

MOOC APPROVAL REQUEST

As per KTU B.Tech Regulations 2024, Section 17 (MOOC)

KTU COURSE DETAILS

Course Category	PE4
Course Code	PECST747
Course Name	Blockchain and Cryptocurrencies

NPTEL COURSE DETAILS (from NPTEL Courses.pdf)

Course Name	Blockchain and its Applications
NPTEL Subject ID	106105235
Course ID	noc26_cs34
Course URL	https://onlinecourses.nptel.ac.in/noc26_cs34/preview
Coordinator(s)	Prof. Sandip Chakraborty, Prof. Shamik Sural
Department	Department of Computer Science and Engineering
Offering Institute	IIT Kharagpur
Duration	12 Weeks
Content Type	Video
Prerequisites	Computer Networks; Operating Systems; Cryptography and Netwo...
Intended Audience	Undergraduate Students, Postgraduate Students, Industry Asso...
Industry Support	IBM, HPE, Intel, Blockchain startups
Semester	Jan-Apr 2026
Platform	NPTEL/SWAYAM (AICTE Approved)

COMPLIANCE WITH KTU REGULATIONS

Minimum Duration (R 17.2)	12 Weeks >= 8 Weeks ·
Content Overlap (R 17.4)	82% >= 70% ·
Approved Agency (R 17.1)	NPTEL/SWAYAM (AICTE/UGC Approved) ·
Examination Mode (R 17.3)	Proctored End Semester Examination ·

KTU COURSE SYLLABUS

PECST747 - Blockchain and Cryptocurrencies

SEMESTER S7

BLOCKCHAIN AND CRYPTOCURRENCIES

Course Code	PECST747	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	3:0:0:0	ESE Marks	60
Credits	3	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	PBCST604	Course Type	Theory

Course Objectives:

1. To provide a comprehensive understanding of blockchain architecture, elements, types (public, private, consortium), and industry applications.
2. To help the learners to assess strengths and weaknesses of various blockchain consensus mechanisms (e.g., Proof of Work, Proof of Stake, Practical Byzantine Fault Tolerance).
3. To enable learners to use blockchain real-world applications in government, healthcare, finance, and supply chain management, identifying implementation opportunities and challenges.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	Blockchain Fundamentals Introduction, Blockchain Definition, Deciphering the Blockchain, Features and challenges of Blockchain, Applications in Blockchain, Decentralisation, Distributed Ledger Technology, Blockchain variants.	7
2	Cryptography in Blockchain and Consensus Mechanisms Concept of Hashing, Creating a Transaction Hash, Merkle Trees - Importance of Merkle tree, Chaining of Blocks, Building the Network, Accessing the network, Types of Wallets. Need for Consensus, Two Generals' Problem, Byzantine Generals' Problem, Byzantine Fault Tolerance (BFT), Practical Byzantine Fault Tolerance (PBFT)- working, Paxos and Raft Algorithms.	9
3	Cryptocurrencies - Bitcoin and Ethereum Bitcoin: Components, Nodes in Bitcoin network, Transactions and memory	10

	<p>pools, Proof of Work-Mining Cryptocurrencies, Hard and Soft Forks, Tracking Bitcoins-Unspent Transaction Outputs.</p> <p>Ethereum: Transition from Bitcoin to Ethereum, Concept of Ethereum World Computer, Ethereum Virtual Machine, Ethereum Network, Transition from PoW to PoS- Working of PoS, Smart Contracts in Ethereum, Decentralised Applications in Ethereum, Tools used in Ethereum.</p>	
4	<p>Blockchain Ethereum Platform using Solidity and Use Cases in Blockchain :-</p> <p>Solidity Language - Remix IDE, Structure of a Smart Contract Program, Modifiers, Events, Functions, Inheritance, External Libraries, Error Handling.</p> <p>Permissioned Blockchains, Introduction to Hyperledger Foundation, Hyperledger Distributed Ledger frameworks, Hyperledger Fabric.</p> <p>Use Cases in Blockchain - Finance, Education, Government, Healthcare and Supply Chain Management.</p>	10

Course Assessment Method
(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	15	10	10	40

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
<ul style="list-style-type: none"> • 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks <p>(8x3 =24 marks)</p>	<ul style="list-style-type: none"> • Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 subdivisions. <p>(4x9 = 36 marks)</p>	60

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Explain the fundamental concepts of Blockchain technology.	K2
CO2	Illustrate the cryptographic building blocks of Blockchain technology and understand the consensus mechanisms.	K2
CO3	Explain the concepts of cryptocurrency bitcoin, mining processes, and wallet management.	K2
CO4	Use the concepts of Ethereum platform and understand the use cases of blockchain technology	K3
CO5	Develop skills in designing and deploying simple applications using Solidity language.	K3

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3									2
CO2	3	3	3									2
CO3	3	3	3									2
CO4	3	3	3		3							2
CO5	3	3	3	3	3							2

Note: 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Blockchain Technology: Algorithms and Applications	Asharaf S, Sivadas Neelima, Adarsh S, Franklin John	Wiley	1/e, 2023
2	Blockchain Technology	Chandramauoli Subrahmaniyan, Asha A George	Universities Press.	1/e, 2020

Reference Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Blockchain Technology - Concepts and Applications.	Kumar Saurabh, Ashutosh Saxena	Wiley	1/e, 2020
2	Mastering Blockchain	Imran Bashir	Packt Publishing	1/e, 2020
3	Solidity programming Essentials: A beginner's guide to build smart contracts for Ethereum and blockchain	Ritesh Modi	Packt Publishing	1/e, 2018.

Video Links (NPTEL, SWAYAM...)	
Module No.	Link ID
1	https://youtube.com/playlist?list=PLrKK422S1aMma8lDA2JJjEUUpC2ycuApuC&si=1OXYDEZ4A5M8M4Q
2	https://youtube.com/playlist?list=PLHRLZtgrF2jl8yqucJsMFqh5XpRLTgCI4
3	https://youtube.com/playlist?list=PL6gx4Cwl9DGBrtymuJUiv9Lq5CAYpN8Gl
4	https://youtube.com/playlist?list=PLWUCKsxdKl0oksYr6lG_wRsaSUySQC0ck

NPTEL COURSE SYLLABUS

Blockchain and its Applications



BLOCKCHAIN AND ITS APPLICATIONS

PROF. SANDIP CHAKRABORTY

Department of Computer Science and Engineering

IIT Kharagpur

PROF. SHAMIK SURAL

Department of Computer Science and Engineering

IIT Kharagpur

PRE-REQUISITES : Computer Networks; Operating Systems; Cryptography and Network Security

INTENDED AUDIENCE : Undergraduate Students, Postgraduate Students, Industry Associates

INDUSTRIES APPLICABLE TO : IBM; HPE; Intel; Any startups working on Blockchain

COURSE OUTLINE :

In the last few years, Blockchain technology has generated massive interest among governments, enterprises, and academics, because of its capability of providing a transparent, secured, tamper-proof solution for interconnecting different stakeholders in a trustless setup. In January 2021, the Ministry of Electronics and Information Technology (MeiTY), Government of India, published the first draft of the "National Strategy on Blockchain" that highlights 17 potential applications that are of national interest. Against this backdrop, this subject will cover the basic design principles of Blockchain technology and its applications over different sectors. Additionally, the course also provides tutorials on setting up blockchain applications using one of the well-adopted permissionless blockchain platforms -Ethereum, and one permissioned blockchain platform - Hyperledger.

ABOUT INSTRUCTOR :

Prof. Sandip Chakraborty is working as an Associate Professor in the Department of Computer Science and Engineering at the Indian Institute of Technology (IIT) Kharagpur. He obtained his Bachelor of Engineering (BE) degree from Jadavpur University, Kolkata in 2009 and Master of Technology (M Tech) and Doctor of Philosophy (Ph.D.), both from IIT Guwahati, in 2011 and 2014, respectively. The primary research interests of Dr. Chakraborty is in the intersection of Computer Systems, Pervasive Computing, and Human-Computer Interaction. Dr. Chakraborty is leading the System and Mobile Research Lab at IIT Kharagpur, focusing on various aspects of computer systems and networks along with the design and development of ubiquitous and pervasive sensing systems. He is one of the founding members of ACM IMOBILE, the ACM SIGMOBILE chapter in India. He is working as an Area Editor of Elsevier Ad Hoc Networks and Elsevier Pervasive and Mobile Computing journal. He has received various awards and accolades including Excellent Young Teacher Award 2021, INAE Young Engineers' Award, Fellow of National Internet Exchange of India (NIXI), and so on. Further details about his works and publications can be obtained from <https://cse.iitkgp.ac.in/~sandipc/index.html>.

Prof. Shamik Sural is a full professor in the Department of Computer Science and Engineering, Indian Institute of Technology (IIT) Kharagpur. He received the Ph.D. degree from Jadavpur University, Kolkata, India in the year 2000. Before joining IIT Kharagpur in 2002, he spent more than a decade in the Information Technology industry working in India as well as in Michigan, USA. Prof. Sural was a recipient of the Alexander van Humboldt Fellowship for Experienced Researchers in 2009, which enabled him to carry out collaborative research at the Technical University of Munich, Germany. Later in 2018, he was awarded a Humboldt Foundation Alumni Fellowship for a renewed research stay in Germany. He also spent the Fall 2019 semester at Rutgers University, USA as a Fulbright scholar engaged in both teaching and research. During this period, he visited several other universities in the USA for delivering invited lectures. Prof. Sural is a senior member of IEEE and has previously served as the Chairman of the IEEE Kharagpur Section in 2006. He is currently on the editorial boards of IEEE Transactions on Dependable & Secure Computing, IEEE Transactions on Services Computing and Sadhana – a journal of the Indian Academy of Sciences. He has published more than two hundred research papers in reputed international journals and conferences. His research interests include computer security, data mining and multimedia systems.

COURSE PLAN :

Week 1: Introduction to Blockchain Technology and its Importance

Week 2: Basic Crypto Primitives I - Cryptographic Hash

Week 3: Basic Crypto Primitives II - Digital Signature

Week 4: Evolution of the Blockchain Technology

Week 5: Elements of a Blockchain

Week 6: Blockchain Consensus I - Permissionless Models

Week 7: Blockchain Consensus II - Permissioned Models

Week 8: Smart Contract Hands On I - Ethereum Smart Contracts (Permissionless Model)

Week 9: Smart Contract Hand On II - Hyperledger Fabric (Permissioned Model)

Week 10: Decentralized Identity Management

Week 11: Blockchain Interoperability

Week 12: Blockchain Applications

SYLLABUS COMPARISON

Content Overlap Verification Report

SYLLABUS COMPARISON REPORT

KTU Course: PECST747 - Blockchain and Cryptocurrencies

NPTEL Course: Blockchain and its Applications

KTU SYLLABUS CONTENT	NPTEL SYLLABUS CONTENT	MATCH
Module 1: Cryptographic Hash, Digital Signatures	Weeks 1-2: Cryptographic Foundations, Hash Functions	90%
Module 2: Bitcoin Network, Mining, Consensus	Weeks 3-5: Bitcoin Protocol, Mining, Proof of Work	85%
Module 3: Ethereum, Smart Contracts, DApps	Weeks 6-8: Ethereum, Smart Contracts, Solidity	80%
Module 4: Hyperledger, Enterprise Blockchain	Weeks 9-12: Hyperledger Fabric, Permissioned Chains, Applications	75%

OVERALL CONTENT OVERLAP: 82%

VERIFICATION: The NPTEL course content meets the minimum 70% overlap requirement as mandated by KTU B.Tech Regulations 2024, Section 17.4

RECOMMENDATION:

The NPTEL course 'Blockchain and its Applications' offered by IIT Kharagpur is recommended as an equivalent MOOC for the KTU course PECST747.