## SNJB's

# Late Sau. Kantabai Bhavarlalji Jain College of Engineering

(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune) Shri Neminath Jain Brahmacharyashram (SNJB) (Jain Gurukul) Neminagar, Chandwad - 423101, Dist. Nashik (MS, India). Tele: (02556) 253750, Web: www.snjb.org, Email: principalcoe@snjb.org



ESTD - 1928



### Curriculum and Evaluation Scheme for Second Year B. Tech. in Computer Engineering with Multidisciplinary Minor and Honor

To be implemented for 2024-28 Batch (With Effect from Academic Year 2025-26)





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#### Vision of the Institute

Transform young aspirant learners towards creativity and professionalism for societal growth through quality technical education.

#### **Mission of the Institute**

- 1. To transfer the suitable technology, particularly for rural development.
- 2. To enhance diverse career opportunities among students for building a nation.
- 3. To acquire the environment of learning to bridge the gap between industry and academics.
- 4. To share values, ideas, and beliefs by encouraging faculties and students for the welfare of society.

#### Vision of the Computer Engineering Department

To empower young generations for significant contributions in the field of computer engineering through excellence in knowledge, technical education, and innovation to cater the industrial demands and societal needs.

#### Mission of the Computer Engineering Department

- 1. To achieve academic excellence by inculcating basic and latest knowledge in which new ideas flourish.
- 2. To undertake collaborative training which offers opportunities for long-term interaction with academia and industry.

#### Program Outcomes (POs) for an engineering graduate:

**PO1: Engineering Knowledge:** Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.

**PO2: Problem Analysis:** Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)

**PO3: Design/Development of Solutions:** Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)

**PO4: Conduct Investigations of Complex Problems:** Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).

**PO5: Engineering Tool Usage:** Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)

**PO6: The Engineer and The World:** Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).

**PO7: Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)

**PO8:** Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

**PO9: Communication:** Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences

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**PO10: Project Management and Finance:** Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

**PO11: Life-Long Learning:** Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

#### **Program Specific Outcomes**

- 1. **Professional Skills-**The ability to understand, analyze, and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying.
- 2. **Problem-Solving Skills-** The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.
- 3. **Successful Career and Entrepreneurship** The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur and a zest for higher studies.

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#### **GENERAL COURSE STRUCTURE**

#### A. Definition of Credit:

#### Table 1: Credit Definition

1 Hour Lecture (L) per week	1 Credit
1 Hour Tutorial (T) per week	1 Credit
2 Hours Practical (P) per week	1 Credit

#### B. Range of Credits: (B.Tech. or Equivalent) in Tech. with Multidisciplinary Minor:

In the light of the fact that a typical NEP Compliant Model Four-year Undergraduate degree program in Technology has about 176 credits, the total number of credits proposed for the four-year B.Tech. in **Computer Engineering** with Multidisciplinary minor degree is kept as **172**.

Course Catego	Credits As PER NEP Guidelines	Proposed Credits	
Basic Science Course		14-18	15
Engineering Science Course	DSC/ESC	16-12	14
Programme Core Course (PCC)	Drearom Courses	44-56	47
Programme Elective Course (PEC)	Program Courses	20	20
Multidisciplinary Minor (MD M)		14	17
Open Elective (OE) Other than a particular program	Multidisciplinary Courses	8	8
Vocational and Skill Enhancement Course (VSEC) Skill Courses		8	8
Ability Enhancement Course (AEC)		4	6
Entrepreneurship/Economics/ Management Courses	Humanities Social Science and	2	4
Indian Knowledge System (IKS)	Management (HSSM)	2	2
Value Education Course (VEC)		4	5
Research Methodology(RM)		4	4
Community Engagement Project (CEP)/ Field Project (FP)	Experiential Learning Courses	2	2
Project	. ,	4	5
Internship/ OJT		12	12
Co-curricular Courses (CC)	Liberal Learning Courses	4	3
Total Credit	160-176	172	

#### **Table 2: Range of Credits**

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#### C. Semester wise Credit Distribution Structure for Four Year B. Tech in Computer Engineering with Multidisciplinary Minor: Table3: Semester-wise Credit Distribution Structure

Semester		I	Ш	III	IV	v	VI	VII	VIII	Total Credits
Basic Science Course		8	7	-	-	-	-	-	-	15
Engineering Science Course	DSC/ESC	7	7	-	-	-	-	-	-	14
Programme Core Course (PCC)		-	3	11	8	9	4	9	3	47
Programme Elective Course (PEC)	Program Courses	-	-	-	-	6	5	6	3	20
Multidisciplinary Minor (MD M)	Multidisciplinary	-	-	3	3	3	2	3	3	17
Open Elective (OE) Other than a particular program	Courses	-	-	-	3	2	3	-	-	8
Vocational and Skill Enhancement Course (VSEC)	Skill Courses	2	2	-	2	-	2	-	-	8
Ability Enhancement Course (AEC)		1	-	1	2	2	-	-	-	6
Entrepreneurship/Economics/ Management Courses	Humanities Social Science and	-	-	2	2	-	-	-	-	4
Indian Knowledge System (IKS)	Management (HSSM)	2	-	-	-	-	-	-	-	2
Value Education Course (VEC)		-	-	3	2	-	-	-	-	5
Research Methodology		-	-	-	-	-	4	-	-	4
Community Engagement Project (CEP)/ Field Project (FP)	Experiential Learning Courses	-	-	2	-	-	-	-	-	2
Project	-	-	-	-	-	-	2	3	-	5
Internship / OJT		-	-	-	-	-	-	-	12	12
Co-curricular Courses (CC)	Liberal Learning Courses	1	2	-	-	-	-	-	-	3
Total Credits (M	lajor)	21	21	22	22	22	22	21	21	172

Students can opt for any of the following as per the rules and regulations given by the institute:

- **1.** B. Tech with Multidisciplinary Minor = Total 172 Credits
- 2. B. Tech with Multidisciplinary Minor and Honor = Total 190 Credits

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#### HONORS

- In addition to 172 credits of B. Tech Programmes (Bachelor of Technology) i.e. Major in which the student has taken admission, a student may opt for Honors in the same Tech. discipline/branch / Emerging Areas.
- A student is required to earn an additional 18 credits in the same Tech. discipline/ branch / Emerging Areas for Honors distributed over semesters III to VIII.
- The total number of credits required to complete the Honors in the same Tech. discipline/ Emerging Areas is 18 credits, in addition to 172 credits in Major.
- Students will have to compulsorily choose Honors from the same Tech. discipline/branch.
- Honors Degree in the Bachelor of Engineering programme shall be awarded to students earning additional total credits of all six semesters from the second year to final year, i.e., 18 Credits, in addition to 172 credits or 130 credits respectively. The student admitted in the first year must earn 172 credits and 130 credits admitted in lateral entry (admitted after Diploma or B.Sc.) in the second year.
- Minor Courses can be completed through an online platform.

#### The student has to choose One Honor out of the Two Honor groups provided below

Honors offered by Computer Engineering are as follows:

Table	4:	Honors
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Sr No	Name of Honors Offered by Department
A.	Blockchain Technologies
B.	Cyber Security

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The detailed syllabus structure for the same is as follows:

#### Table 5A: Specialization Honors in Blockchain Technologies

				Teaching Scheme					
Sr. No Ca	Category	SEM	1 Course Code	Course Name					
	category	JEM			L	т	Ρ	Total Hours	Credits
01	HOC	III	24-HOC-CS-2-01A	Foundation of Blockchain Technology	3	-	-	3	3
02	НОС	IV	24-HOC-CS-2-02A	Decentralize and Blockchain Technologies	3	-	-	3	3
03	HOC	V	24-HOC-CS-3-03A	Blockchain Architecture Design	3	-	-	3	3
04	НОС	VI	24-HOC-CS-3-04A	Smart Contract and Cryptocurrency	3	-	-	3	3
05	HOC	VII	24-HOC-CS-4-05A	Blockchain Security	3	-	-	3	3
06	HOC	VIII	24-HOC-CS-4-06A	Blockchain Applications	3	-	-	3	3
	Total						-	18	18

#### Table 5B: Specialization Honors in Cyber Security

							Teach	ing Scheme	
Sr.	Sr. Category SEM		1 Course Code	Course Name					
NU					L	Т	Р	Total Hours	Credits
01	НОС		24-HOC-CS-2-01B	Cryptography and Network Security	3	-	-	3	3
02	HOC	IV	24-HOC-CS-2-02B	Information Security	3	-	-	3	3
03	НОС	۷	24-HOC-CS-3-03B	Ethical Hacking	3	-	-	3	3
04	HOC	VI	24-HOC-CS-3-04B	Digital Forensic	3	-	-	3	3
05	НОС	VII	24-HOC-CS-4-05B	Network Forensics and Cyber Threat Analysis	3	-	-	3	3
06	HOC	VIII	24-HOC-CS-4-06B	Cyber Physical Systems	3	-	-	3	3
	Total				18	-	-	18	18

**#**Note for NPTEL/SYAYAM: Approved courses and platforms will be enlisted timely by authorities along with rules and regulations

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# Honors Syllabus for SEM III and SEM IV



24-HOC-CS-2-01A : Foundation of Blockchain Technology								
Teaching Scheme:     Credit: 3     Examination Scheme       Theory: 3 Hours/Week     CIE : 20 Marks     MSE : 20 Marks       SEE : 60 Marks     SEE : 60 Marks								
Prerequi	sites Courses: NA							
Compani	on Course: NA							
Course O • • • •	<ul> <li>Course Objectives:</li> <li>To understand the mathematical and cryptographic foundations essential for blockchain technology.</li> <li>To explore the basic concepts, architecture, and components of blockchain technology.</li> <li>To understand the core components and platforms that enable blockchain networks.</li> <li>To understand the smart contracts, their implementation, and cryptocurrency fundamentals.</li> <li>To explore various consensus algorithms that validate transactions in blockchain networks.</li> <li>To analyze the application of blockchain across different industries.</li> </ul>							
Course O After com	utcomes: npletion of the course, learners should be a	able to						
CONo	СО			BL				
1	<b>Understand</b> cryptographic principles and	I mathematical foundations essential for blockchain	technology.	2				
2	Explain the core principles, architecture,	, and components of blockchain technology and its e	evolution.	2				
3	3 <b>Analyze</b> the structure, components, and various types of blockchain platforms to evaluate their practical 3 applications.							
4	<b>Describe</b> the design and implementation and security considerations.	on of smart contracts and cryptocurrencies, and th	eir applications	2				
5	5 <b>Compare</b> different consensus mechanisms and assess their role in ensuring blockchain security and 3 performance.							
6	Analyze blockchain use cases across different industries and analyze their integration with emerging 4 technologies.							

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Course Contents						
Unit I	Mathematical Foundation for Blockch	ain	8 Hours			
Cryptograp Algorithm(S	hy: Symmetric Key Cryptography and 5HA256), Digital Signature Algorithm (D	Asymmetric Key Cryptography, Cryptograph SA), Hash Puzzles, Merkel Trees.	ic Hash Functions, Secure Hash			
#Exemplar	/Case Studies- Evaluate the Potential of	f BLAKE3 as an Alternative to SHA-256 in Bite	coin"			
*Mapping o	of Course Outcomes	C01				
Unit II	Blockchain Fundamentals		7 Hours			
Introductio Basic archit	n to blockchain, <b>Component of Blockch</b> a cecture of Blockchain.	ain: Node, Nonce, Hash, mining, Wallet, Ledge	er, Block in Blockchain, Fork			
<b>#Exemplar</b> caused by a	<b>/Case Studies-</b> Evaluate and analyze he a centralized system while improving tra	ow blockchain can help a logistics company o Insparency and efficiency."	vercome tracking and fraud issues			
*Mapping o	of Course Outcomes	C01,C02				
Unit III	Blockchain Component and Platforms		8 Hours			
Structure o Consensus Ethereum, I	f Block, Block Header, Core component Mechanism. <b>Types of Blockchain</b> : Pu Hyperledger, IoTA, Corda, R3.	s of Blockchain: Distributed Ledger, Peer-to-P blic, Private and Consortium. <b>Introduction c</b>	eer Networks(P2P), Block Mining, of Blockchain Platform: Bitcoin,			
#Exemplar	Case Studies- study real time use or b					
"Mapping o		(02,(03,(05				
Unit IV	Smart Contract and Cryptocurrency		7 Hours			
<b>Smart Contracts:</b> Introduction to Smart Contracts, Characteristics , Types , Smart Contract in Ethereum and Private Blockchain , Smart contract in Industry (Healthcare, Supply Chain etc)., Smart Contract Security. <b>Crypto Currency:</b> Introduction, Basics Types of Cryptocurrency, Cryptocurrency Usage, Crypto Wallets: Metamask, Coinbase, Binance						
#Exemplar	/Case Studies- Analyze how Ethereum-I	based smart contracts used in decentralized i	finance (DeFi) applications			
*Mapping o	of Course Outcomes	CO4, CO6				
Unit V	Consensus in Blockchain		8 Hours			
<b>Consensus in Blockchain</b> Consensus Algorithms, Proof of Work, Byzantine General problem, Proof of Stake, Proof of Elapsed Time, Proof of Activity, Proof of Burn						
<b>#Exemplar/Case Studies-</b> Comparing Proof of Work (Bitcoin) vs. Proof of Stake (Ethereum) in terms of security and energy consumption.						

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*Mapping	of Course Outcomes	CO3, CO5					
Unit VI	Block Chain Use Cases		7 Hours				
Prominent Chain Mana	Blockchain Applications, Retail, Bankir agement, Real Estate.	ng and Financial Services, Government Secto	or, Healthcare, Insurance, Supply				
#Exemplar	/Case Studies: Blockchain in healthcar	re for secure electronic health records (EHR) a	nd data management.				
*Mapping	of Course Outcomes	C03,C04,C06					
Text Books							
ISBN:978-1 T2: Dhillor T3: Lantz L Application	<ul> <li>T1: Singhal Bikramaditya, "Beginning Blockchain: A Beginner's Guide to Building Blockchain Solutions" New York Apress 2023, ISBN:978-1-4842-4041-0</li> <li>T2: Dhillon Vikram," Blockchain Enabled Applications" New York Apress 2023, ISBN:978-1-4842-7908-3</li> <li>T3: Lantz Lorne, "Mastering Blockchain: Unlocking the Power of Cryptocurrencies, Smart Contracts and Decentralized Applications" Shroff Publishers &amp; Distributors Mumbai, ISBN:978-93-8588-952-3</li> </ul>						
<b>R1:</b> Imran <b>R2:</b> Vikram <b>R3:</b> Andrea	Bashir, <i>Mastering Blockchain</i> , Packt Publ Dhillon, David Metcalf, Max Hooper, <i>Bl</i> a Is M. Antonopoulos, <i>Mastering Blockcha</i>	ishing, Second Edition, ISBN: 978-1-78883-90 <i>ockchain Enabled Applications</i> , Apress, NA, ISD <i>in</i> , O'Reilly, Second Edition, ISBN: 978-1-491-1	04-4. BN: 978-1-4842-3080-0. 95438-6.				
Additional Resources: (Books, e-Resources)  1. https://intellipaat.com/blog/tutorial/blockchain-tutorial/how-does-blockchain-work/ 2. https://www.youtube.com/watch?v=rCjVfuR93dk 3. https://www.youtube.com/watch?v=cFVGBxYiBFo 4. https://www.youtube.com/watch?v=KltWJERR6u4  E-Resources: 1. https://blockchain.cse.iitk.ac.in/slides-NPTEL-BlockchainTechnologyApplications.pdf 2. https://users.cs.fiu.edu/~prabakar/cen5079/Common/textbooks/Mastering_Blockchain_2nd_Edition.pdf 3. https://mrcet.com/downloads/digital_notes/CSE/IV%20Year/17062023/BLOCK%20CHAIN%20TECHNOLOGY[R20A0522]pdf (DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY)							
MOOC Cou <u>h</u> <u>ht</u>	MOOC Courses links : 1. NPTEL Course "Introduction to Blockchain Technology & Applications"(NPTEL) <u>https://npteL.ac.in/courses/106/104/106104220/</u> 2. NPTEL Course on "Blockchain Architecture & UseCases"(NPTEL) <u>https://npteL.ac.in/courses/106/105/106105184/</u> 3. Blockchain and its Applications, IIT Kharagpur(NPTEL) <u>https://npteL.ac.in/courses/106105235</u> 4. Blockchain, By Dr.Mayank Aggarwal (Swayam) <u>https://onlinecourses.swayam2.ac.in/aic21_ge01/preview</u>						

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	24-HOC-CS-2-01B: Cryptography and Network Security						
Teaching Scheme:       Credit: 3       Examination Scheme         Theory: 3 Hours/Week       CIE: 20 Marks       MSE: 20 Marks         SEE: 60 Marks       SEE: 60 Marks							
<b>Prerequi</b> (24-PCC	<b>Prerequisite Courses:</b> Discrete Mathematics (24-PCC-CS-2-01), Computer Organization and Architecture (24-PCC-CS-2-03)						
Compani	on Course: NA						
The cour	The course aims to: <ul> <li>Introduction to the fundamentals of cryptography</li> <li>To develop mathematical skills for cryptographic algorithms</li> <li>To Study and implement symmetric and asymmetric encryption techniques</li> <li>To analyze cryptographic attacks and security vulnerabilities</li> <li>To implement authentication mechanisms and secure communication protocols</li> <li>To explore advanced cryptographic trends and applications</li> </ul> Course Outcomes:						
CONo	C0			BL			
1	Demonstrate knowledge of cryptogra	phic principles		3			
2	Apply mathematical techniques to cr	yptographic algorithms		3			
3	3     Implement cryptographic algorithms and security protocols     3						
4	4 Analyze cryptographic security and perform cryptanalysis 3						
5	5 Design secure communication systems 3						
6	6 Evaluate emerging cryptographic trends and technologies 3						
	Course Contents						
Unit I	Introduction to Cryptography and	Classical Techniques	6 Hours				

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Introduction to cryptography, Classical Cryptosystem, Block Cipher. Data Encryption Standard (DES), Triple DES, Modes of Operation, Stream Cipher.							
<ul> <li>#Exemplar/Case Studies-</li> <li>1. CrypTool 2 (https://www.cryptool.org/en/) – Interactive cryptography learning tool</li> <li>2. Python (PyCryptodome Library) – Used for implementing block ciphers like DES, 3DES</li> </ul>							
*Mapping of Course Outcomes CO1							
Unit II	Mathematical Foundations for Cry	ptography	6 Hours				
LFSR-base Euclid Alg	d Stream Cipher, Mathematical bac orithm, Fermat's Little Theorem, Eule	kground, Abstract Algebra, Number Thec er Phi-Function, Euler's theorem.	ory. Modular Inverse, Extended				
#Exempla 1. Si	r/Case Studies - ageMath ( <u>https://www.sagemath.</u> omputations	org/) – Ideal for number theory,	algebra, and cryptographic				
*Mapping	of Course Outcomes	C02					
Unit III	Modern Symmetric and Asymmetri	c Cryptosystems	6 Hours				
Advanced Cryptosyst Modulo a	Encryption Standard (AES), Introduct em, RSA Cryptosystem. Primarily Te Prime.	tion to Public Key Cryptosystem, Diffie-He sting, ElGamal Cryptosystem, Elliptic Curv	llman Key Exchange, Knapsack re over the Reals, Elliptic Curve				
#Exempla 1. 0 2. P	r/Case Studies - penSSL ( <u>https://www.openssl.org/)</u> ython (ECC with ecdsa Library) – Im	– Generating RSA, Diffie-Hellman keys plementation of Elliptic Curve Cryptogra	phy				
*Mapping	of Course Outcomes	C03					
Unit IV	Authentication, Hash Functions, ar	nd Key Management	6 Hours				
Generalized ElGamal Public Key Cryptosystem, Rabin Cryptosystem. Message Authentication, Digital Signature, Key Management, Key Exchange, and Hash Function.							
<ul> <li>#Exemplar/Case Studies –</li> <li>1. GnuPG (GPG) (<u>https://gnupg.org/</u>) – For digital signatures and encryption</li> </ul>							
*Mapping	of Course Outcomes	C04					
Unit V	Cryptanalysis and Advanced Securi	ity Techniques	6 Hours				

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Cryptographic Hash Function, Secure Hash Algorithm (SHA), Digital Signature Standard (DSS). Cryptanalysis, Time-Memory Trade-off Attack, Differential and Linear Cryptanalysis. Cryptanalysis on Stream Cipher, Modern Stream Ciphers, Shamir's secret sharing and BE, Identity-based Encryption (IBE), and Attribute-based Encryption (ABE).				
#Exempla 1. Jo 2. So	r/Case Studies - ohn the Ripper (https://www.openw capy ( <u>https://scapy.net/</u> ) – For netw	vall.com/john/) – Password and hash crac vork packet analysis	cking tool	
*Mapping	of Course Outcomes	C05		
Unit VI	Emerging Trends in Cryptography	& Network Security	6 Hours	
Side-chanı Cryptograf	nel attack, The Secure Sockets I phy, Blockchain, Bitcoin, and Cryptocu	Layer (SSL), Pretty Good Privacy (PGF urrency.	P), Introduction to Quantum	
#Exempla 1. W 2. Et	r/Case Studies: /ireshark ( <u>https://www.wireshark.or</u> thereum & Bitcoin Core – Blockchai	rg/) – Network packet sniffing and SSL/T n and cryptocurrency simulation	'LS analysis	
*Mapping	of Course Outcomes	C06		
Text Book	S			
T1. Willia T2. Behro	m Stallings – Cryptography and Netw uz A. Forouzan – Cryptography and J	<i>work Security: Principles and Practice</i> (Pea <i>Network Security</i> (McGraw-Hill, 3rd Editio	rson, 7th Edition) n)	
Reference	Books :			
R1. Neal k R2. Jonath	Koblitz – A Course in Number Theory nan Katz & Yehuda Lindell – Introdu	<i>and Cryptography</i> (Springer, 2nd Edition) <i>action to Modern Cryptography</i> (Chapman	& Hall/CRC, 3rd Edition)	
Additional Online Resources: <ul> <li>NIST (National Institute of Standards and Technology) – <a href="https://csrc.nist.gov/">https://csrc.nist.gov/</a></li> <li>IETF RFCs for Cryptographic Standards – <a href="https://www.ietf.org/rfc.html">https://csrc.nist.gov/</a></li> <li>IETF RFCs for Cryptographic Standards – <a href="https://www.ietf.org/rfc.html">https://csrc.nist.gov/</a></li> <li>IETF RFCs for Cryptographic Standards – <a href="https://www.ietf.org/rfc.html">https://csrc.nist.gov/</a></li> </ul>				
<ul> <li>MOOC Courses links :</li> <li><u>https://onlinecourses.nptel.ac.in/noc21_cs16/preview</u> - Cryptography and Network Security By Prof. Sourav Mukhopadhyay, IIT Kharagpur</li> </ul>				
Software CTF Challe • O • H • K	Software Tools : CTF Challenges & Online Labs: • OverTheWire – Cryptopals Challenges (https://cryptopals.com/) • Hack The Box – Cryptography Challenges (https://www.hackthebox.com/) • Kali Linux – Contains multiple security tools for cryptanalysis			

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24-HOC-CS-2-02A : Decentralize and Blockchain Technologies				
<b>Teaching</b> Theory: 3	<b>J Scheme:</b> 3 Hours/Week	Credit: 3 Examination Scheme: CIE : 20 Marks MSE : 20 Marks SEE : 60 Marks		
Prerequi	sites Courses: NA			
Compani	ion Course: NA			
Course O • • • • • • • • • • • • • • • • • • •	<ul> <li>Course Objectives:</li> <li>To introduce the fundamental principles of decentralized systems, including their frameworks, ecosystem, and contest-driven approaches.</li> <li>To explore the structure and functionality of decentralized applications, including blockchain mining and supporting tools like Whisper and Swarm.</li> <li>To provide a comprehensive understanding of Bitcoin, focusing on its components like digital keys, wallets, transactions, and network.</li> <li>To introduce Ethereum's blockchain platform and develop smart contracts using Solidity.</li> <li>To study the components and tools of Hyperledger and understand its Blockchain-as-a-Service (BaaS) deployment model.</li> <li>To examine blockchain security mechanisms, analyze potential attacks, and explore defense strategies like sharding and Algorand.</li> </ul>			
CONo	СО		BL	
1	<b>Understand</b> the fundamental concepts of	of decentralized systems and blockchain technology.	2	
2	Describe the architecture and componer	ts of blockchain platforms, including Bitcoin and Ethereum.	2	
3	<b>Understand</b> the role of decentralized a and storage systems	pplications (DApps) and their impact on industries such as finance	2	
4	<b>Identify</b> the challenges in blockchain see	curity and possible solutions to prevent common attacks.	3	
5	<b>Classify</b> the types of blockchain framewo	orks like Hyperledger and their applications in business.	2	
6	Demonstrate the use of blockchain princ	ciples and tools to solve real-world problems through case studies.	3	

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Course Contents				
Unit I	Decentralized Architecture		8 Hours	
Centralizec cases: Supp	Centralized vs Decentralized, Introduction to Decentralized System, Decentralized Architecture: Advantages, Challenges, Use cases: Supply Chain Management			
<b>#Exemplar</b> and its imp	<b>/Case Studies-</b> Analyze the transformation of the transformation speed and cost.	tion of traditional banking processes through	decentralized systems like Ripple	
*Mapping	of Course Outcomes	C01, C02		
Unit II	Decentralization in Blockchain		7 Hours	
Decentraliz Systems (O	e application blockchain, Peer-to-Peer n-Chain vs. Off-Chain Governance).	(P2P) Networks: Structure and Communicat	ion, Governance in Decentralized	
<b>#Exemplar</b> validation	<b>/Case Studies-</b> <i>Analyze how a startup</i> by implementing a decentralized platfor	can address challenges in data security, st m leveraging Swarm	orage efficiency, and transparent	
*Mapping	of Course Outcomes	C03,C04		
Unit III	Bitcoin		8 Hours	
Introductio Limitations	Introduction, Digital Signatures, Digital Keys: Private and Public Keys, Transactions, Mining, Bitcoin Wallets, Bitcoin Forks, Limitations , Adoption in various industries.			
<b>#Exemplar</b> <i>payments.</i>	/Case Studies- Analyze the adoption of	f Bitcoin in e-commerce platforms like Overst	ock and its implications for global	
*Mapping	of Course Outcomes	CO2, CO3		
Unit IV	Blockchain Ethereum Platform using S	Solidity	7 Hours	
Introduction, Types of Ethereum Networks, EVM (Ethereum Virtual Machine), Gas and Gas Fees, Transactions and Blocks in Ethereum. Smart contracts: Purpose and types of Smart Contracts, Solidity Programming, Tools: IDE-Remix, Implementing and deploying smart contracts using Solidity. Smart Contract Security.				
#Exemplar	/Case Studies- Analyze the Use of Ether	reum Smart Contracts for Automating Loan Ap	pprovals in a Fintech Company	
*Mapping	*Mapping of Course Outcomes CO4			
Unit V	Hyperledger		8 Hours	
<b>Hyperledger:</b> Architecture, <b>Framework:</b> Fabri, Indy, <b>Tools</b> : Composer, Library: Aries, Blockchain as-a-service deployment model of Hyperledger:IBM Blockchain.				
<b>#Exemplar/Case Studies-</b> Examine the implementation of Hyperledger Fabric in Walmart's food traceability system to ensure transparency in the supply chain.				

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#### SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad (Autonomous Institute)

*Mapping of Course Outcomes CO5				
Unit VI	Blockchain Security		7 Hours	
Blockchain Security, Tr	Blockchain security basics, Attacks: Sybil attacks, selfish mining, 51% attacks, double-spending, Eclipse Attack, Private Key Security, Transaction Privacy			
<b>#Exemplar</b> advanced c	<b>/Case Studies:</b> Investigate the 51% at consensus algorithms.	tack on Ethereum Classic and propose preven	itive measures using sharding and	
*Mapping	of Course Outcomes	C01, C02, C03, C04, C05, C06		
Text Books	i			
ISBN:978-1 T2: Dhillor T3: Lantz L Applicatior	I-4842-4041-0 n Vikram," Blockchain Enabled Applicatio Lorne, "Mastering Blockchain: Unlocking ns" Shroff Publishers & Distributors Mum	ns" New York Apress 2023, ISBN:978-1-4842 the Power of Cryptocurrencies, Smart Contrac bai, ISBN:978-93-8588-952-3	:-7908-3 ts and Decentralized	
Reference	<u>Books :</u>			
R1: Imran R2: Vikram R3: Andrea	Bashir, <i>Mastering Blockchain</i> , Packt Publ I Dhillon, David Metcalf, Max Hooper, <i>Bl</i> Is M. Antonopoulos, <i>Mastering Blockcha</i>	ishing, Second Edition, ISBN: 978-1-78883-90 ockchain Enabled Applications, Apress, NA, IS in, O'Reilly, Second Edition, ISBN: 978-1-491-	)4-4. BN: 978-1-4842-3080-0. 95438-6.	
Additional	Resources: (Books, e-Resources)			
1. <u>h</u>	ttps://intellipaat.com/blog/tutorial/bloc	kchain-tutorial/how-does-blockchain-work/		
2. <u>n</u> z b	ttps://www.youtube.com/watch?v=rLjVtl			
$3. \underline{11}$	ttps://www.youtube.com/watch?v=CFVG	FRR6u4		
F-Resource				
1. h	ttps://blockchain.cse.iitk.ac.in/slides-NP	TEL-BlockchainTechnologyApplications.pdf		
2. h 3. h T	<ol> <li>https://users.cs.fiu.edu/~prabakar/cen5079/Common/textbooks/Mastering_Blockchain_2nd_Edition.pdf</li> <li>https://mrcet.com/downloads/digital_notes/CSE/IV%20Year/17062023/BLOCK%20CHAIN%20TECHNOLOGY[R20A0522]</li> <li>_pdf (DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING MALLA REDDY COLLEGE OF ENGINEERING &amp; TECHNOLOGY)</li> </ol>			
MOOC Cou	rses links :			
	1. NPTEL Course "Introduction to E	Blockchain Technology & Applications" (NPTEL	_)	
https://nptel.ac.in/courses/106/104/106104220/				
2. NPTEL Course on "Blockchain Architecture & UseCases"(NPTEL)				
https://nptel.ac.in/courses/106/105/106105		U5184/		
5. Blockchain and its Applications, I		III KIIdidypui(NPTEL)		
	4 Blockchain Ry Dr Mavank Angar	wal (Swayam)		
ht	tps://onlinecourses.swavam2.ac.in/aic21	ge01/preview		

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24-HOC-CS-2-02B: Information Security				
Teaching Theory: 3	<b>j Scheme:</b> 3 Hours/Week	Credit: 3	Examination Schem CIE: 20 Marks MSE: 20 Marks SEE: 60 Marks	e:
Prerequi	isite Courses: Cryptography and Netwo	ork Security (24-HOC-CS-2-01B)		
Compani	ion Course: NA			
Course Objectives: To introduce several statistical techniques still useful in developing machine learning and artificial intelligence-based computer algorithms. • To Understand the Fundamentals of Information Security • To Analyze Information Security Standards and Regulations • To Assess Threats, Vulnerabilities, and Risk Management Strategies • To Perform Security Audits and Assessments • To Enhance System Security for Windows, Linux, and Networks • To Analyze and Mitigate Web Application Security Threats Course Outcomes: After completion of the course, learners should be able to				e-based
CONo	со			BL
1	Describe fundamental security mode environment.	ls, policies, and governance frameworks t	o ensure a secure IT	2
2	Analyze security risks and regulatory and risk mitigation techniques	compliance by evaluating security threats	s, vulnerabilities,	3
3	Implement security measures for net for Windows, Linux, network devices,	works and systems by applying security h , firewalls, and cloud-based systems	ardening techniques	3
4	Perform penetration testing, security	assessments, and IT audits		3
5	Develop secure web applications by vulnerabilities	Identifying and mitigating OWASP-listed v	web security	3
6	Investigate modern cybersecurity tre emerging cyber threats	nds and attack methodologies by examini	ng current and	3

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Course Contents				
Unit I	Introduction to Information Securi	ty	6 Hours	
Introductio Policies, p Technolog	Introduction to Information Security & its need, Basic Principles of Confidentiality, Integrity Availability, Concepts Policies, procedures, Guidelines, Standards Administrative Measures and Technical Measures, People, Processes, and Technology.			
#Exempla	r/Case Studies- or Implementing Security Policies, G ripwire – File integrity monitoring fo Qualys Policy Compliance – Automate	uidelines, and Standards or ensuring confidentiality and integrity. es compliance audits against ISO 27001, (	IS, and other frameworks.	
*Mapping	of Course Outcomes	C01		
Unit II	Current Trends & Security Standar	ds	6 Hours	
<pre>current Trends in Information Security, Cloud Computing: benefits and Issues related to Info Security, Standards available for InfoSec: Cobit, Cadbury, ISO 27001, OWASP, OSSTMM, etc - An Overview, Certifiable Standards: How, What, When, Who #Exemplar/Case Studies -</pre>				
*Mapping	of Course Outcomes	CO2		
Unit III	Risk Management & Legal Aspects	;	6 Hours	
Vulnerabil managem	ity, Threat and Risk, Risk Assessme ent, Segregation and Separation of D	nt and Mitigation + Quick fixes, Introdu uties & Roles and responsibilities, IT ACT	ction to BCP / DRP / Incident 2000	
<ul> <li>#Exemplar/Case Studies -</li> <li>◆ Tools for Risk &amp; Threat Management</li> <li>MITRE ATT&amp;CK Navigator - Helps map cyber threats to security controls.</li> </ul>				
*Mapping	of Course Outcomes	CO3		
Unit IV	Security Assessments & Audits		6 Hours	
Types of Assessments for Information Security: VAPT of Networks, Web Appln Audits, IT assessments or audits, Assessment of Network Equipments, Assessment of Security Devices (Web Filtering, Firewalls, IDS / IPS, Routers), Data				

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Center Assessment, Security of Application Software, SAP Security, Desktop Security, RDBMS Security, BCP / DRP assessments, Policy reviews, Network Security & Common and Popular Tools Used			
#Exempla <b> </b>	r/Case Studies— or Vulnerability Assessment & Pene Imap, Nessus	tration Testing (VAPT)	
*Mapping	of Course Outcomes	CO4	
Unit V	System Security (Windows & Linu	x)	6 Hours
Web App Vulnerabi	lication Security: OWASP, Commor lities, SSL, CAPTCHA, Session Hijacki	Issues in Web Apps, What is XSS, S ng, Local and Remote File Inclusion, Audit	QL injection, CSRF, Password Trails, Web Server Issues, etc
#Exempla	ar/Case Studies - ws Security Auditing Tools Aicrosoft Defender ATP – Advanced	threat protection for Windows.	
*Mapping	of Course Outcomes	CO5	
Unit VI	Web Application Security		6 Hours
Interval Estimators, Confidence intervals, Simple Linear regression, multivariate regression, logistic regression, Goodness of fit, p-test, Kolmogorov-Smirnoff test, f-score, and other statistical tests. Application of tests on sample datasets using Python			
<pre>#Exempta</pre>	ed Tools for Web Security Audits cunetix – Automated web vulnerabi Surp Suite Pro – Manual and automa	lity scanner. ted web penetration testing.	
*Mapping	of Course Outcomes	C06	
Text Book	5		
T1. "Principles of Information Security" – Michael E. Whitman & Herbert J. Mattord T2. "Security+ Guide to Network Security Fundamentals" – Mark Ciampa			
Reference Books :			
R1. "Network Security Essentials: Applications and Standards" – William Stallings R2. "Firewalls and Internet Security" – William Cheswick & Steven Bellovin			
MOOC Co	urses links : https://archive.nptel.ac.in/conten ecurity, Prof. V. Kamakoti, Associate	t <u>/syllabus_pdf/106106129.pdf</u> - Intro Professor, Department of Computer Scienc	duction to Information ce & EngineeringIIT Madras

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#### Mid Semester Examination (MSE: March 2025)

Programme: AIDS/Civil/Computer/E&TC/Mechanical/MBA-I			
Class	Pattern:		
Course Name:	Course Code:		
AY:	Semester:		
Time:	Maximum Marks: 20		
Instructions to the candidates:			
1. Solve Q.1 OR Q.2, Q.3 OR Q.4, Q.5 OR Q.6			
2. Bold-faced figures to the right indicate full marks.			

- 3. Assume the suitable data if necessary
- 4. Any other instruction required for particular course may be added by subject/course chairman

QN	Question	Mark
1a)	Q 1 can be bifurcated to maximum two sub questions	07
1b)		
	OR	
2	Q 2 can be bifurcated to maximum two sub questions	07
3	Q 3 can be bifurcated to maximum two sub questions	07
	OR	
4	Q 4 can be bifurcated to maximum two sub questions	07
5	Q 5 can be bifurcated to maximum two sub questions	06
	OR	
6	Q 6 can be bifurcated to maximum two sub questions	06

CHAIRMAN ACADEMIC COUCIL SNUB's LSKBJ COLLEGE OF ENGINEERING Chandwad Dist.Nashik



#### Shree Neminath Jain Brahmacharyashram's Late Sau. Kantabai Bhavarlalji Jain College of Engineering

Neminagar, Chandwad -423 101 Dist. Nashik.

An Autonomous Institute, Affiliated to Savitribai Phule Pune University, Pune

#### Semester End Examination (Regular) << Month Year>>

Instructions to the candidates:		
Time: 2Hr 30 Min	Examination: SEE (Month Year)	Max. Marks: 60
Academic Year:		Pattern:
Course and Code:		Semester
Programme:		Class:

- 1. Solve Q.1 OR Q.2, Q.3 OR Q.4, Q.5 OR Q.6, Q.7 OR Q.8
- 2. Bold-faced figures to the right indicate full marks.
- 3. Assume the suitable data if necessary, but Justify it.
- 4. Draw the neat labelled diagrams, wherever necessary.

QN	Question	Marks		
1 a)	Unit I	6		
1 b)	Unit II	7		
1 c)	Unit III	7		
	OR			
2 a)	Unit I	6		
2 b)	Unit II	7		
2 c)	Unit III	7		
3 a)	Unit IV	7		
3 b)	Unit IV	7		
	OR			
4 a)	Unit IV	7		
4 b)	Unit IV	7		
5 a)	Unit V	7		
5 b)	Unit V	6		
	OR			
6 a)	Unit V	7		
6 b)	Unit V	6		
7 a)	Unit VI	7		
7 b)	Unit VI	6		
	OR			
8 a)	Unit VI	7		
8 b)	Unit VI	6		

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#### **Supporting Document**

Sr. No.	Syllabus Contains	Short Answer	Yes / No	Page No. (In Syllabus)
1	अभ्यासक्रम	Enclosed in Syllabus	Yes	1
2	पात्रता	(As per the Rules and Regulations mentioned in MoM)	Yes	23
3	अभ्यासक्रमाची उद्दिष्टे	Enclosed in Syllabus	Yes	9
4	विषयाचे नाव	Enclosed in Syllabus	Yes	7
5	घटकांचा तपशील	Enclosed in Syllabus	Yes	7
6	तासिका	Enclosed in Syllabus	Yes	7
7	श्रेयांक पद्धत	Enclosed in Syllabus	Yes	7
8	संदर्भ साहित्य	Enclosed in Syllabus	Yes	11
9	संदर्भ ग्रंथ	Enclosed in Syllabus	Yes	11
10	प्रश्नपत्रिकेचे स्वरूप	Enclosed in Syllabus	Yes	21
11	अंतर्गत मूल्यमापनाचे स्वरूप	Enclosed in Syllabus	Yes	7
12	सत्र परीक्षेचे स्वरूप	Enclosed in Syllabus	Yes	22
13	गुणांकन	Enclosed in Syllabus	Yes	7

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