BLOCKCHAIN AND ITS APPLICATIONS

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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