Pimpri Chinchwad Education Trust's

PIMPRI CHINCHWAD COLLEGE OF ENGINEERING

SECTOR NO. 26, PRADHIKARAN, NIGDI, PUNE 411044

(An Autonomous Institute Approved by AICTE and Affiliated to SPPU, Pune)

Curriculum Structure and Syllabus

of

Final Year B. Tech. Information Technology
(Regulations 2023)

Effective from Academic Year 2026-27

Institute Vision

To be one of the top 100 Engineering Institutes of India in coming five years by offering exemplarily Ethical, Sustainable and Value Added Quality Education through a matching ecosystem for building successful careers.

Institute Mission

1. Serving the needs of the society at large through establishment of a state-of-art Engineering Institute.
2. Imparting right Attitude, Skills, Knowledge for self-sustenance through Quality Education.
3. Creating globally competent and Sensible engineers, researchers and entrepreneurs with an ability to think and act independently in demanding situations.

EOMS Policy

"We at PCCOE are committed to offer exemplarily Ethical, Sustainable and Value Added Quality Education to satisfy the applicable requirements, needs and expectations of the Students and Stakeholders.

We shall strive for technical development of students by creating globally competent and sensible engineers, researchers and entrepreneurs through Quality Education.

We are committed for Institute's social responsibilities and managing Intellectual property.

We shall achieve this by establishing and strengthening state-of-the-art Engineering Institute through continual improvement in effective implementation of Educational Organizations Management Systems (EOMS)."

Course Approval Summary

Board of Studies - Department of Information Technology

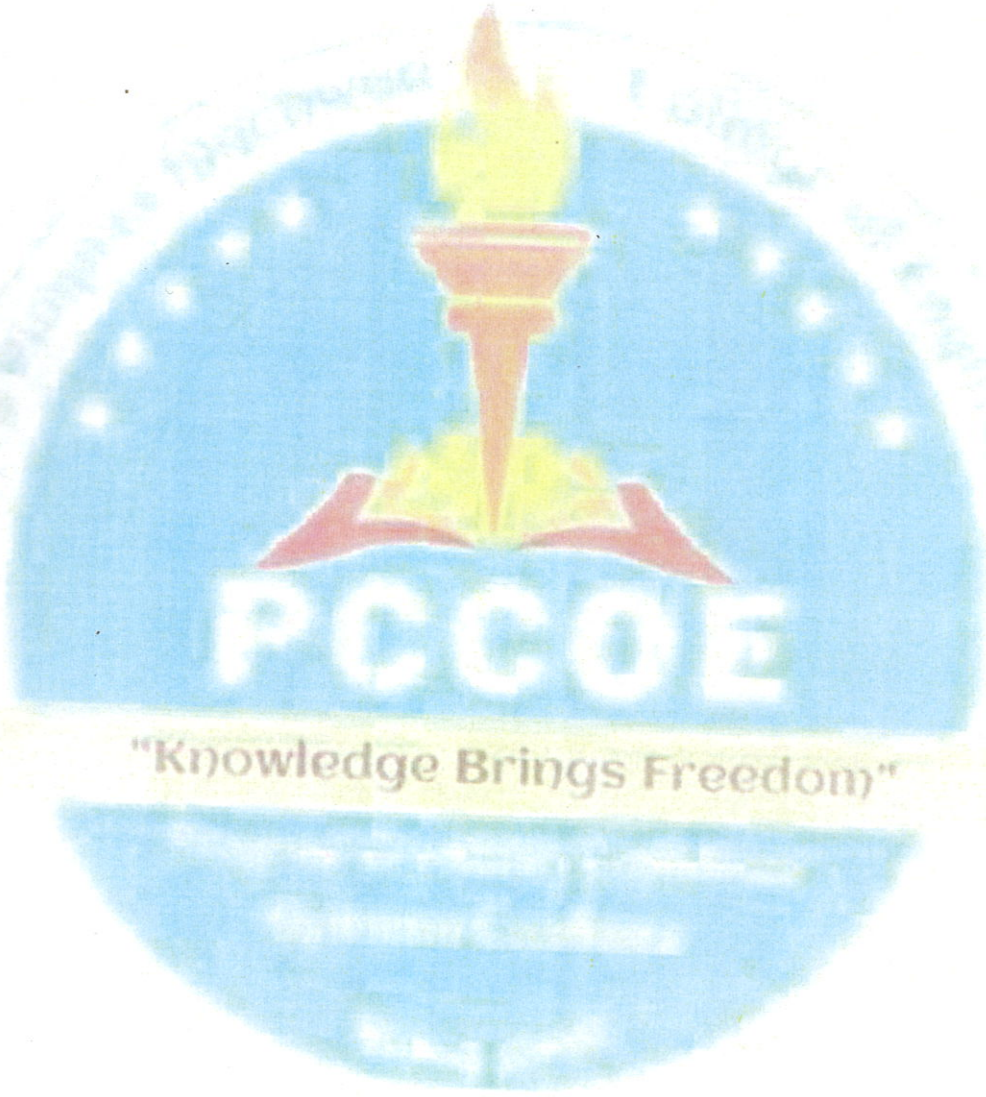
Sr. No.	Name of the Course	Course Code	Page number	Signature and stamp of BoSChairman
1.	Cryptography and Network Security	BIT27PC01/ BIT28PC01	2	
2.	Cryptography and Network Security Laboratory	BIT27PC02/ BIT28PC02	4	
3.	Distributed Computing System	BIT27PC03/ BIT28PC03	6	
4.	Distributed Computing System Laboratory	BIT27PC04/ BIT28PC04	8	
5.	Research Methodology	BIT27EL01	12	
6.	Project Work	BIT28EL02	14	
7.	Internship/ On Job Training(OJT)	BIT27EL03/ BIT28EL03	16	
8.	Programme Elective Course (PEC) 4 :Generative Artificial Intelligence	BIT27PE01/ BIT28PE01	21	
9.	Programme Elective Course (PEC) 4 Lab: Generative Artificial Intelligence Laboratory	BIT27PE04/ BIT28PE04	23	
10.	Programme Elective Course (PEC) 4 : Software Design Patterns	BIT27PE02/ BIT28PE02	25	
11.	Programme Elective Course (PEC) 4 Lab: Software Design Patterns Laboratory	BIT27PE05/ BIT28PE05	27	
12.	Programme Elective Course (PEC) 4 : Cyber Security	BIT27PE03/ BIT28PE03	29	
13.	Programme Elective Course (PEC) 4 Lab: Cyber Security Laboratory	BIT27PE06/ BIT28PE06	31	
14.	Programme Elective Course (PEC) 5: Big Data Analytics	BIT27PE07/ BIT28PE07	33	
15.	Programme Elective Course (PEC) 5 Lab: Big Data Analytics Laboratory	BIT27PE10/ BIT28PE10	35	
16.	Programme Elective Course (PEC) 5: Agile Software Development	BIT27PE08/ BIT28PE08	37	
17.	Programme Elective Course (PEC) 5 Lab: Agile Software Development Laboratory	BIT27PE11/ BIT28PE11	39	
18.	Programme Elective Course (PEC) 5: Blockchain Smart Contracts- Principles and Practices	BIT27PE09/ BIT28PE09	41	
19.	Programme Elective Course (PEC) 5 Lab: Blockchain Smart Contracts- Principles and Practices Laboratory	BIT27PE12/ BIT28PE12	43	
20.	Programme Elective Course (PEC) 6: MOOC	BIT27PE13/ BIT28PE13	45	

Chairman
BoS, Information Technology
PCET's, Pimpri Chinchwad College of Engineering
Sector No. 26, Pradhikaran, Nigdi, Pune-44

Approved by Academic Council:

Chairman
Academic Council
PCET's, Pimpri Chinchwad College of Engineering
Sector No. 26, Pradhikaran, Nigdi, Pune-44

Chairman, Academic Council
Pimpri Chinchwad College of Engineering



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CURRICULUM FRAMEWORK
(Regulations 2023)

LIST OF ABBREVIATIONS

Sr. No.	Abbreviation	Type of Course
1	BSC	Basic Science Course
2	ESC	Engineering Science Course
3	PCC	Programme Core Course
4	PEC	Programme Elective Course
5	MDM	Multidisciplinary Minor
6	OEC	Open Elective Course
7	VSEC	Vocational and Skill Enhancement Course
8	AEC	Ability Enhancement Course
9	EEM	Entrepreneurship/Economics/Management Course
10	IKS	Indian Knowledge System
11	VEC	Value Education Course
12	ELC	Experiential Learning Courses
13	LLC	Liberal Learning Courses

COURSE WISE CREDIT DISTRIBUTION

Sr. No.	Type of Course	No. of Courses	Total Credits	
			No.	%
1	Basic Science Course	**8**	**14**	8.75
2	Engineering Science Course	**5**	**12**	7.50
3	Programme Core Course	**22**	**44**	27.50
4	Programme Elective Course	**11**	**20**	12.50
5	Multidisciplinary Minor	**6**	**14**	8.75
6	Open Elective Course	**4**	**8**	5.00
7	Vocational and Skill Enhancement Course	**4**	**8**	5.00
8	Ability Enhancement Course	**2**	**4**	2.50
9	Entrepreneurship/Economics/Management Course	**2**	**4**	2.50
10	Indian Knowledge System	**1**	**2**	1.25
11	Value Education Course	**2**	**4**	2.50
12	Experiential Learning Courses	**4**	**22**	13.75
13	Liberal Learning Courses	**2**	**4**	2.50
	Total	**73**	**160**	**100.00**

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SEMESTER-WISE COURSE DISTRIBUTION

Course Distribution: Semester Wise										
Sr. No.	**Type of Course**	**No. of Courses / Semester**								**Total**
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	
1.	Basic Science Course	4	4							8
2.	Engineering Science Course	3	2							5
3.	Programme Core Course		1	4	4	5	4	4		22
4.	Programme Elective Course					2	4	4	1	11
5.	Multidisciplinary Minor			1	1	2	1	1		6
6.	Open Elective Course			2	1	1				4
7.	Vocational and Skill Enhancement Course	1	1	1			1			4
8.	Ability Enhancement Course		1		1					2
9.	Entrepreneurship/Economics/Management Course			1	1					2
10.	Indian Knowledge System	1								1
11.	Value Education Course			1	1					2
12.	Experiential Learning Courses				1			1	2	4
13.	Liberal Learning Courses	1	1							2
Total		**10**	**10**	**10**	**10**	**10**	**10**	**10**	**3**	**73**

SEMESTER-WISE CREDIT DISTRIBUTION

Credit Distribution: Semester Wise										
Sr. No.	**Type of Course**	**No. of Credits / Semester**								**Total**
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	
1.	Basic Science Course	7	7							14
2.	Engineering Science Course	7	5							12
3.	Programme Core Course		2	8	8	10	8	8		44
4.	Programme Elective Course					4	8	6	2	20
5.	Multidisciplinary Minor			2	2	4	2	4		14
6.	Open Elective Course			4	2	2				8
7.	Vocational and Skill Enhancement Course	2	2	2			2			8
8.	Ability Enhancement Course		2		2					4
9.	Entrepreneurship/Economics/Management Course			2	2					4
10.	Indian Knowledge System	2								2
11.	Value Education Course			2	2					4
12.	Experiential Learning Courses				2			4	16	22
13.	Liberal Learning Courses	2	2							4
Total		**20**	**20**	**20**	**20**	**20**	**20**	**22**	**18**	**160**

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Curriculum Structure
Final Year B.Tech.
Information Technology

CURRICULUM STRUCTURE

Final Year B.Tech. (Information Technology)

Semester – VII (Scheme A)

Final YearB.Tech Information Technology (Regulations 2023) (With effect from Academic Year 2026-27)																	
Semester – VII (Scheme A)																	
Course Code	**Course Name**	**Credit Scheme**				**Teaching Scheme (Hours/Week)**					**Evaluation Scheme and Marks**						
											FA		**SA**	**TW**	**PR**	**OR**	**Total**
		L	**P**	**T**	**Total**	**L**	**P**	**T**	**O**	**Total**	**FA 1**	**FA 2**					
BIT27PC01	Cryptography and Network Security	2	-	-	**2**	2	-	-	1	3	10	10	30	-	-	-	50
BIT27PC02	Cryptography and Network Security Laboratory	-	2	-	**2**	-	4	-	-	4	-	-	-	50	50	-	100
BIT27PC03	Distributed Computing System	2	-	-	**2**	2	-	-	1	3	10	10	30	-	-	-	50
BIT27PC04	Distributed Computing System Laboratory	-	2	-	**2**	-	4	-	-	4	-	-	-	50	-	50	100
-	Programme Elective Course (PEC) 4	2	-	-	**2**	2	-	-	1	3	10	10	30	-	-	-	50
-	Programme Elective Course (PEC) 4 Lab	-	1	-	**1**	-	2	-	-	2	-	-	-	50	-	-	50
-	Programme Elective Course (PEC) 5	2	-	-	**2**	2	-	-	1	3	10	10	30	-	-	-	50
-	Programme Elective Course (PEC) 5 Lab	-	1	-	**1**	-	2	-	-	2	-	-	-	50	-	-	50
-	Multidisciplinary Minor (MDM) VI Project	-	4	-	**4**	-	8	-	-	8	-	-	-	100	-	50	150
BIT27EL01	Research Methodology	2	2	-	**4**	2	4	-	-	6	-	50	-	-	-	100	150
Total		**10**	**12**	**0**	**22**	**10**	**24**	**0**	**4**	**38**	**40**	**90**	**120**	**300**	**50**	**200**	**800**

*Multidisciplinary Minor-VI: kindly refer to the booklet of Multidisciplinary Minor

Note: Students are required to ensure that the same course is not selected under multiple categories such as Core Courses, Programme Electives, Open Electives, or through the Minor Degree in Multidisciplinary Studies. Each course should be credited only once towards the degree requirements

L-Lecture, **P**-Practical, **T**-Tutorial, **FA**–Formative Assessment, **FA1**-Formative Assessment 1, **FA2**-Formative Assessment 2, **SA**-Summative Assessment, **TW**-Term Work, **PR**-Practical Exam, **OR**-Oral Exam. **O**-Other i.e. self directed learning, self study, outside the class efforts.

CURRICULUM STRUCTURE

Final Year B.Tech. (Information Technology)
Semester – VIII (Scheme A)

Final Year B. Tech Information Technology (Regulations 2023) (With effect from Academic Year 2026-27)																	
Semester – VIII (Scheme A)																	
Course Code	**Course Name**	**Credit Scheme**				**Teaching Scheme (Hours/Week)**					**Evaluation Scheme and Marks**						
											FA		**SA**	**TW**	**PR**	**OR**	**Total**
		L	**P**	**T**	**Total**	**L**	**P**	**T**	**O**	**Total**	**FA 1**	**FA 2**					
BIT28PE13	Programme Elective Course (PEC) 6 : MOOC	2	-	-	**2**	2	-	-	-	2	-	50	-	-	-	-	50
BIT28EL02	Project Work	-	4	-	**4**	-	8	-	-	8	-	-	-	100	-	50	150
BIT28EL03	Internship/ On Job Training(OJT)	-	12	-	**12**	-	24	-	-	24	-	-	-	300	-	-	300
Total		**2**	**16**	**0**	**18**	**2**	**32**	**0**	**0**	**34**	**0**	**50**	**0**	**400**	**0**	**50**	**500**

Note: Students are required to ensure that the same course is not selected under multiple categories such as Core Courses, Programme Electives, Open Electives, or through the Minor Degree in Multidisciplinary Studies. Each course should be credited only once towards the degree requirements

L-Lecture, **P**-Practical, **T**-Tutorial, **FA**–Formative Assessment, **FA1**-Formative Assessment 1, **FA2**-Formative Assessment 2, **SA**-Summative Assessment, **TW**-Term Work, **PR**-Practical Exam, **OR**-Oral Exam. **O**-Other i.e. self directed learning, self study, outside the class efforts.

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CURRICULUM STRUCTURE

Final Year B.Tech. (Information Technology)
Semester – VII (Scheme B)

Final YearB.Tech Information Technology (Regulations 2023) (With effect from Academic Year 2026-27)																	
Semester – VII (Scheme B)																	
Course Code	**Course Name**	**Credit Scheme**				**Teaching Scheme (Hours/Week)**					**Evaluation Scheme and Marks**						
											FA		**SA**	**TW**	**PR**	**OR**	**Total**
		L	**P**	**T**	**Total**	**L**	**P**	**T**	**O**	**Total**	**FA 1**	**FA 2**					
BIT27PE13	Programme Elective Course (PEC) 6 :MOOC	2	-	-	**2**	2	-	-	-	2	-	50	-	-	-	-	50
BIT27EL01	Research Methodology	2	2	-	**4**	2	4	-	-	6	-	50	-	-	-	100	150
BIT27EL03	Internship/ On Job Training(OJT)	-	12	-	**12**	-	24	-	-	24	-	-	-	300	-	-	300
-	Multidisciplinary Minor (MDM) VI Project	-	4	-	4	-	8	-	-	8	-	-	-	100	-	50	150
Total		**4**	**18**	**0**	**22**	**4**	**36**	**0**	**0**	**40**	**0**	**100**	**0**	**400**	**0**	**150**	**650**

Note: Students are required to ensure that the same course is not selected under multiple categories such as Core Courses, Programme Electives, Open Electives, or through the Minor Degree in Multidisciplinary Studies. Each course should be credited only once towards the degree requirements

L-Lecture, **P**-Practical, **T**-Tutorial, **FA**–Formative Assessment, **FA1**-Formative Assessment 1, **FA2**-Formative Assessment 2, **SA**-Summative Assessment, **TW**-Term Work, **PR**-Practical Exam, **OR**-Oral Exam. **O**-Other i.e. self directed learning, self study, outside the class efforts.

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CURRICULUM STRUCTURE

Final Year B.Tech. (Information Technology)
Semester – VIII (Scheme B)

Final YearB.Tech Information Technology (Regulations 2023) (With effect from Academic Year 2026-27)																	
Semester – VIII (Scheme B)																	
Course Code	**Course Name**	**Credit Scheme**				**Teaching Scheme (Hours/Week)**					**Evaluation Scheme and Marks**						
											FA		**SA**	**TW**	**PR**	**OR**	**Total**
		L	**P**	**T**	**Total**	**L**	**P**	**T**	**O**	**Total**	**FA 1**	**FA 2**					
BIT28PC01	Cryptography and Network Security	2	-	-	2	2	-	-	1	3	10	10	30	-	-	-	50
BIT28PC02	Cryptography and Network Security Laboratory	-	2	-	2	-	4	-	-	4	-	-	-	50	50	-	100
BIT28PC03	Distributed Computing System	2	-	-	2	2	-	-	1	3	10	10	30	-	-	-	50
BIT28PC04	Distributed Computing System Laboratory	-	2	-	2	-	4	-	-	4	-	-	-	50	-	50	100
-	Programme Elective Course (PEC) 4	2	-	-	2	2	-	-	1	3	10	10	30	-	-	-	50
-	Programme Elective Course (PEC) 4 Lab	-	1	-	1	-	2	-	-	2	-	-	-	50	-	-	50
-	Programme Elective Course (PEC) 5	2	-	-	2	2	-	-	1	3	10	10	30	-	-	-	50
-	Programme Elective Course (PEC) 5 Lab	-	1	-	1	-	2	-	-	2	-	-	-	50	-	-	50
BIT28EL02	Project Work	-	4	-	4	-	8	-	-	8	-	-	-	100	-	50	150
Total		**8**	**10**	**0**	**18**	**8**	**20**	0	**4**	**32**	**40**	**40**	**120**	**300**	**50**	**100**	**650**

*Multidisciplinary Minor-VI: kindly refer to the booklet of Multidisciplinary Minor

Note: Students are required to ensure that the same course is not selected under multiple categories such as Core Courses, Programme Electives, Open Electives, or through the Minor Degree in Multidisciplinary Studies. Each course should be credited only once towards the degree requirements

L-Lecture, **P**-Practical, **T**-Tutorial, **FA**–Formative Assessment, **FA1**-Formative Assessment 1, **FA2**-Formative Assessment 2, **SA**-Summative Assessment, **TW**-Term Work, **PR**-Practical Exam, **OR**-Oral Exam. **O**-Other i.e. self directed learning, self study, outside the class efforts.

List of Programme Elective Courses 4

Course Code	Course Name	
BIT27PE01/ BIT28PE01	Generative Artificial Intelligence	Choose any one
BIT27PE02/ BIT28PE02	Software Design Patterns	
BIT27PE03/ BIT28PE03	Cyber Security	

List of Programme Elective Courses 4 Laboratory

Course Code	Course Name	
BIT27PE04/ BIT28PE04	Generative Artificial Intelligence Laboratory	Choose any one
BIT27PE05/ BIT28PE05	Software Design Patterns Laboratory	
BIT27PE06/ BIT28PE06	Cyber Security Laboratory	

List of Programme Elective Courses 5

Course Code	Course Name	
BIT27PE07/ BIT28PE07	Big Data Analytics	Choose any one
BIT27PE08/ BIT28PE08	Agile Software Development	
BIT27PE09/ BIT28PE09	Blockchain Smart Contracts- Principles and Practices	

List of Programme Elective Courses 5 Laboratory

Course Code	Course Name	
BIT27PE10/ BIT28PE10	Big Data Analytics Laboratory	Choose any one
BIT27PE11/ BIT28PE11	Agile Software Development Laboratory	
BIT27PE12/ BIT28PE12	Blockchain Smart Contracts- Principles and Practices Laboratory	

Course Syllabus

Semester VII/VIII

Program:	B. Tech. I.T.				Semester:			VII/VIII
Course:	Cryptography and Network Security				Code:			BIT27PC01/ BIT28PC01
Credit	Teaching Scheme (Hrs./Week)				Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	Other	FA		SA	Total
					FA1	FA2		
2	2	-	-	1	10	10	30	50

Prior knowledge of:

1. Modular Arithmetic & Prime Numbers
2. Networking Concepts

is essential

Course Objectives:

1. Understand the basics of Cryptography and Network Security.
2. Maintain the Confidentiality, Integrity and Availability of the data.

Course Outcomes:

After learning the course, the students will be able to:

1. **Apply** traditional and modern cryptographic techniques to ensure data security
2. **Design** Security systems using public key cryptography.
3. **Apply** integrity and authentication mechanisms to protect document authenticity.
4. **Analyze** various networking protocols to protect the network from the threats.

Detailed Syllabus

Unit	Description	Duration (Hrs)
1	**Classical and block ciphers** Computer security concepts, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security, Symmetric Cipher Model, Substitution Techniques, Transposition techniques, Steganography, Block Cipher Principles, The Data Encryption Standard (DES), Differential and Linear Cryptanalysis, AES algorithm	8
2	**Number Theory and Public Key Cryptography** Prime numbers, Fermat‘s and Euler‘s Theorems, Testing for Primality, The Chinese Remainder Theorem, Discrete Logarithms, Principles of Public Key Cryptosystem, The RSA Algorithm, Diffie-Hellman Key Exchange, Elliptic curve Cryptography	6
3	**Data Integrity Algorithms and key management** Secure Hash Algorithm(SHA), Message Authentication Requirements, Message Authentication Codes (MAC), Security of MACs, HMAC **Digital Signatures** ElGamal Digital Signature Scheme, Schnorr Digital SignatureScheme, Digital Signature Standard **Key management** Symmetric Key Distribution, X.509 Certificates, Public key Infrastructure, Kerberos	10

4	**Network and Internet Security** Transport-Level Security: Web Security Issues, Secure Sockets Layer(SSL), Transport Layer Security(TLS), HTTPS, Secure Shell(SSH) IP Security :IPSecurity Overview, IPSecurity Policy, Encapsulating Security Payload, Combining Security Associations, Internet Key Exchange, Cryptographic Suites.	6
	Total	30

Text Books:

1. William Stallings, Cryptography and Network Security: Principles and Practice, Pearson Education Limited, 8th Edition, ISBN:978-1-292-43748-4 (2023)
2. Bernard Menezes, Network Security and Cryptography, Cengage Learning, ISBN-ISBN-13**978-**81315134911st edition (1 April 2010)
3. Dr.V.K.Pachghare, Cryptography and Information security, PHI, THIRD EDITION ,ISBN-9789389347104

Reference Books:

1. BruiceSchneier,Applied Cryptography- Protocols, Algorithms and Source code in C, Algorithms, Wiley India Pvt Ltd, 2nd Edition, ISBN 978-81-265-1368-0
2. Nina Godbole ,Information Systems Security, Wiley India Pvt. Ltd, ISBN-978-81-265-1692-6
3. Atul kahate, Cryptography& network security, TATA-McGraw Hill India,4thEdition, ISBN-13:978-0-07- 064823-4.
4. Berouz Forouzan, Cryptography and Network Security, TMH, 2edition, ISBN-978-00-707-0208-0.

E-sources:

1. https://onlinecourses.nptel.ac.in/noc22_cs90/preview
2. https://onlinecourses.nptel.ac.in/noc25_ee54/preview
3. https://nptel.ac.in/courses/106102064

Program:	B. Tech. I.T.				Semester:			VII/VIII
Course:	Cryptography and Network Security Laboratory				Code:			BIT27PC02/ BIT28PC02
Credit	Teaching Scheme (Hrs./Week)				Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	Other	TW	PR	OR	Total
2	-	4	-	-	50	50	-	100

Prior knowledge of:

1. Programming languages
2. Operating System Basics

is essential

Course Objectives:

1. Understand the concepts related to classical cryptography, symmetric cryptography and asymmetric cryptography.
2. Demonstrate the various cryptographic, authentication and hashing algorithms

Course Outcomes:

After learning the course, the students will be able to:

1. **Design** secure communication using classical and block ciphers.
2. **Implement** secure messaging and digital signatures to ensure integrity, authenticity, and non-repudiation.
3. **Apply** transport-level security protocols to secure data in transit.
4. **Develop** a fully secure communication system by integrating cryptographic and network security mechanisms.

Guidelines:

Continuous assessment of the laboratory is done based on overall performance and laboratory assignments performance of students. Each laboratory assignment assessment will assign marks based on parameters with appropriate weights. Suggested parameters for overall assessment as well as each laboratory assignment assessment include - Neatness and cleanliness in Experimental write-up, Efficient Code, Innovation, Interpretation of results and conclusions, Punctuality, Overall behaviour, attitude and performance.

Detailed Syllabus

Assignment No.	Suggested List of Assignments
1.	Perform encryption, decryption using the following substitution techniques i) Ceaser cipher ii) Playfair cipher iii) Vigenere cipher iv) Rail Fence v) Row & Column Transformation
2.	Implement and Analyze Block Ciphers and Cryptanalysis via CrypTool 2.
3.	Design an experiment to estimate the amount of time to i) Generate key pair (RSA) ii) Encrypt n bit message (RSA) iii) Decrypt n bit message (RSA) As function of key size, experiment with different n-bit messages. Summarize your conclusions.
4.	Design and Implement your own encryption/decryption algorithm using any programming language. A start-up company is building a file-sharing system for its employees to exchange sensitive project documents (like contracts, reports, and source code). They cannot rely on existing standard algorithms (AES, DES, RSA, etc.) due to licensing and intellectual property concerns. Design and implement a custom encryption/decryption algorithm in a programming language of your choice (C, C++, Java, Python, etc.). The algorithm should securely convert plaintext messages into ciphertext and recover the original message correctly.

5.	Demonstrate how Diffie-Hellman key exchange works with Man-In-The-Middleattack. Two employees of a financial company, Alice and Bob, want to exchange confidential messages securely over the internet. They decide to use the Diffie-Hellman (DH) key exchange algorithm to generate a shared secret key. However, the company's network is being monitored by a malicious attacker, Eve. Since DH alone does not provide authentication, Eve is able to launch a Man-in-the-Middle (MITM) attack by intercepting and modifying the key exchange messages. Demonstrate how the DH key exchange works and how it can be exploited by a MITM attack, Also propose solutions to mitigate the attack.
6..	Calculate the message digest of a text using the SHA-1 algorithm. A company wants to ensure that its software updates are not tampered with during download. To verify integrity, it provides a SHA-1 message digest for each update file. Customers can compute the digest of the downloaded file and compare it with the official digest. If both match, the file is authentic; if not, it indicates modification or corruption. Calculate the message digest of a given text using the SHA-1 algorithm and demonstrate how even a small change in the input produces a completely different digest, proving its usefulness in integrity verification
7.	A government e-procurement portal allows vendors to submit online tenders. To ensure authenticity and non-repudiation, vendors are required to digitally sign their tender documents before submission. The portal then verifies the digital signature to confirm: 1. The document really comes from the vendor (authentication). 2. The document was not modified in transit (integrity). 3. The vendor cannot deny having submitted the document (non-repudiation). Demonstrate how the Digital Signature Standard worksby signing and verifying a text message.
8.	Design a website and provide the security features to protect it from password cracking attacks. Apply any password protection technique.
9.	Two users are exchanging the images on an unsecured network. Design a security system to protect the image from any security attack while transmitting it on the network.
10.	Generate and install an SSL certificate using OpenSSL and configure a local web server (Apache/Nginx) to enable secure communication over HTTPS.
11.	A university IT department manages multiple Linux servers for hosting student portals, research data, and internal applications. Currently, administrators use Telnet for remote login, which transmits usernames and passwords in plain text. This has led to security concerns after suspicious activities were observed on the network. Remove the concern by performing following tasks: ● Migrate from Telnet to SSH-based secure login. ● Implement passwordless authentication for administrators to improve both security and efficiency. ● Monitor and compare the difference between Telnet and SSH traffic using Wireshark.

Reference Books:

1. William Stallings, Cryptography and Network Security: Principles and Practice, Pearson Education Limited, 7th Edition, ISBN 978-0134444284
2. Nina Godbole ,Information Systems Security, Wiley India Pvt. Ltd, ISBN-978-81-265-1692-6
3. Atul kahate, Cryptography& network security, TATA-McGraw Hill India,4thEdition, ISBN-13:978-0-07- 064823-4.
4. Berouz Forouzan, Cryptography and Network Security, TMH, 2edition, ISBN-978-00-707-0208-0..

E-resources:

1. https://onlinecourses.nptel.ac.in/noc22_cs90/preview
2. https://onlinecourses.nptel.ac.in/noc25_ee54/preview

Program:	B. Tech. I.T.					**Semester:**	VII/VIII	
Course:	Distributed Computing System					**Code:**	BIT27PC03/ BIT28PC03	
Credit	**Teaching Scheme (Hrs./Week)**				**Evaluation Scheme and Marks**			
	Lecture	**Practical**	**Tutorial**	**Other**	**FA**		**SA**	**Total**
					FA1	**FA2**		
2	2	-	-	1	10	10	30	50

Prior knowledge of:

Networking and algorithms

is essential

Course Objectives:

1. Learn the core concepts of distributed computing systems
2. Able to apply distributed computing systems to real-world systems.

Course Outcomes:

After learning the course, the students will be able to:

1. **Illustrate** the core concepts of distributed computing systems
2. **Make use** of different communication and coordination mechanisms to ensure efficient and reliable system interaction.
3. **Apply** concepts of naming, file and web-based distributed systems for efficient data sharing and communication.
4. **Analyze** various consistency models and replication strategies to enhance fault tolerance in distributed systems.

Detailed Syllabus

Unit	**Description**	**Duration (Hrs)**
1	**Introduction to Distributed Computed Systems** Definition, Characteristics, Middleware and Distributed System;Design goals Distributed Computing Models:Physical, Architecture and Fundamental models Types of distributed computing systems: High performance distributed computing, Distributed Information Systems, Pervasive system Architectural styles: Layered architectures, Object based architectures, Publish-subscribe architectures; System architecture: Centralized, Decentralized, Hybrid Challenges and Trends in Distributed Systems Case Study: World Wide Web	8
2	**Communication and Coordination** Inter-Process Communication (IPC): Introduction, Processes and Threads, IPC through Shared Memory, External Data Representation and Marshaling, Distributed objects, CORBA (Common Object Request Broker Architecture) Types of communication: Client-Server Communication, Multicast Communication, Message-Oriented Communication, Remote Procedure Call (RPC), Remote method Invocation (RMI), Message Passing Interface (MPI), Network Virtualization: Overlay Networks Coordination: Clock Synchronization, Physical and Logical Clocks, global states, Mutual Exclusion, Election Algorithms Case Study:IBM WebSphere Message Queuing	8

3	**Naming and Distributed File Systems** Names, Identifiers, and Addresses, Name services, Flat naming, Structured naming, Attributed based naming, Domain Name System, Directory services, **Case study:** X.500 directory, Introduction to Distributed File Systems: Overview and concepts, File service architecture Case Studies: Sun Network File System, The Andrew File System Distributed Web Based Systems:Architecture of Traditional Web-Based Systems, Apache Web Server, Web Server Clusters, Communication by Hypertext Transfer Protocol, Synchronization, Web Proxy Caching.	8
4	**Consistency, Replication and Fault tolerance** Consistency and Replication: Consistency models & protocols, Replica management Case study: Coda Fault Tolerance and Security: Distributed Commit protocols, Recovery techniques Case Study**:** Caching and replication in web	6
	Total	30

Text Books:

1. Steen, Maarten van and Tanenbaum, Andrew S., *"Distributed Systems"*, Third Edition, Maarten van Steen and Vrije Universiteit Amsterdam, 2017. ISBN: 978-90-815406-2-9
2. Coulouris, George, Dollimore, Jean, and Kindberg, Tim, *"Distributed Systems: Concepts and Design"*, Fifth Edition, Addison-Wesley, 2012. ISBN: 978-0-13-214301-1
3. Garg, Vijay K., *"Elements of Distributed Computing"*, Wiley, 2002. ISBN: 978-0-471-41975-6

Reference Books:

1. Sinha, P. K., *"Distributed Operating Systems: Concepts and Design"*, Wiley–IEEE Press, 1996. ISBN: 978-0-8176-3720-2
2. Singhal, Mukesh and Shivaratri, Niranjan G., *"Advanced Concepts in Operating Systems"*, McGraw-Hill Education, 1994. ISBN: 978-0-07-057572-2
3. Tanenbaum, Andrew S. and Steen, Maarten van, *"Distributed Systems: Principles and Paradigms"*, Prentice Hall, 2007. ISBN: 978-0-13-239227-3

E-Resources:

1. NOC: Distributed Systems, IIT Patna, Prof. Rajiv Misra
   Link: https://nptel.ac.in/courses/106106168
2. Distributed Computing Systems, IIT Madras, Prof. Ananthanarayana V.S
   Link: https://nptel.ac.in/courses/106106107

Program:	B. Tech. I.T.					**Semester:**		VII/VIII
Course:	Distributed Computing System Laboratory					**Code:**		BIT27PC04/ BIT28PC04
Credit	**Teaching Scheme (Hrs./Week)**				**Evaluation Scheme and Marks**			
	Lecture	**Practical**	**Tutorial**	**Other**	**TW**	**PR**	**OR**	**Total**
2	-	4	-	-	50	-	50	100

Prior knowledge of:
Computer Programming, Operating Systems, and Computer Networks, etc
is essential

Course Objectives:
1. Demonstrate knowledge of the core concepts and techniques in distributed systems
2. Explore tools, techniques, and applications of distributed computing systems.

Course Outcomes:
After learning the course, the students will be able to:
1. **Implement** various inter-process communication mechanisms among distributed processes.
2. **Analyze** synchronization and coordination techniques to maintain consistency and manage tasks in distributed systems.
3. **Build** distributed applications using web services, CORBA, and file systems.
4. **Develop** a mini project applying distributed system concepts effectively.

Guidelines:
Continuous assessment of the laboratory is done based on overall performance and laboratory assignments performance of students. Each laboratory assignment assessment will assign marks based on parameters with appropriate weights.

Detailed Syllabus

Assignment No.	**Suggested List of Assignments**
1.	Inter-Process Communication Using Socket Programming A. TCP Echo Client A TCP client that connects to the echo server, sends messages, and displays the echoed responses. B. UDP Echo Client A UDP server that listens for datagrams from clients and sends back the received message as a response. C. TCP Client-Server Communication A simple TCP client and server that exchange predefined messages to demonstrate connection-oriented communication. D. UDP Client-Server Communication A simple UDP client and server that exchange messages to demonstrate connectionless communication.
2	Implementation of RPC Mechanism ● Develop a client-server communication system using Remote Procedure Call (RPC) to invoke procedures on a remote server.

3	Implementation of RMI Mechanism 1: Distributed Calculator Design and implement a distributed calculator application using Java RMI where multiple clients can remotely invoke arithmetic operations such as addition, subtraction, multiplication, and division on a server. The server must handle concurrent client requests efficiently using multithreading. 2: Remote File Management System Develop a remote file management system using Java RMI that allows clients to perform file operations such as reading, writing, deleting, and listing files on a centralized server. The server should support multiple clients simultaneously and ensure data consistency. 3: Chat Application Create a distributed chat application using Java RMI that enables multiple clients to send and receive messages through a central server. The server should support concurrent clients and manage message broadcasting in real-time. 4: Banking System Implement a distributed banking system using Java RMI where clients can remotely perform operations like checking account balances, deposits, and withdrawals. The server must handle multiple client requests concurrently and ensure transaction consistency
4	Simulation of Election Algorithms Implement and simulate Ring and Bus topology election algorithms for leader election. 1: Distributed Calculator Election Implement and simulate Ring and Bus topology leader election algorithms in a distributed calculator system. Multiple calculator nodes coordinate to elect a leader node responsible for coordinating complex computations or aggregating results. 2: Remote File Management System Develop a remote file management system where multiple file server nodes use Ring and Bus topology election algorithms to elect a leader. The leader manages file metadata and handles coordination tasks among servers. 3: Distributed Chat Application Election Create a distributed chat application in which multiple chat server nodes run Ring and Bus topology leader election algorithms to elect a coordinator responsible for message ordering and client management. 4: Banking System Election Implement Ring and Bus topology leader election algorithms in a distributed banking system with multiple server nodes. The leader node handles critical operations like transaction coordination and consistency enforcement.
5	Clock Synchronization Algorithms Implement a distributed banking system where multiple branches perform transactions on a central database. Implement any one clock synchronization using: A. NTP (Network Time Protocol) simulation B. Lamport's Logical Clock
6	Election Algorithms: Implement Bully Algorithm and Ring Algorithm for leader election.
7	Web Service and Distributed Application ● Create a simple Web Service. ● Develop a distributed application that consumes the web service.
8	Distributed File System: Study and Setup ● Study and configure NFS (Network File System). ● Study and install distributed file systems like CUDA, Google File System (GFS), or Hadoop Distributed File System (HDFS).
9	Distributed Application Using CORBA ● Develop a distributed application demonstrating object brokering using CORBA (e.g., Calculator or String Operations). ● Develop any distributed application using CORBA to demonstrate object brokering. (Calculator or String operations).

10	Distributed Computing using MPI/OpenMP ● Develop a distributed system, to find sum of N elements in an array by distributing N/n elements to n number of processors MPI or OpenMP ● Demonstrate by displaying the intermediate sums calculated at different processors.
11	Suggested Mini Project List (Perform any one) 1. Distributed Multiplayer Game Real-time interactive multiplayer game using socket programming and synchronization among players. 2. Distributed Chat Application Multi-client chat system with a central or peer-to-peer server using Java RMI or Sockets. 3. Distributed Banking System Clients perform balance inquiry, deposits, and withdrawals on a central server ensuring consistency. 4. Remote File Management System Centralized server allowing clients to read, write, delete, and list files remotely (RMI-based). 5. Distributed Calculator Clients perform arithmetic operations remotely using Java RMI or RPC. Distributed E-Commerce Platform Multi-server system handling catalog, orders, and payments using distributed components. 6. Clock Synchronization in Distributed Banking Branches Simulate real-time synchronization among multiple banking branches using Lamport or NTP. Leader Election Simulation Implement Bully or Ring algorithm to elect a coordinator among distributed nodes (e.g., servers or chat nodes). 7. Distributed File Storage System Design a system to store and retrieve files using replication and consistency principles (inspired by HDFS). 8. Distributed Log Monitoring System Collect and aggregate logs from multiple servers using sockets or RPC to ensure reliability. 9. IoT-Based Distributed Sensor Monitoring System Multiple sensor nodes communicate data to a central monitoring server for analysis. 10. Distributed Web Service Application Create a web service and a distributed client system that consumes it for real-time data exchange. 11. Blockchain-Based Transaction Ledger Lightweight blockchain simulation for distributed, secure transaction recording. 12. Distributed Task Scheduler Distribute computational tasks among multiple worker nodes using RPC or message passing. 13. Cloud-Based File Sharing System Build a file-sharing platform with distributed storage and replication mechanisms.

Text Books:

1. Steen, Maarten van and Tanenbaum, Andrew S., *"Distributed Systems"*, Third Edition, Maarten van Steen and Vrije Universiteit Amsterdam, 2017. ISBN: 978-90-815406-2-9
2. Coulouris, George, Dollimore, Jean, and Kindberg, Tim, *"Distributed Systems: Concepts and Design"*, Fifth Edition, Addison-Wesley, 2012. ISBN: 978-0-13-214301-1
3. Garg, Vijay K., *"Elements of Distributed Computing"*, Wiley, 2002. ISBN: 978-0-471-41975-6

Reference Books:

1. Reilly, David and Reilly, Michael, *"Java Network Programming and Distributed Computing"*, Addison-Wesley Professional, 2002. ISBN: 978-0-201-78790-3
2. Ghosh, Sukumar, *"Distributed Systems: An Algorithmic Approach"*, Second Edition, Chapman and Hall/CRC Press, 2014. ISBN: 978-1-4665-0450-7

E-resources:

1. NOC: Distributed Systems, IIT Patna, Prof. Rajiv Misra
   Link: https://nptel.ac.in/courses/106106168
2. Distributed Computing Systems, IIT Madras, Prof. Ananthanarayana V.S
   Link: https://nptel.ac.in/courses/106106107

Program:			B. Tech. I.T.						Semester:		VII
Course:			Research Methodology						Code:		BIT27EL01
Credit			Teaching Scheme (Hrs./Week)				Evaluation Scheme and Marks				
			Lecture	Practical	Tutorial	Other	FA		PR	OR	Total
L	P	T					FA1	FA2			
2	2	-	2	4	-	-	-	50	-	100	150

Prior knowledge of:

1. Project based Learning

is essential

Course Objectives:

1. Apply the knowledge to solve realistic problems.
2. Collaborate effectively in team environment and learn professional behavior.
3. Develop Technical, Professional and Ethical skills.

Course Outcomes:

After learning the course, the students will be able to:

1. Identify the problem through extensive Literature Review.
2. Analyze the problem in detail to define its scope with problem specific data.
3. Apply appropriate methods for data collection, processing, and analysis in research problems.
4. Develop a concise technical report using modern tools to effectively communicate the proposed idea.
5. Develop the ability to maintain Inter-personal relationship, resolve conflict and leads team effectively
6. Demonstrate Professional and Ethical behavior.

Suggested Research Methodology Contents:

Introduction

Research Aptitude: Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, and Research Methods versus Methodology, Research and Scientific Method.

Research Process

Research Formulation: Reviewing the literature, Formulation of research problem, Nature and type of variables, Hypothesis - meaning, types, development of hypothesis and its testing, Meaning & Functions of Research Design.

Data Collection and Analysis

Data Collection – Processing and analysis of data, Design of Experiments.

Data Collection and Analysis: Sources, acquisition and interpretation of data, Quantitative and qualitative data, Graphical representation and mapping of data, Sensitivity Analysis with Data Tables, Optimization

Summarizing Data with database statistical functions: Correlation, Multiple Regression analysis, Parameter estimation, Multivariate statistics, Principal component analysis, Moments and response curve methods, State vector machines and uncertainty analysis, Probable errors in the research, Error analysis.

Research Article Reading and Writing

Research paper reading - The three pass approach, comparing the approaches to find the potential research issues.

Research paper writing- Paper Design Process, Readers, Concept Sheet, Embodiment, General advice about writing technical papers in English – Grammar, Punctuation, Tips for writing correct English.

Report Writing

Report Writing: Different Steps in writing Report, Layout of the Research Report, Types of Reports, Mechanics of Writing a Research Report, Organization of material and style.

Ethical issues in research: Code of Ethics in Research , Ethics and Research Process, Importance of Ethics in Research.

Guidelines:

1. **Topic Selection and Allocation:**
   - Orientation can be given at the start of the semester.
   - Students should be informed about the domain and domain experts whose guidance can be taken before selecting a topic.
   - Students are advised to refer to recent research papers from reputed conferences/ journals like IEEE, Elsevier, SCI etc.
   - The research work needs to be undertaken by a group of 3 to 4 students.
   - Selected topics should be innovative and have an experimental component.
   - Students are encouraged to use modern tools and latest technologies.
   - Research work may be carried out in an institute or an industry, if sponsored.
   - The research work proposal presentation may be arranged according to the different domains and assessed by domain expert faculty members.
   - Guide allocation should be done and students have to submit a weekly progress report to the internal guide.

2. Technical Report and Research Paper

At the end of the semester, each group needs to prepare a technical report and publish one research paper in reputed conferences / journals.

A technical report should preferably contain at least following details:

- Abstract
- Introduction
- Literature Survey/ Existing system
- Research gap
- Problem Statement and Objectives
- Data Collection and Analysis
- Proposed System
  - Analysis
  - System Architecture
- Implementation Plan
- References

3. Deliverables

- Synopsis
- Technical Report
- Research Paper

4. Formative Assessment

- Weekly Log Report
- Work done
- Technical Report
- Presentation at the end of semester
- Research Paper

5. Oral

Research work will be assessed jointly by a panel of internal and external examiners. The panel of examiners will evaluate the student's performance based on presentation skills, Questions based on term work and overall development effort taken by the students.

Text Books:

1. C R Kothari, GauravGarg. Research Methodology Methods and Techniques, New Age International Publishers. Fifth Edition, 2023
2. Wayne Goddard, Stuart Melville. Research Methodology: An Introduction for Science and Engineering Students. Second Edition, 2014.

Reference Books:

1. Ranjit Kumar. Research Methodology: A Step-by-Step Guide for Beginners. Sage Publications, Fifth Edition, 2018.

Program:	B. Tech. I.T.					**Semester:**		VIII
Course:	Project Work					**Code:**		BIT28EL02
Credit	**Teaching Scheme (Hrs./Week)**				**Evaluation Scheme and Marks**			
	Lecture	**Practical**	**Tutorial**	**Other**	**TW**	**PR**	**OR**	**Total**
4	-	8	-	-	100	-	50	150

Prior knowledge of:

Basic knowledge of programming, software engineering concepts, databases, and relevant IT tools is required for project development.

is essential

Course Objectives:

1. Enable students to identify and define real-world problems by applying analytical and technical skills.
2. Design, implement, and validate IT-based solutions using appropriate tools, technologies, and engineering principles.
3. Enhance project management, teamwork, communication, and professional skills through systematic project execution and documentation.

Course Outcomes:

After learning the course, the students will be able to:

1. **Identify** requirements and constraints for the defined problem.
2. **Apply** concepts, tools, and technologies to propose a feasible solution.
3. **Design** system architecture using engineering principles.
4. **Develop** a solution by following coding and implementation practices.
5. **Evaluate** the performance and functionality of the developed system using suitable testing methods.
6. **Communicate** project work effectively through reports, presentations, and professional documentation.

Detailed Syllabus

Project work intends to conceive an idea and to implement it systematically by usingknowledge derived during the course of education, mainly to innovate or facilitate. A group of Undergraduate students in the Final Year will undertake project work.

General Guidelines for Project Work:

1. A project is one of the essential contributory teamwork that has to be completed for the required number of credits.
2. **Project teams:** Three to four students can form a group within the same or different disciplines, and their area of interest is to be registered with the project coordinator.
3. **Types of projects**:

   Projects can be carried out inside or outside the institute/Sponsored project, in any relevant industry/organization, or research institution/organization, with the prior permission of the department.

   The category of the project can be as follows:

   - Domain Specific
   - Interdisciplinary
   - Art and the Indian Knowledge System
4. Selection of Project: It is necessary to explore the domain of interest/research/ thrust area/ societal needs to finalise the problem statement.
5. Guide Allotment:

a. Considering the registered group's area of interest/domain and the expertise of the guide, the project coordinator, in consultation with a panel of experts, allots project guides.
b. The guide should be allotted from the same program.
c. In the case of an interdisciplinary project, along with the guide of the same program, one more guide will be allotted from another program.
d. In case of a sponsored project (with a reputed industry or any research organization), the external guide should be from the sponsoring company/Industry along with the internal guide from the program.

7. In consultation with a guide, teams will prepare the project synopsis.
8. Project Review:
   a. The Project coordinator, with the Head of the department, shall constitute a review committee for project groups.
   b. A review committee will approve the project problem statement and synopsis. Discussion/presentation may be arranged covering topics listed in the synopsis.
   c. The Project Review committee will evaluate the timely progress of the projects.
   d. The project team is expected to appear for two reviews per semester.
9. Project Report:
   a. The Project Report should be prepared using Word/LaTeX as per the template provided by the department.
   b. Project reports shall be submitted in softcopy and hardcopy form.
   c. In case of a sponsored project, students must submit a Completion certificate with the signature of an external guide from the sponsored company.
   d. In case of an Interdisciplinary project, students must submit a Completion certificate with the signature of the Guide from another department.
10. A GitHub repository should be maintained for the project.
11. **Expected Project Deliverables/Outcomes:**
    a. As a project work outcome, each group should complete the following activities.
       - Paper publication in a quality journal/conference (Like SCOPUS/ WOS/SCIE)
       - IPR (Patent / Copyright)
       - Participation in state/national/international contests
    b. Software Setup/Product
    c. Black Book and Project Diary
    d. All relevant documents

Program:	B. Tech. I.T.				Semester:			VII/VIII
Course:	Internship /On Job Training (OJT)				Code:			BIT27EL03/ BIT28EL03
Credit	Teaching Scheme (Hrs./Week)				Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	Other	TW	PR	OR	Total
12	-	24	-	-	300	-	-	300

Prior knowledge of:

1. Ability to apply theoretical knowledge to practical situations.

is essential

Course Objectives:

1. Provide students with real-world exposure to industry, research, and professional environments.
2. Promote awareness of ethics, sustainability, and social responsibility.
3. Strengthen career exploration and decision-making capabilities.
4. Develop a professional network and improve job readiness.

Course Outcomes:

After learning the course, the students will be able to:

1. Apply academic learning to real-world work environments
2. Foster skills in teamwork, leadership, communication, and problem-solving.
3. Get acquainted with organizational structures, work culture, and ethics.
4. Gain clarity on career paths and enhance employability.
5. Build industry/research networks for future opportunities.
6. Display a higher degree of confidence and professionalism.

About Course

1. Structure and Duration

To offer flexibility, B.Tech students may choose from different internship structures, selecting a scheme that best aligns with institute academic and professional goals.

Total Internship Credits = 12
1 Credit = 40 Hrs.
1 day = 8 Hrs.
For 12 credits: (12*40)/7 days for internship – 60 days for internship
12 weeks of internship = 5 days per week.

Table 1.1 Suggested Schemes

Scheme 1		
Year	Credits	Internship in days
Second Year BTech	2	10 (2 weeks)
Third Year BTech	4	20 (4 weeks)
Final Year BTech	6	30 (6 weeks)

Scheme 2		
Year	Credits	Internship in days
Second Year BTech	6	30 (6 weeks)
Third Year BTech	-	
Final Year BTech	6	30 (6 weeks)

Scheme 3		
Year	Credits	Internship in days
Second Year BTech	-	-
Third Year BTech	6	30 (6 weeks)
Final Year BTech	6	30 (6 weeks)

Scheme 4		
Year	Credits	Internship in days
Second Year BTech	-	-
Third Year BTech	-	-
Final Year BTech	12	60 (12 weeks)

Scheme 5		
Year	Credits	Internship in days
Second Year BTech	4	20 (4 weeks)
Third Year BTech	4	20 (4 weeks)
Final Year BTech	4	20 (4 weeks)

2. Suggested Types of Internship/On Job Training (OJT)

- Industry (Tech, FMCG, Banking, Startups, Manufacturing)
- Research (R&D Labs, Higher Education Institutions)
- NGOs & Social Work
- Government Bodies & Local Administration
- Healthcare & Wellness
- Artisans, Heritage, and Traditional Crafts
- Education & AICTE's EDUSkills / EduTech
- AI/ML/Digital Technologies
- Information Technology/Information Technology enabled Services & Electronics Area
- Trade and Agriculture Area
- Economy & Banking Financial Services and Insurance Area
- Logistics, Automotive & Capital Goods Area
- Fast Moving Consumer Goods & Retail Area
- Digitization & Emerging Technologies (Internet of Things/Artificial Intelligence /Machine Learning/Deep Learning/Augmented Reality/Virtual Reality, etc.) Domains
- MOOC courses
    i. As per the policy of Swayam NPTEL, 1 Credit is assigned for 4 Weeks, 2 Credits for 8 Weeks and 3 Credit for 12 Weeks courses.
    ii. It is discussed in the meeting that students can avail maximum 4 credits from MOOC Courses.
    iii. **As per the department policy the 12 Weeks course will have 2 Credits**.
- Research Internship by Internal Faculty

It may please be noted: This is only an indicative list and not an exhaustive one.

3. Implementation Mechanism

IT Department's Internship/On Job Training (OJT) Cell: The OJT Cell in the IT Department is responsible for the effective planning, execution, and monitoring of the On-the-Job Training program. The

cell comprises the following members:

- BOS Chairman
- Internship/On Job Training (OJT) Coordinator (Faculty Member)
- Faculty Mentor(s)

4. Evaluation Scheme

Total Marks: 300 (Split 50:50)

Table 4.1 Evaluation Scheme

Component	Marks
External (Industry): Completion of Hours	60
External (Industry): Quality of Work	60
External (Industry): Punctuality & Conduct	30
Internal (Faculty): Weekly Reporting	45
Internal (Faculty): Final Report	60
Internal (Faculty): Viva/Presentation	45

5. Role of Internship/On Job Training (OJT) Providing Organization, Nodal Officer, Internship Supervisor and Mentor

5.1 Role of Internship Providing Organization

Internship Providing Organization (IPO) is any organization, HEI, philanthropy, farmer, government organization, R&D institutions, research labs, enterprises, institution/person of eminence, cooperatives, corporate providing an opportunity to the student for Internship during the program

- Internship providing organization will connect with a OJT Coordinator to look after for facilitating the interns on arrival with registration, any other specific requirements, accommodation, etc.
- The mentor from internship providing organization needs to provide time-to-time guidance to the candidate to have exposure to the research environment and employability market.

5.2 Role of OJT Coordinator

- Assigning the internship supervisor
- To oversee the quality and effectiveness of the OJT program.
- To establish mechanisms for evaluating the program and making improvements.
- To act as a liaison between the department, students, faculty mentors, and OJT supervisors (Host institute/organization)

5.3 Role of Internship Supervisor

An internship supervisor is any individual who will be nominated by the department for monitoring, supervising, and evaluating the student during the internship duration.

- An internship supervisor will be nominated at the start of the academic year for each batch.
- The internship supervisor should monitor the regularity of the intern at his/her workplace. Students should preferably inform the internship supervisor at least one day prior to availing leave during the internship, except for emergencies.
- The internship supervisor should assess the intern based on rubric on the rubrics and evaluation guidelines.

5.4 Role of Mentor

A mentor is an empanelled professional identified either by the internship-providing organization or by the student through their professional network. The selected mentor's willingness to guide must be confirmed

and formally communicated to the internship supervisor.

The mentor plays a critical role in offering professional and/or research guidance to the student throughout the internship duration. In addition to mentorship, they help facilitate connections with subject matter experts and industry professionals, thereby enriching the intern's learning experience and broadening their professional exposure.

They shall be making the timely evaluation of a student and provide completion certification and/ a report for submission at the department.

- The mentor needs to provide guidance to the students digitally or physically throughout the internship duration.
- The mentor needs to check and validate the performance of students fortnightly and after the completion of the internship, issue the certificate/report.
- The mentor must ensure the learning of competencies with research orientation among the students during the internship duration.
- Institutes may integrate the job assigned to faculty with workload assessment.

6. Internship Mechanism for students

Internship outcomes should have been incorporated in developing a perspective among the candidates or students towards a profession and their ability to deconstruct a job role and to become job-ready as soon as they enter into a job or a profession.

a) Students will apply for research internships on their own or through the mentor of their parent institute by registering with OJT coordinator.
b) Interns will be selected by host organizations based on their selection criteria. The host organization will arrange to inform the potential intern through the mail and will ask for confirmation or for acceptance.
c) If a student fails to get an internship in physical mode, then the host organization should have a provision for digital/remote or group internships.
d) On receipt of an offer of internship, the student will arrange to consult the internship supervisor, obtain due permission from the department, and join the concerned host organization for an internship as per the suggested schedule.
e) The student may carry out their internship within the supervisor's lab or designated workspace at the host organization. Throughout the internship period, the internship supervisor and mentor will monitor the student's activities and performance. This will be done by reviewing periodic progress reports submitted by the student, ensuring continuous evaluation and guidance during the internship tenure.
f) On completion of the internship, the intern will prepare an internship report and get it endorsed by the mentor and internship supervisor.
g) All the documentation templates are available with the OJT/internship coordinator

Programme Electives

Program	B. Tech. I.T.					Semester		VII/VIII
Course	PEC 4: Generative Artificial Intelligence					Code		BIT27PE01/ BIT28PE01
Credits	Teaching Scheme (Hrs./Week)				Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	Other	FA		SA	Total
					FA1	FA2		
2	2	-	-	1	10	10	30	50

Prior knowledge of:

Machine Learning, Deep Learning, Text Preprocessing

is essential

Course Objectives:

1. Provide foundational knowledge in classical and modern generative AI models, including probabilistic, deep learning, and transformer-based approaches.
2. Apply generative AI techniques responsibly across domains such as text, image, audio, and engineering applications, while understanding ethical and security implications.

Course Outcomes:

After learning the course, the students will be able to:

1. Explain the fundamental concepts and classical models of Generative AI.
2. Evaluate deep generative modelling techniques for synthetic data.
3. Analyze transformer-based generative models across various domains.
4. Examine ethical, security, and societal implications of Generative AI for responsible development.

Detailed Syllabus

Unit	Description	Duration (Hrs)
1.	**Foundations of Generative AI** Introduction: Evolution of AI to Generative AI, Applications across engineering and industries, Probability: likelihood, Bayesian inference. information theory: MLE, KL divergence, entropy, Overview of generative vs discriminative models, Classical Generative Models: Gaussian Mixture Models (GMMs), Hidden Markov Models (HMMs), Restricted Boltzmann Machines (RBMs), Autoencoders (Basic, Sparse, Denoising)	8
2.	**Deep Generative Models** Generative Adversarial Networks (GANs): architecture, training, challenges. GAN variants: DCGAN, WGAN, StyleGAN. Variational Autoencoders (VAEs). Diffusion Models: concepts and applications (DDPM, Stable Diffusion). Evaluation metrics: FID, Inception Score Case-study: Image denoising, anomaly detection, representation learning, etc.	8
3.	**Transformer-based Generative AI Models** Attention mechanism & self-attention, Transformer architecture, Large Language Models (GPT), Fine-tuning methods (LoRA, prompt tuning, adapters), Vision Transformer, Multimodal GenAI (CLIP) Case-study: Text generation: chatbots, Image & video generation/editing (art, design, medical imaging, CAD). Audio & speech synthesis (music, voice cloning), etc.	8
4.	**Ethics and Security in Generative AI** Bias, fairness, and explainability in generative models. Deepfakes, misinformation, copyright issues. Privacy-preserving generative models. Responsible AI and regulatory frameworks. Emerging trends in GenAI.	6
	Total	30

Text Books:

1. Goodfellow, Y. Bengio, and A. Courville, *Deep Learning*. Cambridge, MA: MIT Press, 2016.
2. D. Foster, *Generative Deep Learning: Teaching Machines to Paint, Write, Compose, and Play*, 2nd ed. Sebastopol, CA: O'Reilly Media, 2023.
3. Rothman, Denis. *Transformers for Natural Language Processing: Build, Train, and Fine-Tune Deep Neural Network Architectures for NLP with Python, PyTorch, TensorFlow, BERT, and GPT-3*.Packt Publishing, January 29 2021. ISBN 978-1800565791.
4. Auffarth, Ben &Kuligin, Leonid. *Generative AI with LangChain: Build Large Language Model (LLM) Apps with Python, ChatGPT, and Other LLMs.* 2024 Edition. Packt Publishing, December 22 2023 (ISBN 978-1835083468).

Reference Books:

1. Babcock, J. & Bali, R. (2023). *Generative AI with Python and TensorFlow 2: Create images, text and music with VAEs, GANs, LSTMs, Transformer models*. PacktPublisher
2. ZonunfeliRalte and Indrajit Kar - Learn Python Generative AI: Journey from autoencoders to transformers to large language
3. Alammar, Jay & Grootendorst, Maarten. *Hands-On Large Language Models: Language Understanding & Generation.* O'Reilly Media, 2024. ISBN: 978-1098150969.

E-sources:

1. https://nptel.ac.in/courses/106108703
2. https://onlinecourses.swayam2.ac.in/imb24_mg116/preview
3. https://www.coursera.org/learn/generative-ai-for-everyone
4. https://www.coursera.org/learn/generative-ai-introduction-and-applications

Program	B. Tech. I.T.				Semester		VII/VIII
Course	PEC 4 Lab: Generative Artificial Intelligence Laboratory				Code		BIT27PE04/ BIT28PE04
Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	TW	OR	PR	Total
1	-	2	-	50	-	-	50

Prior knowledge of:

1. Machine Learning, Deep Learning
2. Programming Language

is essential

Course Objectives:

1. Understand, implement, and evaluate classical and deep generative models for creating synthetic data and developing domain-specific generative AI applications.
2. Ensure responsible, ethical, and transparent use of generative technologies.

Course Outcomes:

After learning the course, the students will be able to:

1. Use classical and deep generative models to generate the synthetic data.
2. Analyze the performance of generative architectures using evaluation metrics for image, text, and multimodal data.
3. Develop a generative AI application demonstrating responsible and ethical model usage.

Guidelines:

Continuous assessment of the laboratory is done based on overall performance and laboratory assignments performance of students. Each laboratory assignment assessment will assign marks based on parameters with appropriate weights.

Detailed Syllabus

Assignment No.	Suggested List of Assignments
1	Implementation following models: a. Gaussian Mixture Models (GMMs) for Data Clustering b. Hidden Markov Models (HMMs) for Sequence Modelling c. Restricted Boltzmann Machines (RBMs) for Feature Learning and Dimensionality Reduction
2	Implement different variants of GANs (e.g., DCGAN, StyleGAN& WGAN) and analyse their performance on a common dataset.
3	Implement and compare a variational Autoencoder with and without their parameterization trick.
4	Implement a Transformer-based language model (e.g., GPT) for text generation. Fine-tune the model on a text corpus and generate coherent and contextually relevant text.
5	Analyze the architecture of a diffusion model (e.g., DALL-E) and generate images using available pre-trained models.
6	Use CLIP to generate text-image pairs and evaluate their relevance and accuracy.
7	Train a GAN model on a custom dataset for image generation. Experiment with hyper parameters, loss functions, and optimization techniques to optimize GAN training.

8	Develop a simple text-to-image generation model using available libraries.
9	Development of Mini-Project

Reference Books:

1. Babcock, J. & Bali, R. (2023). *Generative AI with Python and TensorFlow 2: Create images, text and music with VAEs, GANs, LSTMs, Transformer models*. PacktPublisher
2. ZonunfeliRalte and Indrajit Kar - Learn Python Generative AI: Journey from autoencoders to transformers to large language
3. Alammar, Jay & Grootendorst, Maarten. *Hands-On Large Language Models: Language Understanding & Generation.* O'Reilly Media, 2024. ISBN: 978-1098150969.

E-resources:

1. https://nptel.ac.in/courses/106108703
2. https://onlinecourses.swayam2.ac.in/imb24_mg116/preview
3. https://www.coursera.org/learn/generative-ai-for-everyone
4. https://www.coursera.org/learn/generative-ai-introduction-and-applications

Program	B. Tech. I.T.					Semester	VII / VIII
Course	PEC 4: Software Design Patterns					Code	BIT27PE02/ BIT28PE02
Credits	Teaching Scheme (Hrs./Week)				Evaluation Scheme and Marks		
	Lecture	Practical	Tutorial	Other	FA		SA	Total
					FA1	FA2		
2	2	-	-	1	10	10	30	50

Prior knowledge of:

1. Software Engineering
2. Object Oriented design and Modeling

is essential

Course Objectives:

1. Understand the concepts and classification of software design patterns.
2. Apply design patterns to develop efficient, reusable, and maintainable software solutions.

Course Outcomes:

After learning the course, the students will be able to:

1. Illustrate the different design patterns based on problem requirements
2. Apply creational design patterns to develop flexible and reusable software solutions.
3. Make use of structural design patterns to enhance system scalability and flexibility.
4. Analyze design problems using suitable behavioral design patterns.

Detailed Syllabus

Unit	Description	Duration (Hrs)
1.	**Fundamentals of Design pattern** Definition, Essential elements of design pattern, Describing Design Patterns, organizing the catalogue of design patterns, Solving design problems are using design patterns: Finding Appropriate Objects, Determining Object Granularity, Specifying Object Interfaces, Specifying Object Implementations, and Putting Reuse Mechanisms to Work, Designing for Change, Selecting and Using a Design Pattern. Common causes of redesign along with the design pattern.	7
2.	**Creational Design Patterns:** Overview and classification, Object creational, Abstract factory, builder, factory method, prototype, and singleton design patterns	7
3.	**Structural Design Patterns:** Overview of Object structural patterns, Adapter, Bridge, Composite, Decorator, Façade, Flyweight, Proxy	8
4.	**Behavioral Design Patterns :** Overview of Object Behavioral patterns, Chain of Responsibility, Command, Interpreter, Iterator, Mediator, State, Observer, Strategy, Template method, Visitor	8
	Total	**30**

Text Books:

1. Gamma, E., Helm, R., Johnson, R., & Vlissides, J. *Design patterns: Elements of reusable object-oriented software*. Addison-Wesley. ISBN 0-201-63361-2
2. Allan Shalloway, James Trott, *Design Patterns Explained- A New Perspective on Object Oriented Design*, Addison Wesley 2nd Edition, ISBN-10: 0321247140, ISBN-13: 978- 0321247148

Reference Books:

1. Eric Freeman and Elisabeth Freeman, Head First Design Patterns, O"Reilly 1st Edition, ISBN-10: 8173664668, ISBN-13: 978-8173664663
2. Stephen Stelting and Olav Maassen , Applied Java Patterns, Prentice Hall 1st Edition, ISBN10: 0130935387, ISBN-13: 978-0130935380

E-resources:

1. Refactoring.Guru. (n.d.). *Design patterns catalog*. https://refactoring.guru/design-patterns
2. Coursera. (n.d.). Object-Oriented Design [Free course by University of Alberta]. Coursera. https://www.coursera.org/learn/object-oriented-design

Program	B. Tech. I.T.			Semester			VII/VIII
Course	PEC 4 Lab: Software Design Patterns Laboratory			Code			BIT27PE05/ BIT28PE05
Credit	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	TW	OR	PR	Total
1	-	2	-	50	-	-	50

Prior knowledge of:

- Software Engineering
- Object Oriented Design and Modelling

is essential

Course Objectives:

1. Understand software architecture principles and styles for building scalable systems.
2. Analyze design patterns for reusable and efficient software solutions.

Course Outcomes:

After learning the course, the students will be able to:

1. Develop reusable and maintainable software components using creational, structural, and behavioural design patterns
2. Analyze design problems and select appropriate design patterns to provide efficient solutions.

Guidelines:

Continuous assessment of the laboratory is done based on overall performance and laboratory assignments done by students. Each laboratory assignment assessment will assign marks based on parameters with appropriate weights. The instructor may select any three design patterns for implementation from the complete set of creational, structural, and behavioural design patterns, comprising all Gang of Four (GoF) patterns. Instructor can frame any scenario / case study for each assignment.

Detailed Syllabus

Assignment No.	Suggested List of Assignments
1.	Apply Factory Method and Abstract Factory to design a flexible object-creation mechanism for a system requiring multiple related object families.
2.	Use Builder to construct complex objects step-by-step and Prototype to clone existing object structures efficiently.
3.	Implement the Singleton pattern to provide a globally accessible shared resource with controlled, single-instance creation.
4.	Demonstrate Adapter, Bridge, and Decorator patterns to: ● Connect incompatible interfaces ● Separate abstractions from implementations ● Add features dynamically without modifying existing classes.
5.	Use Composite, Facade, and Proxy patterns to: ● Model part–whole hierarchies, ● Provide simplified higher-level interfaces, ● Control access to objects.
6.	Apply Chain of Responsibility, Command, and Iterator patterns to: ● Process requests through multiple handlers ● Encapsulate actions for undo/redo, ● Traverse collections uniformly.

7.	Use Observer, Strategy, State : ● Notify dependent objects of changes, ● Switch algorithms at runtime, ● Represent state-dependent behaviour, ● Define algorithm skeletons, ● Apply operations across heterogeneous object structures.

Reference Books:

1. Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, Design Patterns: Elements of Reusable Object Oriented Software, ISBN-10: 0-201-63361-2, ISBN-13: 078-5342633610, Pearson 1st edition.
2. Freeman, E., Robson, E., Bates, B., & Sierra, K. (2021). Head first design patterns (2nd ed.). O'Reilly Media.
3. Allan Shalloway, James Trott, Design Patterns Explained- A New Perspective on Object Oriented Design, Addison Wesley 2nd Edition, ISBN-10: 0321247140, ISBN-13: 978- 0321247148

E-resources:

1. Refactoring.Guru. (n.d.). *Design patterns catalog*. https://refactoring.guru/design-patterns
2. Object Oriented System Development Using UML, Java and Patterns — preview available here: https://onlinecourses.nptel.ac.in/noc20_cs84/preview

Program:	B. Tech. I.T.				**Semester:**		VII/VIII	
Course:	PEC 4: Cyber Security				**Code:**		BIT27PE03/ BIT28PE03	
Credit	**Teaching Scheme (Hrs./Week)**				**Evaluation Scheme and Marks**			
	Lecture	**Practical**	**Tutorial**	**Other**	**FA**		**SA**	**Total**
					FA1	**FA2**		
2	2	-	-	1	10	10	30	50

Prior knowledge of:

1. Data Communication
2. Computer Networks

is essential

Course Objectives:

1. Get familiar with the fundamentals, need, and scope of cyber security in today's digital world.
2. Determine various cyber threats, attacks, and vulnerabilities, and to understand the fundamentals of ethical hacking and digital forensics.
3. Apply cyber laws, privacy rules, and compliance standards to real-world scenarios.

Course Outcomes:

After learning the course, the students will be able to:

1. Illustrate core concepts, significance, and challenges of cyber security and cybercrimes.
2. Detect various cyber threats, vulnerabilities, and malware types.
3. Apply ethical hacking principles and basic forensic investigation methods to identify and address cyber security concerns.
4. Analyze legal, ethical, and privacy principles in cyberspace in relation to current cyber security trends and practices.

Detailed Syllabus

Unit	**Description**	**Duration (Hrs)**
1	**Introduction to Cyber Security and Cyber Crimes** Introduction to Cyber Security: Need, importance, and challenges in the digital era. Cyberspace: Definition, characteristics, and actors in cyberspace. CIA Triad (Confidentiality, Integrity, Availability) and its significance. Cyber Threats & Cyber Warfare Overview. Cyber Terrorism and Cyber Security for Critical Infrastructure. Introduction to Cyber Crimes: Definition, motives, and classification. Common Cyber Crimes: phishing, cyberstalking, identity theft, forgery, software piracy, online fraud, spamming, and malware-based crime. **Case Study: WannaCry** *Ransomware Attack (2017)*—Understanding global cyber threat impact and critical infrastructure vulnerability.	**7**
2	**Threats, Vulnerabilities, and Ethical Hacking** Threats and Vulnerabilities: Malware, Spyware, Worms, Trojans, Viruses, Backdoors. Stages of an Attack: Gaining access, escalating privileges, and covering tracks. Hacking and Cracking: Concepts and Differences. Types of Hackers: White hat, black hat, grey hat. Ethical Issues in Hacking. Ethical Hacking: Needs, phases, and legal considerations. **Case Study: Yahoo** *Data Breach (2013–14)*—Analysis of vulnerabilities, data leakage, and aftermath.	**8**

3	**System Security and Cyber Forensics** Basics of System Security: User authentication, authorization, and password management. Access Control Models: DAC, MAC, RBAC—Concepts and examples. Patch management and system hardening techniques. Introduction to Cyber Forensics: Need, investigation process, and challenges. Digital Evidence: Types, collection, and preservation. Overview of Network and Email Forensics. Malware Forensics: Identifying and analyzing malicious code (conceptual overview). Tools and Techniques used in Cyber Forensics (EnCase, Autopsy, FTK, etc.) **Case Study: The** *Silk Road Investigation (2013)*—Role of Bitcoin forensics and digital evidence tracking in law enforcement.	**8**
4	**Cyber Laws, Ethics, Privacy, and Emerging Trends** Introduction to Cyber Laws: IT Act 2000 (India) and key amendments. Overview of Global Data Protection Regulations: GDPR, HIPAA. Cyber Ethics and Privacy: Ethical concerns, digital footprint, and responsible online behavior. Cybersecurity Compliance: Introduction to NIST, ISO 27001, and PCI-DSS. Emerging Areas in Cybersecurity: Cloud Security, Security in IoT and AI-Based Systems, and Blockchain Security Basics. Careers in Cybersecurity: Roles, skills, and certifications (CEH, CISSP, CompTIA Security+) **Case Study:** Cambridge Analytica Scandal (2018)—Data privacy, misuse of personal information, and regulatory response.	**7**
	Total	**30**

Textbooks:

1. "Computer Security: Principles and Practice" by William Stallings & Lawrie Brown, 4th Edition (2018)
2. "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives" by Nina Godbole & Sunit Belapure, 1st Edition (2019)
3. "A Textbook of Cyber Forensic Analytics" by Gaytri Gupta, 1st Edition (2025)
4. "Network Security Essentials" by William Stallings, 6th Edition (2017)

Reference Books:

1. "Hacking: The Art of Exploitation" by Jon Erickson, 2nd Edition (2008)
2. "Cyber security and Cyberwar: What Everyone Needs to Know" by P.W. Singer & Allan Friedman, 1st Edition (2014)
3. "Cryptography and Network Security: Principles and Practice" by William Stallings, 7th Edition (2016)
4. "Metasploit: The Penetration Tester's Guide" by David Kennedy, Jim O'Gorman, Devon Kearns & Mati Aharoni, 1st Edition (2011)

E-sources:

1. https://www.skillsbuild.org/students/course-catalog/cybersecurity
2. https://www.netacad.com/cybersecurity
3. https://www.cybrary.it/free-content

Program:	B. Tech. I.T.					**Semester:**		VII/VIII
Course:	PEC 4 Lab: Cyber Security Laboratory					**Code:**		BIT27PE06/ BIT28PE06
Credit	**Teaching Scheme (Hrs./Week)**				**Evaluation Scheme and Marks**			
	Lecture	**Practical**	**Tutorial**	**Other**	**TW**	**PR**	**OR**	**Total**
1	-	2	-	-	50	-	-	50

Prior knowledge of:

1. Data Communication
2. Computer Networks

is essential

Course Objectives:

1. Understand fundamental cyber security tools and techniques for analyzing system vulnerabilities and forensic investigations.
2. Apply various network security and vulnerability assessment tools to detect and mitigate cyber threats.

Course Outcomes:

After learning the course, the students will be able to:

1. Apply fundamental cyber security techniques to detect and assess system vulnerabilities.
2. Analyze digital evidence using forensic tools.
3. Simulate vulnerabilities and basic attacks in a controlled environment.
4. Demonstrate techniques for assessing password strength, basic encryption, and related security risks.

Guidelines:

Continuous assessment of the laboratory is done based on overall performance and laboratory assignment performance of students. Each laboratory assignment assessment will assign marks based on parameters with appropriate weights. Suggested parameters for overall assessment as well as each laboratory assignment assessment include neatness and cleanliness in experimental write-up, efficient code, innovation, interpretation of results and conclusions, punctuality, and overall behavior, attitude, and performance.

Detailed Syllabus

Assignment No.	**List of Suggested Assignments(Any 8)**
1.	Configuring Firewall Security, Strengthening Web Browser Protection, and Assessing Website Vulnerabilities
2.	Use the open-source **Autopsy** forensic tool to analyse a sample disk image. Extract basic artefacts such as deleted files, browser history, or metadata, and generate a brief investigation report based on the evidence found.
3.	Configure File and Directory Permissions to Implement Role-Based Access Control (RBAC) on Linux
4.	Perform an experiment for port scanning with Nmap.
5.	Use Nessus to scan your own laptop or a test VM to check for weak passwords, open ports, and outdated software. Document the key security gaps found.
6.	Run **Slowloris**, an open-source DoS tool, against your own local **Apache server** running on XAMPP. Launch a slow-request attack and observe how the server becomes unresponsive due to connection exhaustion.
7.	Evaluate Password Strength Using Online Checkers and Hash Cracking Tool
8.	Use a simple tool to check metadata (like location & camera details) from an image.

9.	Use Recuva or TestDisk to check if deleted files can be recovered from a USB drive.
10.	Execute SQL injection attacks on a vulnerable web application (e.g., DVWA or bWAPP) to exploit security flaws and bypass login authentication.
11.	Extract metadata (such as GPS coordinates, timestamp, and camera details) from images using ExifTool or online metadata extraction tools for forensic investigation.

Reference Books:

1. William Stallings, Computer Security: Principles and Practices, Pearson 6th Ed, ISBN: 978-0- 13-335469-0
2. Bernard Menezes, Network Security and Cryptography, Cengage Learning, ISBN-978-81- 315-1349- 1
3. Dr. V.K. Pachghare, Cryptography and Information security, PHI, Second edition, ISBN- 978- 81- 203-5082-3

E-resources:

1. **https://skillsbuild.org/students/course-catalog/cybersecurity**

Program	B. Tech. I.T.					Semester		VII/VIII
Course	PEC 5: Big Data Analytics					Code		BIT27PE07/ BIT28PE07
Credits	Teaching Scheme (Hrs./Week)				Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	Other	FA		SA	Total
					FA1	FA2		
2	2	-	-	1	10	10	30	50

Prior knowledge of:

Database Management System

is essential

Course Objectives:

1. Explore Big Data frameworks, processing models and tools.
2. Learn Big Data techniques for analytics, visualization, and decision-making.

Course Outcomes:

After learning the course, the students will be able to:

1. Explain the basic concepts of big data and its ecosystem.
2. Illustrate hadoop architecture and non relational databases.
3. Apply apache spark frameworks for scalable big data analytics.
4. Analyze advanced visualization techniques for effective representation of big data.

Detailed Syllabus

Unit	Description	Duration (Hrs)
1.	**Introduction to Big Data** **Concepts of Big Data:** Definition of Big Data, Evolution of Big Data era , 5 Vs of Big Data, Importance of Big Data Analytics. Characteristics of Big Data, Traditional RDBMS vs Distributed systems. **Big Data Ecosystem:** Introduction to Big Data frameworks, Big Data Analytics Life Cycle, Big Data Applications	6
2.	**Hadoop Architecture** Role of distributed systems in Big Data, Need for Hadoop/Spark, Hadoop ecosystem overview: HDFS (Storage), YARN (Resource Management), MapReduce (Processing). **NoSQL Databases:** Types of NoSQL, HBase, Cassandra, MongoDB. **Case study:** How Facebook Leverages Hadoop and HDFS for Big Data Storage and Analytics	8
3.	**Apache Spark Frameworks** Big data analytics with Apache Spark, Spark core, Interactive data analysis with spark shell, Writing a spark application, RDD's and Optimization Techniques, Spark Algorithm. **Case study:** Twitter Sentiment Analysis	8
4.	**Visualization Techniques for Big Data** Visualization techniques and tools for Big Data, Importance of data visualization and Challenges, Advanced visualization techniques: Geospatial visualization, Network graphs, Time-series visualization, and Heatmaps, Visualization for streaming and high-dimensional data. Big Data Visualization with Python/Tableau/PowerBI/other tools**.** **Case study**: Uber – Real-time dynamic pricing visualization.	8
	Total	30

Text Books:

1. DT Editorial Services, *Big Data, Black Book,* DT Editorial Services, ISBN: 9789351197577, 2016 Edition.
2. Tom White, *Hadoop: The Definitive Guide*. Fourth Edit on, O'reilly Media, 2015
3. Seema Acharya, Subhasini Chellappan, *Big Data Analytics*. Second Edition, 2019, Wiley India Pvt.Ltd, ISBN 978-81-2657-951-8.

Reference Books:

1. Michael Mineli, Michele Chambers, Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley Publications, 2013.
2. Alex Holmes, Hadoop in practice, Dreamtech press, ISBN: 9781617292224.
3. Arvind Sathi, Big Data Analytics: Disruptive Technologies for Changing the Game, IBM Corporation, ISBN:978-1-58347-380-1.

E-Learning Material & Online Resources:

1. NPTEL – Big Data Computing – Prof. Rajiv Misra (IIT Patna) https://nptel.ac.in/courses/106/105/106105236
2. Coursera – Big Data Specialization (University of California, San Diego) https://www.coursera.org/specializations/big-data
3. edX – Big Data for Data Science (UC San Diego / Microsoft) https://www.edx.org/learn/big-data

Program	B. Tech. I.T.				Semester		VII/VIII
Course	PEC 5 Lab: Big Data Analytics Laboratory				Code		BIT27PE10/ BIT28PE10
Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	TW	OR	PR	Total
1	-	2	-	50	-	-	50

Prior knowledge of:

1. Database Management System
2. Data Structure and Algorithms

is essential

Course Objectives:

1. Gain practical knowledge of Big Data tools and ecosystems.
2. Learn to implement data storage, processing, and querying using Hadoop and Spark.

Course Outcomes:

After learning the course, the students will be able to:

1. Apply hadoop distributed file system (HDFS) commands to manage and manipulate data in a distributed environment.
2. Implement map-reduce and spark programs for big data analytics.
3. Evaluate the performance and effectiveness of big data applications.

Guidelines:

Students should complete any three assignments from given suggested list and mini-project as compulsory component. Suggested Lab Software & Tools: Hadoop (single-node cluster), Apache Spark, NoSQL Databases: Cassandra/HBase, Python/Java/Scala for programming.

Detailed Syllabus

Assignment No.	Suggested List of Assignments (Any Three)
1.	Upload a text file (e.g., sample.txt) to Hadoop Distributed File System (HDFS). Perform the following: 1. Install, configure and run Hadoop and HDFS. 2. Display the list of files in HDFS. 3. Check the replication factor of the file. 4. Retrieve (download) the file back from HDFS to the local system.
2.	Implement the Word Count program using Hadoop MapReduce. Run the program on a text dataset (e.g., a log file, a storybook, or news article). 1. Count the frequency of each word. 2. Display the top 5 most frequent words in the dataset.
3.	Practice importing and exporting data from databases. Use the tool like Spark to read data from the database. For example, Using Apache Spark load a CSV file (e.g., sales or marks dataset). Perform the following operations 1. Count the total number of rows. 2. Filter all rows where a numeric column (e.g., marks > 50 or sales > 1000). 3. Calculate the average value of one numeric column**.**
4.	Implement CRUD operations in Cassandra using an employee database. For example: 1. Insert at least 5 employee records. 2. Display all employee details. 3. Retrieve employees belonging to a particular department. 4. Find the employee with the highest salary.

5.	Mini project: Design and implement a Big Data Analytics application. The project should demonstrate the ability to handle large or semi-structured data, perform meaningful analysis, and generate insights.

Text Books:

1. Tom White,"*Hadoop: The Definitive Guide*". Fourth Edit on, O'reilly Media, 2015
2. Seema Acharya, Subhasini Chellappan, "*Big Data Analytics*". Second Edition,Wiley 2019.

Reference Books:

1. Jenny Kim, Benjamin Bengfort, "*Data Analytics with Hadoop*". OReilly Media, Inc,June 2016
2. Jake VanderPlas, "*Python Data Science Handbook*". O'Reilly Media, 2016
3. Alex Holmes, "*Hadoop in practice".*Secondedition,Dreamtech press, January 2015

E-Learning Material & Online Resources:

1. Apache Hadoop 3.4.1.https://hadoop.apache.org/docs/stable/
2. MapReduce Programming Guide. https://hadoop.apache.org/docs/stable/hadoop-mapreduce-client/hadoop-mapreduce-client-core/MapReduceTutorial.html
3. Apache Spark. https://spark.apache.org/docs/latest/quick-start.html
4. Apache Cassendra. https://cassandra.apache.org/doc/latest/
5. NPTEL – Big Data Computing – Prof. Rajiv Misra (IIT Patna) https://nptel.ac.in/courses/106/105/106105236.
6. Coursera – Big Data Specialization (University of California, San Diego) https://www.coursera.org/specializations/big-data.
7. edX – Big Data for Data Science (UC San Diego / Microsoft) https://www.edx.org/learn/big-data

"Knowledge Brings Freedom"

Program	B. Tech. I.T.				Semester		VII/VIII	
Course	PEC 5: Agile Software Development				Code		BIT27PE08/ BIT28PE08	
Credits	Teaching Scheme (Hrs./Week)				Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	Other	FA		SA	Total
					FA1	FA2		
2	2	-	-	1	10	10	30	50

Prior knowledge of:

1. Software Engineering principles

is essential

Course Objectives:

1. Gain insights on Agile project management techniques.

Course Outcomes:

After learning the course, the students will be able to:

1. Describe agile principles, methodologies, and frameworks used in software development.
2. Apply agile workflows and version-control practices to execute sprint-based development
3. Apply agile engineering automation concepts and CI/CD workflows for software development
4. Analyze agile delivery and DevOps practices to assess project performance and optimize end-to-end deployment workflows.

Detailed Syllabus

Unit	Description	Duration (Hrs)
1	**Agile Fundamentals and Collaboration Frameworks** Evolution from traditional SDLC to Agile methodologies, Agile Manifesto, principles, and iterative mindset Scrum, Kanban, and XP frameworks Roles, ceremonies, and artifacts in Scrum Creating user stories, product backlog, and sprint planning Collaboration and documentation using Jira Software / Confluence). Frameworks: Scrum, Kanban, XP, Jira Case Study: Create and configure an Agile project board for a sample software application	8
2	**Agile Project Management and Version Control** Sprint execution – stand-ups, reviews, and retrospectives, Story point estimation, velocity tracking, and burndown charts, Git branching strategies – feature branches, pull requests, and merge workflows, Code review process and integration with Agile boards, Continuous feedback and traceability from backlog to code	7
3	**Agile Engineering Automation and CI/CD Pipeline** Test-Driven Development (TDD) and continuous testing, Setting up Continuous Integration (CI) and automated build pipelines, Static code analysis, linting, and code coverage tools, Continuous Delivery (CD) – deployment pipeline automation Containerization using Docker for consistent environments Case Study: Configure a CI/CD pipeline using Jenkins / GitHub Actions with SonarQube analysis	7

4	**Agile Project Delivery and DevOps Integration** End-to-end Agile project execution through multiple sprints, Definition of Done (DoD), acceptance criteria, and testing reports, Tracking Agile metrics – velocity, defect density, lead/cycle time Cloud-based deployment and environment management, Agile reporting and visualization dashboards Industry case studies: Infosys Agile Delivery Model, Spotify Squad Framework, Atlassian Agile at Scale	8
	Total	**30**

Text Books:

1. Robert C. Martin. Agile Software Development: Principles, Patterns, and Practices. Prentice Hall, February 2002. ISBN 0-13-597444-5
2. Thomas Stober, Uwe Hansmann "Agile Software Development: Best Practices for Large software development projects" Springer publication 2010. ISBN 978-3-540-70830-8

Reference Books:

1. Gene Kim, Patrick ,Debois, John Willis & Jez Humble, "How to Create World-Class Agility, Reliability, and Security in Technology Organizations", IT Revolution Press(2016), ISBN: 978-1942788003.

E-sources:

1. https://onlinecourses.nptel.ac.in/noc23_mg123/preview
2. https://elearn.nptel.ac.in/shop/completed-courses/short-term-programs-completed/agile-testing-methodology-and-project-management-test-automation/

Program	B. Tech. I.T.				Semester	VII/VIII	
Course	PEC 5 Lab: Agile Software Development Laboratory				Code	BIT27PE11/ BIT28PE11	
Credit	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	TW	OR	PR	Total
1	-	2	-	50	-	-	50

Prior knowledge of:

1. Software Engineering fundamentals
2. Programming concepts

is essential

Course Objectives:

1. Use agile methodologies and practices for project planning, sprint execution, version control, and continuous integration.

Course Outcomes:

After learning the course, the students will be able to:

1. Demonstrate agile practices through project setup, sprint management, version control, TDD, and continuous integration**.**
2. Design agile project management workflow integrating planning, development, automation, deployment, and monitoring for an any software project

Guidelines:

Continuous assessment of the laboratory is done based on overall performance and laboratory assignments performance of students. Each laboratory assignment assessment will assign marks based on parameters with appropriate weights. Suggested industry-standard tools *such as Jira, GitHub, Jenkins, SonarQube, Docker, and Power BI,* aCoCo, Coverage.py.

Detailed Syllabus

Assignment No.	Suggested List of Assignments
1.	Create and configure an Agile project board for a given case/scenario • Create a Scrum project in Jira Software. • Define Epics, User Stories, and Tasks. • Assign roles (Product Owner, Scrum Master, Developer). • Configure sprint duration and backlog view.
2.	Plan and manage a complete sprint cycle in Jira to simulate Agile project execution**.** • Create a sprint in Jira Software with defined start and end dates. • Add prioritized backlog items and assign story points. • Conduct daily stand-ups and update task status regularly. • Monitor sprint progress through burndown charts and sprint reports.
3	Demonstrate Agile version-control workflows for given project by creating feature branches, performing pull requests, and integrating commits using GitHub or GitLab • Initialize a Git repository for the Task Tracker Web Application. • Create separate feature branches for modules such as task creation, task update, and user login • Implement small functional or UI enhancements within each feature branch • Commit changes with descriptive messages linked to user stories or issue IDs • Create Pull Requests (PRs) or Merge Requests (MRs) to merge code into the main branch.

	• Conduct a peer code review, add comments, and approve changes. • Resolve merge conflicts (if any) and document resolution steps. • Generate a summary of merged branches and link PRs to Agile board issues (if integrated).
4.	Demonstrate Test-Driven Development (TDD) principles for the project by designing unit test cases and validating functionality. • Identify at least two core modules. • Write unit test cases first (before code implementation) to define expected behavior. • Implement corresponding functions or methods until all tests pass. • Use industry driven testing frameworks to execute test suites. • Test Report and interpret test results to ensure functionality correctness.
5	Strengthen quality assurance in Agile delivery using automated tests and coverage tools. • Configure automated unit test execution using • Add integration tests for at least two workflows • Integrate a coverage tool • Generate test coverage reports
6.	Configure a CI/CD pipeline for the project using Jenkins or GitHub to automate build, testing, and code-quality analysis. • Create a Jenkinsfile or GitHub Actions workflow to automate code build and testing. • Set up automatic triggers for pipeline execution on each code commit or pull request. • Include stages for build, test, analysis, and reporting. • Generate CI/CD reports showing build success, test results, and quality metrics.
7	Analyze and visualize Agile project performance metrics such as velocity, defect density, and lead time using *Jira Dashboards* or *Power BI*. • Collect sprint and issue data from Jira Software, including completed stories and defects logged. • Compute key Agile metrics — velocity, defect density, and lead time — for at least two sprints. • Import data into Power BI or use Jira Dashboards to create metric visualizations. • Design interactive charts and graphs showing team progress and quality trends. • Interpret the dashboard insights to identify performance patterns or process gaps.

Reference Books:

1. Gene Kim, Patrick ,Debois, John Willis & Jez Humble, "How to Create World-Class Agility, Reliability, and Security in Technology Organizations", IT Revolution Press(2016), ISBN: 978-1942788003
2. Thomas Stober, Uwe Hansmann "Agile Software Development: Best Practices for Large software development projects" Springer publication 2010. ISBN 978-3-540-70830-8

E-resources:

1. https://onlinecourses.nptel.ac.in/noc23_mg123/preview
2. https://elearn.nptel.ac.in/shop/completed-courses/short-term-programs-completed/agile-testing-methodology-and-project-management-test-automation/

Program:	B. Tech. IT.				**Semester:**	VII/VIII		
Course:	PEC 5: Blockchain Smart Contracts- Principles and Practices				**Code:**	BIT27PE09/ BIT28PE09		
Credits	**Teaching Scheme (Hrs./Week)**				**Evaluation Scheme and Marks**			
	Lecture	**Practical**	**Tutorial**	**Other**	**FA**		**SA**	**Total**
					FA1	**FA2**		
2	2	-	-	1	10	10	30	50

Course Objectives:

1. Learn the technology behind Blockchain and Smart contracts
2. Gain knowledge about Emerging trends in Blockchain and its Real-world applications.

Course Outcomes:

After learning the course, the students will be able to:

1. Interpret the fundamental concepts of Blockchain Technology
2. Illustrate the concept of cryptocurrency in Blockchain
3. Apply the concept of smart contracts in Ethereum Blockchain
4. Analyze the decentralized applications and emerging trends in Blockchain Technology

Detailed Syllabus

Unit	**Description**	**Duration (Hrs)**
1	**Introduction to Blockchain and Distributed Ledger Technology** Need of Blockchain, Basic ideas behind Blockchain, Introduction to cryptographic concepts, Hashing, Blockchain evolution, P2P systems, Architecture of Blockchain, Introduction to Decentralized System and Distributed Ledger Technology, Types of Block chains, Lifecycle of Blockchain transaction, Different terminologies associated	**8**
2	**Cryptocurrency Fundamentals** Basics of cryptocurrency, Difference between Money & Currency, examples: Bitcoin, Ether, Litecoin, Dodgecoin, StableCoin, Governance Coin / Token etc. Bitcoin Mechanics- Digital signatures, Wallets, Mining, forks, Consensus mechanisms (POW and POS), attacks (double-spend, selfish mining)	**7**
3	**Ethereum Smart Contracts** Introduction to Ethereum, EVM, GHOST protocol, Smart contracts, Gas, Gas Fees Optimization for Smart Contracts, Solidity programming language, Smart contract life cycle, Smart contract vulnerabilities, Introduction to enterprise platforms (Hyperledger, Corda)	**7**
4	**Emerging Trends in Blockchain** Zero-knowledge proofs, Pseudo-anonymity vs. anonymity, Zcash and Zk-SNARKS for anonymity preservation**,** DeFi, NFTs, web3.0, DAO, CBDC (Central Bank Digital Curriencies),Cloud-based Blockchain, Blockchain interoperability, green Blockchain **Block Chain Use Cases** Introduction to Decentralized Applications, Supply Chain Management, Finance, Health Care, Internet of Things (IoT), Voting system, Loyalty Programs, Go Green (Renewable Energy), Blockchain in Real Estate, Blockchain and AI	**8**
	Total	30

Text Books:

1. Ramchandra Sharad Mangrulkar; Pallavi Vijay Chavan, 'Blockchain Essentials: Core Concepts and Implementations', Apress (part of Springer Nature) 1st Edition (2024), ISBN-13: 978-1-4842-9974-6, ISBN-13: 978-1-4842-9975-3.
2. Scott Marks, "Blockchain for Beginners: Guide to Understanding the Foundation and Basics of the Revolutionary Blockchain Technology", Create Space Independent Publishing Platform, 2018, ISBN-10: 1974564509 ISBN-13: 978-1974564507
3. Arvind Narayanan, Joseph Bonneau, EdwardFelten, Andrew Miller and Steven Goldfeder, "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction", Princeton University 2016, ISBN-10: 0691171696 ISBN-13: 978-0691171692

Reference Books:

1. Adarsh S, Asharaf S, Sivadas Neelima & Sumi Maria Abraham , 'Advanced Blockchain Technologies: A Comprehensive Textbook on Ethereum Smart Contracts to Decentralised Applications',Wiley (2025), ISBN: ISBN-13: 978-9363863972
2. H.F.Atlam, Muhammad A.A.,A.G.Alzaharani, G. Wills, "A review of Blockchain in Internet of Things and AI", paper in Big Data and Cognitive Computing, Vol.4, Issue 28, Oct.2020

E-Resources:

1. NPTEL Course **"Introduction to Blockchain Technology & Applications"** https://nptel.ac.in/courses/106/104/106104220/
2. NPTEL Course on **"Blockchain Architecture &Use Cases"** https://nptel.ac.in/courses/106/105/106105184/

Program:	B. Tech. IT.			**Semester:**			VII/VIII
Course:	PEC 5 Lab: Blockchain Smart Contracts- Principles and Practices Laboratory			**Code:**			BIT27PE12/ BIT28PE12/
Credits	**Teaching Scheme (Hrs./Week)**			**Evaluation Scheme and Marks**			
	Lecture	**Practical**	**Tutorial**	**TW**	**PR**	**OR**	**Total**
1	-	2	-	50	-	-	50

Course Objectives:

1. Learn the working of Blockchain technology
2. Implement the real-world applications of Blockchain.

Course Outcomes:

After learning the course, the students will be able to:

1. Build smart contract based on cryptography and Blockchain concepts
2. Demonstrate Bitcoin core client to see the transactions.
3. Create a Decentralized Application and perform testing to find the vulnerabilities

Guidelines:

Continuous assessment of the laboratory is done based on overall performance and laboratory assignments performance of students. Each laboratory assignment assessment will assign marks based on parameters with appropriate weights. Suggested parameters for overall assessment as well as each laboratory assignment assessment include - Neatness and cleanliness in Experimental write-up, Efficient Code, Innovation, Interpretation of results and conclusions, Punctuality, Overall behavior, attitude and performance

Detailed Syllabus

Assignment No.	**Suggested List of Assignments (Any Six)** *Assignment 5 is compulsory.
1	Set up Blockchain Development Environment (Install and configure Blockchain development Tools)
2	Implement a simple Smart Contracts in Solidity in Remix IDE
3	Install and Get Started with the Bitcoin core client. Write a program to get Bitcoin and create transactions.
4	Build and deploy a new ERC-20 token using OpenZepplin.
5	Implement a dApp using Ethereum Blockchain platform. Example: 1. Electronic Voting System 2. Supply chain for tracking products 3. Certificate Issuance System 4. Blockchain based Identity Management System
6	Identify the vulnerabilities in the smart contract generated in above dApp.
7	Case study on Cognitive Computing.

Text Books:

1. Tobias Fertig and Andreas Schütz, 'Blockchain: The Comprehensive Guide to Blockchain Development, Ethereum, Solidity, and Smart Contracts', Rheinwerk Computing, 2024, ISBN-10: 1493225138
2. Tobias Fertig and Andreas Schütz, 'Blockchain: The Comprehensive Guide to Blockchain Development, Ethereum, Solidity, and Smart Contracts', Rheinwerk Computing, 2024, ISBN-10: 1493225138
3. Ritesh Modi, 'Solidity Programming Essentials: A Beginner's Guide to Build Smart Contracts for Ethereum and Blockchain', Packt Publishing, 2018, ISBN-13: 978-1788831383

Reference Books:

1. Parvez Rahi; Ajay Pal Singh; Inderjeet Singh , 'Blockchain Technology: A Practitioners Approach', Prime International Publication, ISBN: 978-93-6010-640-9

E-Resources:

1. NPTEL Course on **"Blockchain Architecture &UseCases"** https://nptel.ac.in/courses/106/105/106105184/

Program	B. Tech. I.T.					Semester	VII/VIII
Course	PEC 6: MOOC					Code	BIT27PE13/ BIT28PE13
Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	FA		SA	Total
				FA1	FA2		
2	2	-	-	-	50	–	50

Prior knowledge of:

Ability to work with online learning platforms, including accessing video lectures and tools for learning and collaboration.

is essential.

Course Objectives:

1. To familiarize students with emerging IT domains.
2. To provide exposure to modern tools, frameworks, and development environments.
3. To encourage independent learning and foster continuous up-skilling

Course Outcomes:

After learning the course, the students will be able to:

1. Explain the concepts and applications of emerging domains in Information Technology.
2. Implement learned methods to design, simulate, or evaluate systems/processes relevant to the course domain.
3. Utilize digital platforms for collaboration, discussion, and continuous learning.
4. Present findings, solutions, or projects clearly in written or oral form.

About Course

Massive Open Online Courses (MOOCs) offer a cost-effective and adaptable way to learn new skills, explore lifelong interests, and deliver quality education at scale. Whether for personal growth, career advancement, or workforce training, platforms like SWAYAM, NPTEL, edX, Coursera, Udemy and similar kinds of platforms provide accessible learning opportunities.

MOOC platforms offer easy access to global resources while supporting the three cardinal principles of the National Education Policy: access, equity, and quality.

MOOCs empower students by:

- Allowing them to learn at their own pace and convenience.
- Offering hands-on projects, virtual labs, and case studies for practical skills.
- Enhancing employability through globally recognized certifications.
- Encouraging self-directed learning and continuous skill development.

Guidelines for MOOC Coordinator

- Identify and share suitable MOOC platforms (e.g., SWAYAM, NPTEL, edX, Coursera, Udemy) aligned with curriculum requirements and NEP principles.
- Course Selection & Approval - Maintain a list of approved courses and avoid duplication of courses already covered in regular curriculum.
- Track student progress periodically and motivate students to complete the course.
- Arrange the presentation after completion of MOOC course
- Maintain detailed documentation and collect feedback from students and faculty to improve future MOOC offerings.

Guidelines for Students

- Choose the course only from approved platforms such as SWAYAM, NPTEL, edX, Coursera, Udemy or allied platforms.
- Duration of course should be at least 8 weeks / 30 hrs.
- Course need to be approved from MOOC Coordinator.
- Fill the MOOC approval form and submit it to the MOOC coordinator.

- Watch all lecture videos and read supplementary materials carefully.
- Participate actively in discussion forums, peer reviews, and live sessions.
- Take regular notes and summarize each module to reinforce understanding.
- Attempt all practice quizzes and formative assessments to monitor your progress.
- Give the presentation on selected MOOC course after course completion.
- Submit the report and certificate to the MOOC coordinator.

Evaluation Criteria

Sr. No	Criteria	Marks
1	Presentation and Oral	20
2	Certificate Submission	20
3	Report Submission	10

E-sources:

1. https://www.mooc.org/
2. https://swayam.gov.in/
3. https://onlinecourses.nptel.ac.in/
4. https://www.edx.org
5. https://www.coursera.org/
6. https://www.udemy.com/

Vision and Mission of Information Technology Department

Department Vision

To become a front-runner in the western region in preparing Information Technology engineers with academic excellence and research skills empowering their roles in technology and society.

Department Mission

1. To equip students with the skills and knowledge through a dynamic learning environment
2. To collaborate with industries to nurture proficient Information Technology Engineers
3. To cultivate a spirit of research, innovation, and entrepreneurship to address community and business challenges.
4. To imbibe work ethics and leadership skills through co-curricular and extracurricular activities.