सत्यमेव जयते
Ministry of Education
Government of India

GLOBAL INITIATIVE OF ACADEMIC NETWORKS

Motilal Nehru National Institute of Technology Allahabad, Prayagraj

GIAN course on

"Smart Contracts and Consensus Algorithms for Business Blockchains"

Feb 24-28, 2025

Overview

Blockchain is a distributed-ledger technology that is poised to have greater societal impact than the internet. It can revolutionize and disrupt the way businesses are conducted today. Especially, it is a threat to intermediary based businesses as it promises to establish trust in peer-to-peer transactions and remove the intermediaries. It is a quickly growing technology and it is immutable, transparent and distributed.

The two major constituents of blockchain technology are: smart contracts and consensus algorithms. A smart contract, in blockchain, is a self-executing program that automates the actions which are specified in an offer/agreement between two or more parties. These contracts are written, mostly in Solidity, as scripts which are executed when a certain specified condition is met. The major advantage of using the smart contracts is that they are deterministic, accurate and fast. A block in blockchain can only be added if all the stakeholders of business agree on a single data state as proposed by one of the miners. This agreement keeps the decentralized blockchain synchronized among various nodes/peers and helps the blockchain grow. A consensus algorithm is a protocol guiding all the peers of the Blockchain network reach a common agreement.

This GIAN course is to help the students or researchers to upgrade their knowledge about blockchain architecture and to learn how to write smart contracts and consensus algorithms for business blockchains dealing in money transfer, supply chain, IoT and healthcare sector etc. A student-centered based pedagogical approach will be followed using lectures and tutorials. The lectures will cover basic theoretical and implementational knowledge whereas, evidence-based cases will be used in tutorials. This course, thus, aims to prepare the pool of researchers and practitioners who can undertake newer evidence-based studies on blockchain.

Module	**Smart Contracts and Consensus Algorithms for Business Blockchains** ***Number of participants for the course will be limited to fifty.***
You Should Attend If…	You are student or faculty or research professional interested in learning the core of Blockchain technology and developing Blockchain based solutions.
Course Objectives	**After the completion of the course, the participants shall be able to:** 1. Understand and evaluate the components of Blockchain and Blockchain-based technologies. 2. Explain in detail the structure and architecture of Ethereum and Ethereum Virtual Machine. 3. Reason on the design of Smart Contracts that act independently and execute automatically. 4. Build smart contracts and decentralized applications (Dapps). 5. Understand distributed consensus and Blockchain consensus algorithms. 6. Know how modern consensus algorithms work. 7. Foster a deep level of applied learning through project-based case studies.
Course Highlights	Coverage of research and design issues with smart contracts and consensus algorithms. Case studies on blockchain applications with emphasis on smart contracts and consensus algorithms with exercise programs and quizzes
Fees	The participation fees for taking the course is **NIL.** The participants will be provided with accommodation in the institute guest house/hostel on payment basis.
Registration Link	https://forms.gle/zV1iEEk1uMN3qrm7A

Schedule: Feb 24-28, 2025

Date	Topics	L/T/P	Hours
Feb 24, 2025	➢ Essentials of Distributed Computing ➢ Introduction to Blockchain Architecture • The Ethereum network • Mining • Addition of Blocks	**L**	**2**
	➢ Understanding Simple Blockchain Architecture (Practical Hand-on)	**T**	**2**
	➢ Use cases for Blockchain • Financial Software and Systems • Trade/supply Chain.	**L**	**1**
Feb 25, 2025	➢ Smart Contracts • Smart Contracts • Ethereum Virtual Machine (EVM) • JavaScript VM • Solidity Introduction • Variables, Expressions, Functions, Events and Control Statements • Account Types, Gas, and Transactions • Web3 Base Layer Services	**L**	**3**
	➢ Implementation and Deployment Considerations for Smart Contracts • Developer Tools • Solidity Programs	**T**	**2**
Feb 26, 2025	➢ Decentralized Application (Dapps) • Decentralized Application Architecture • Connections between Blockchain and Smart Contract • Web3js • Deployment ➢ Decentralized Autonomous Organizations (DAO's) • DAO's and Its hierarchy • Protocol, Grant, Philanthropy, Social, Collector, Venture, Media and Sub.	**L**	**4**
Feb 27, 2025	➢ Consensus Algorithms and their types: • Proof of Work, Proof of Stake, Proof of Authority, Proof of Capacity, Proof of Burn, Proof of Identity, Proof of Activity, Proof of Elapsed Time, Proof of Importance.	**L**	**2**
	➢ Implementation and Deployment Considerations for Consensus Algorithms.	**L**	**2**
	➢ Design and Coding for the Hierarchy of Consensus Algorithms. (Practical Hand-on)	**T**	**2**
Feb 28, 2025	➢ Scalability Aspects of Smart Contracts and Blockchain Consensus Protocols • Recognition of Blockchain by Government Agencies • Growth Aspects of Blockchain	**L**	**2**
	➢ Future of Blockchains and Interoperability	**L**	**1**

The faculty:

Professor A.K.M. Najmul Islam is a professor of Digital Transformation at the Department of Software Engineering at LUT University, Finland. Professor Islam is also a docent (Adjunct Professor) of Information Systems at Tampere University. His research interests include Responsible IT Design & Use, Blockchain & AI Development, Computational Design Science. He has published various highly cited technical articles and he is serving as the editor with various international journals of repute.

Dr. Manoj Wairya is an associate professor at the Department of CSE, Motilal Nehru National Institute of Technology Allahabad, Prayagraj. His research interests include Network Security, Software Engineering and Machine Learning. He had competed his Ph.D. on the effective adoption of mobile learning systems in Indian higher educational institutions. He has published several high value research papers and possesses a vast teaching experience.

LT. (Dr.) Divya Kumar is an assistant professor at the Department of CSE, Motilal Nehru National Institute of Technology Allahabad, Prayagraj. His research interests include Blockchain and Application Development, Machine Learning, E-governance, MIS, Optimization and Evolutionary Computation. He was a Gold Medallist during graduation (B.Tech) and post-graduation(M.Tech) in Computer Science and Engineering. He has published various highly cited technical articles.

Contact details

Local GIAN Coordinator	Course Co-coordinator	Course Co-ordinator
Prof. G. P. Sahu Professor, School of Management Studies, MNNIT Allahabad, Prayagraj Tel: +91-9305508002 E-mail: gsahu@mnnit.ac.in	Dr. Manoj Wairya Associate Professor Department of CSE, MNNIT Allahabad, Prayagraj, Tel: +91-9453317401 E-mail: wairya@mnnit.ac.in	LT. (Dr.) Divya Kumar Assistant Professor, Department of CSE, MNNIT Allahabad, Prayagraj, Tel: 7905 595 695 E-mail: divyak@mnnit.ac.in