INTERNATIONAL MANAGEMENT INSTITUTE, BHUBANESWAR
POST GRADUATE DIPLOMA IN MANAGEMENT (PGDM)
Block Chain & Cyber Security (IS609)
CREDIT: Half credit (1.5 credits)
TERM: VI (January to March, 2019)

Instructor(s)
Name   **:** Prof. Ramesh Behl (RB)
Email   **:** rbehl@imi.edu
Phone (Extn no.)   **:** 0674-3042107
Consultation Hours : Tuesday, 2- 3pm else by appointment (by e-mail)

Course Introduction:

Bitcoin! The cryptocurrency that has been applauded, ridiculed, hacked (well, not directly), and dismissed. Yet it is trading at a high exchange rate against the USD. Whatever the fate of bitcoin, the technological breakthrough is worth studying. Blockchain is the distributed and decentralized database technology behind this cryptocurrency. This course explores the fundamentals of the public, transparent, secure, immutable and distributed database called blockchain. Blockchains can be used to record and transfer any digital asset not just currency. This course will introduce students to the workings and applications of this potentially disruptive technology. Its potential impact on financial services, government, banking, contracting and identity management will be discussed. Course will also cover other different forms of blockchain.

Learning Outcomes:

This course is designed to provide students with the foundations necessary for understanding and extending the power of disruptive technology called Blockchain. By the end of the course, students will:

LO1. Understand what is blockchain and why we need blockchain. What is the real world problem(s) that blockchain is trying to solve
LO2. Understand and describe how blockchain works including the underlying technologies for blocks & proof of work.
LO3. How does blockchain exist in the public domain (decentralized, distributed) yet maintain transparency, privacy, anonymity, security, immutability, history
LO4. How is blockchain incentivized without any central controlling or trusted agency

LO5. How bitcoin cryptocurrency works and why people value a 'digital' currency, how it can be protected against scam, fraud, hacking and devaluation

LO6. Design and implement new ways of using blockchain for applications other than cryptocurrency

LO7. Explore platforms such as Ethereum to build applications on blockchain

Course Pedagogy:

The course will be discussion based using live applications and exercises. Students are expected to do hands-on exercises in most of the sessions.

Course Readings

Course workbook comprising of readings and exercises will be distributed.

Course Evaluation criteria:

Quiz (15%): The quizzes will be based on the course covered in the previous classes. There will be n quizzes (n will be decided by the faculty) spread across the entire course. For final evaluation (n-1) quizzes will be considered. The quiz will test the conceptual understanding of the subject.

Project (20%): Project will be mapped to the learning of the course and is to be done at an individual level. A team based project is to design a blockchain database to be used in an application of the team's choice. The blockchain can be designed on a platform such as Ethereum. Team will have to show the design methodology, implementation details, viability of the application, and incentive for the miner to join the blockchain and the potential disruption to the existing business. Viability, in this project, means if the blockchain application has potential for success in terms of adoption, resistance to hacking, sustainable population interest, and sufficient business investment. Incentivizing, in this project, means if the blockchain application has the potential to attract independent 'miners' without whom the blockchain does not progress. Miners are computers that expend computational power to mine for rewards and get to update the blockchain as a database of permanent record.

Case Studies (10%): Case Analysis is to be presented and submitted on time. Grading will be based on completeness, accuracy, and timeliness.

Assignment (15%): Assignments are to be submitted on time. Grading will be based on completeness, accuracy, and timeliness.

End Term (40%): End term exam will cover all the topics covered in the course. The end term will cover theoretical concepts as well as hand-on exercises covered in the course.

Academic integrity
a) **Plagiarism** is the use of or presentation of ideas, works that are not one's own and which are not common knowledge, without granting credit to the

originator. Plagiarism is unacceptable in IMI and will invite penalty. Type and extent of penalty will be at the discretion of the concerned faculty.

b) **Cheating** means using written, verbal or electronic sources of aid during an examination/ quiz/ assignment or providing such assistance to other students (except in cases where it is expressly permitted by the faculty). It also includes providing false data or references/list of sources which either do not exist or have not been used, having another individual write your paper or assignment or purchasing a paper for one's own submission. Cheating is strictly prohibited at IMI and will invite penalty as per policies of the Institute.

Reference Books

- "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction" by Arvind Narayanan; published by Princeton University Press (July 19, 2016); ISBN-10: 0691171696; ISBN-13: 978-0691171692
- "Blockchain: Blueprint for a New Economy" by Melanie Swan; published by O'Reilly
- "Mastering Blockchain" by Imran Bashir; published by packt; ISBN 978-1-78712-544-5

Session Plan:

Session No.	Topic	Learning Outcomes	Reading
1	Course objectives and outcomes • History of centralized services, trusted third party for transactions • Making a case for a trustless system • Why blockchain • You are your own bank? • Decentralized transactions • No permission for transactions needed	LO1 LO2	Reading: https://www.geeksforgeeks.org/blockchain-technology-introduction/ https://hackernoon.com/an-introduction-to-blockchain-technology-261ffb8de
2	History • How and when blockchain/bitcoin started	LO1 LO2	Readings: • *https://bitcoin.org/bitcoin.pdf* Assignment-1: Explore various popular blockchain applications. Create a list of those

	• Milestones on the development of bitcoin • Criticism, ridicule and promise of bitcoin • Sharing economy • Internet of Value		applications and the industries/businesses they are impacting. Submit the report by Session 3.
3	Overview of blockchain technology • What is blockchain • Transactions • Blocks • Hashes • Consensus • Verify and confirm blocks	LO2 LO3 LO4	Readings: *http://scet.berkeley.edu/wp-content/uploads/BlockchainPaper.pdf* Assignment-2: Explore the bitcoin blockchain on blockchain.info and submit the report by session 5.
4	Cryptography • Hash cryptography • Encryption vs hashing	LO5	Readings: *http://scet.berkeley.edu/wp-content/uploads/BlockchainPaper.pdf* Assignment-3: Use an online service to generate hashes for content and submit your report by session 6.
5-6	Cryptography • Recording transactions • Digital signature • Verifying and confirming transactions	LO5	Readings: https://www.geeksforgeeks.org/cryptography-introduction-to-crypto-terminologies/
7-8	Bitcoin • Definition • Transactions • Blockchain • Alternatives • Mining & Incentivizing blockchain	LO5 LO6	**Reading:** *https://bitcoin.org/bitcoin.pdf* **Assignment-4**: Explore the bitcoin blockchain on blockchain.info for block generation. Explore how long it takes a block to be confirmed. Submit by session 8
9	Smart Contracts	LO7	Readings: https://blockgeeks.com/guides/smart-contracts/

			https://blockchainhub.net/smart-contracts/ Case: FILECOIN'S INITIAL COIN OFFERING: USING BLOCKCHAIN TO DECENTRALISE STORAGE
10	Ethereum • Definition • Elements • Blocks & Mining	LO7	**Reading:** *https://media.consensys.net/programmable-blockchains-in-context-ethereum-s-future-cd8451eb421e#.z4788f3kx* https://blockgeeks.com/guides/ethereum/
11	Hyperledger • Projects • Protocols • Fabric	LO7	Readings: https://blockgeeks.com/guides/hyperledger/ Case: Deutsche Bank: Pursuing Blockchain Opportunities
14-15	Alternative Blockchains & Projects • IOT • Government • Health • Education • Finance • Supply Chain	LO7	**Reading**: *https://www.evry.com/globalassets/insight/bank2020/bank-2020---blockchain-powering-the-internet-of-value---whitepaper.pdf* *https://www.evry.com/globalassets/insight/bank2020/bank-2020---blockchain-powering-the-internet-of-value---whitepaper.pdf* **Assignment-5**: Pick three industries. Research the application of blockchain in those industries. Describe how blockchain could be successful in those industries. Case: BLOCKCHAIN: A NEW SOLUTION FOR SUPPLY CHAIN INTEGRITY