.gian.iitkgp.ac.in/GREGN>. The shortlisted candidates will be informed through email regarding the modalities to pay the registration fee.

## Course Coordinator

**Dr. Karthick Seshadri**

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