

Information and Network Security			
Course Code	22SCE31	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3	SEE Marks	50
Total Hours of Pedagogy	50	Total Marks	100
Credits	4	Exam Hours	03
Course Learning objectives: <ul style="list-style-type: none"> • Explain the basics of Cryptography and Network Security. • Secure a message over insecure channel by various means. • Maintain the Confidentiality, Integrity, Reliability and Availability of a data. 			
Module-1			
Classical Encryption Techniques Symmetric Cipher Model, Cryptography, Cryptanalysis and BruteForce Attack, Substitution Techniques, Caesar Cipher, Mono-alphabetic Cipher, Playfair Cipher, Hill Cipher, Poly alphabetic Cipher, One Time Pad. Block Ciphers and the data encryption standard: Traditional block Cipher structure, stream Ciphers and block Ciphers, Motivation for the Feistel Cipher structure, the Feistel Cipher, The data encryption standard, DES encryption, DES decryption, A DES example, results, the avalanche effect, the strength of DES, the use of 56-Bit Keys, the nature of the DES algorithm, timing attacks, Block cipher design principles, number of rounds, design of function F, key schedule algorithm			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-2			
Public-Key Cryptography and RSA: Principles of public-key cryptosystems. Public-key cryptosystems. Applications for public-key cryptosystems, requirements for public-key cryptosystems. Public-key cryptanalysis. The RSA algorithm, description of the algorithm, computational aspects, the security of RSA. Other Public-Key Cryptosystems: Diffie-Hellman key exchange, The algorithm, key exchange protocols, man in the middle attack, Elgamal Cryptographic systems, Elliptic curve arithmetic, abelian groups, elliptic curves over real			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-3			
Key Management and Distribution: Symmetric key distribution using Symmetric encryption, A key distribution scenario, Hierarchical key control, session key lifetime, a transparent key control scheme, Decentralized key control, controlling key usage, Symmetric key distribution using asymmetric encryption, simple secret key distribution, secret key distribution with confidentiality and authentication, A hybrid scheme, distribution of public keys, public announcement of public keys, publicly available directory, public key authority, public keys certificates, X-509 certificates. Certificates, X-509 version 3, public key infrastructure. User Authentication: Remote user Authentication principles, Mutual Authentication, one way Authentication, remote user Authentication using Symmetric encryption, Mutual Authentication, one way Authentication, Kerberos, Motivation , Kerberos version 4, Kerberos version 5, Remote user Authentication using Asymmetric encryption, Mutual Authentication, one way Authentication, federated identity management, identity management, identity federation, personal identity verification.			

Teaching-Learning Process	Chalk and talk/PPT/case study/web content
Module-4	
Wireless network security: Wireless security, Wireless network threats, Wireless network measures, mobile device security, security threats, mobile device security strategy, IEEE 802.11 Wireless LAN overview, the Wi-Fi alliance, IEEE 802 protocol architecture. Security, IEEE 802.11i services, IEEE 802.11i phases of operation, discovery phase, Authentication phase, key management phase, protected data transfer phase, the IEEE 802.11i pseudorandom function. Web Security Considerations: Web Security Threats, Web Traffic Security Approaches. Secure Sockets Layer: SSL Architecture, SSL Record Protocol, Change Cipher Spec Protocol, Alert Protocol, and shake Protocol, Cryptographic Computations. Transport Layer Security: Version Number, Message Authentication Code, Pseudorandom Functions, Alert Codes, Cipher Suites, Client Certificate Types, Certificate Verify and Finished Messages, Cryptographic Computations, and Padding. HTTPS Connection Initiation, Connection Closure. Secure Shell(SSH) Transport Layer Protocol, User Authentication Protocol, Connection Protocol	
Teaching-Learning Process	Chalk and talk/PPT/case study/web content
Module-5	
Electronic Mail Security: Pretty good privacy, notation, operational; description, S/MIME, RFC5322, Multipurpose internet mail extensions, S/MIME functionality, S/MIME messages, S/MIME certificate processing, enhanced security services, Domain keys identified mail, internet mail architecture, E-Mail threats, DKIM strategy, DKIM functional flow. IP Security: IP Security overview, applications of IPsec, benefits of IPsec, Routing applications, IPsec documents, IPsec services, transport and tunnel modes, IP Security policy, Security associations, Security associations database, Security policy database, IP traffic processing, Encapsulating Security payload, ESP format, encryption and authentication algorithms, Padding, Anti replay service, transport and tunnel modes, combining security associations, authentication plus confidentiality, basic combinations of security associations, internet key exchange, key determinations protocol, header and payload formats, cryptographic suits.	
Teaching-Learning Process	Chalk and talk/PPT/case study/web content

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

1. Three Unit Tests each of **20 Marks**
2. Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
- Each full question will have a sub-question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Books

1. *Cryptography and Network Security*, William Stallings, Pearson, 6th Edition
2. *Cryptography and Information Security*, V K Pachghare, PHI, 2nd Edition

Web links and Video Lectures (e-Resources):

<https://www.coursera.org/specializations/computer-network-security>

Skill Development Activities Suggested

The students with the help of the course teacher can take up relevant technical – activities which will enhance their skill.

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Level
C01	Identify the vulnerabilities in any computing system and hence be able to design a security solution.	L2
C02	Identify the security issues in the network and resolve it.	L2
C03	Analyze security mechanisms using rigorous approaches, including theoretical.	L2
C04	Apply various protocols for network security to protect against the threats in the networks	L3

SCE 2022 Syllabus

Program Outcome of this course		
Sl. No.	Description	POs
1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and computer science and business systems to the solution of complex engineering and societal problems.	PO1
2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering and business problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	PO2
3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	PO3
4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	PO4
5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations	PO5
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering and business practices.	PO6
7	Environment and sustainability: Understand the impact of the professional engineering solutions in business societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	PO7
8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering and business practices.	PO8
9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	PO9
10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	PO10
11	Project management and finance: Demonstrate knowledge and understanding of the engineering, business and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	PO11
12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	PO12

Mapping of COS and POs

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P01 0	P01 1	P01 2
C01		x		x								
C02		x				x						
C03		x		x								
C04			x									x

SCE 2022 Syllabus

Cloud Security			
Course Code	22SCE321 Cloud Security	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	2:0:2	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Course Learning objectives: <ul style="list-style-type: none"> • Evaluate the different types of cloud solutions among IaaS, PaaS, SaaS • Generalize the Data Centre operations, encryption methods and deployment details. • Identify the security issues that arise from cloud computing architectures intended for delivering Cloud based enterprise IT services. 			
Module-1			
Cloud Computing Architectural Framework: Cloud Benefits, Business scenarios, Cloud Computing Evolution, cloud vocabulary, Essential Characteristics of Cloud Computing, Cloud deployment models, Cloud Service Models, Multi- Tenancy, Approaches to create a barrier between the Tenants, cloud computing vendors, Cloud Computing threats, Cloud Reference Model, The Cloud Cube Model, Security for Cloud Computing, How Security Gets Integrated.			
Teaching-Learning Process	Chalk and Talk/ PPT		
Module-2			
Compliance and Audit: Cloud customer responsibilities, Compliance and Audit Security Recommendations. Portability and Interoperability: Changing providers reasons, Changing providers expectations, Recommendations all cloud solutions, IaaS Cloud Solutions, PaaS Cloud Solutions, SaaS Cloud Solutions.			
Teaching-Learning Process	Chalk and Talk/ PPT		
Module-3			
Traditional Security, Business Continuity, Disaster Recovery, Risk of insider abuse, Security baseline, Customers actions, Contract, Documentation, Recovery Time Objectives (RTOs), Customers responsibility, Vendor Security Process (VSP).			
Teaching-Learning Process	Chalk and Talk/ PPT		
Module-4			
Data Center Operations: Data Center Operations, Security challenge, Implement Five Principal Characteristics of Cloud Computing, Data center Security Recommendations. Encryption and Key Management: Encryption for Confidentiality and Integrity, Encrypting data at rest, Key Management Lifecycle, Cloud Encryption Standards, Recommendations.			
Teaching-Learning Process	Chalk and Talk/ PPT		
Module-5			
Identity and Access Management: Identity and Access Management in the cloud, Identity and Access Management functions, Identity and Access Management (IAM) Model, Identity Federation, Identity Provisioning Recommendations, Authentication for SaaS and Paas customers, Authentication for IaaS customers, Introducing Identity Services, Enterprise Architecture with IDaaS , IDaaS Security			

Recommendations. Virtualization: Hardware Virtualization, Software Virtualization, Memory Virtualization, Storage Virtualization, Data Virtualization, Network Virtualization, Virtualization Security Recommendations.	
Teaching-Learning Process	Chalk and Talk/ PPT
<p>Assessment Details (both CIE and SEE)</p> <p>The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.</p> <p>Continuous Internal Evaluation:</p> <ul style="list-style-type: none"> • Three Unit Tests each of 20 Marks • Two assignments each of 20 Marks or one Skill Development Activity of 40 marks • to attain the COs and POs <p>The sum of three tests, two assignments/skill Development Activities, will be scaled down to 50 marks CIE methods /question paper is designed to attain the different levels of Bloom’s taxonomy as per the outcome defined for the course.</p> <p>Semester End Examination:</p> <ul style="list-style-type: none"> • The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50. • The question paper will have ten full questions carrying equal marks. • Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module. • Each full question will have a sub-question covering all the topics under a module. • The students will have to answer five full questions, selecting one full question from each module 	
<p>Suggested Learning Resources:</p> <p>Books</p> <ol style="list-style-type: none"> 1. Cloud Security and Privacy, An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, Oreilly Media Education, 2009. 2. Securing the Cloud, Cloud Computer Security Techniques and Tactics, Vic (J.R.) Winkler, Syngress 2011. 	
<p>Web links and Video Lectures (e-Resources):</p> <ul style="list-style-type: none"> • https://www.javatpoint.com/cloud-computing-tutorial • https://www.tutorialspoint.com/cloud_computing/index.htm • https://www.digimat.in/nptel/courses/video/106105167/L01.html 	
<p>Skill Development Activities Suggested</p> <p>The students with the help of the course teacher can take up relevant technical activities which will enhance their skill. The prepared report shall be evaluated for CIE marks.</p>	

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Level
CO1	Analyze industry security standards, certificates, regulatory mandates, audit policies, and compliance requirements.	L3
CO2	Demonstrate the growth of Cloud computing, architecture and different modules of implementation.	L3
CO3	Access the security implementation flow, actions and responsibilities of stake holders.	L3

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	X					X					x	
CO2		X	X									x
CO3			X		X							

SCE 2022 Syllabus

Blockchain Technology			
Course Code	22SCE322	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	2:0:2	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Course Learning objectives:			
<ul style="list-style-type: none"> • Explain the strong technical knowledge of Blockchain technologies. • Analyzing the blockchain decentralization and cryptography concepts. • Explore the driving force behind the cryptocurrency Bitcoin, along with the Decentralization. 			
Module-1			
Blockchain 101: Distributed systems, History of blockchain, Introduction to blockchain, Types of blockchain, CAP theorem and blockchain, Benefits and limitations of blockchain.			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-2			
Decentralization and Cryptography: Decentralization using blockchain, Methods of decentralization, Routes to decentralization, Decentralized organizations. Cryptography and Technical Foundations: Cryptographic primitives, Asymmetric cryptography, Public and private keys			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-3			
Bitcoin and Alternative Coins A: Bitcoin, Transactions, Blockchain, Bitcoin payments B: Alternative Coins, Theoretical foundations, Bitcoin limitations, Namecoin, Litecoin, Primecoin, Zcash			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-4			
Smart Contracts and Ethereum 101: Smart Contracts: Definition, Ricardian contracts. Ethereum 101:Introduction, Ethereum blockchain, Elements of the Ethereum blockchain, Precompiled contracts.			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-5			
Alternative Blockchains: Blockchains Blockchain-Outside of Currencies: Internet of Things, Government, Health, Finance, Media			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

1. Three Unit Tests each of **20 Marks**
2. Two assignments each of **20 Marks** or one **Skill Development Activity of 40 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
- Each full question will have a sub-question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Text Books:

- *Bitcoin and Cryptocurrency Technologies*, Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder, Princeton University, 2016

Reference Books:

- *Blockchain Basics: A Non-Technical Introduction in 25 Steps*, Daniel Drescher, Apress, First Edition, 2017
- *Mastering Bitcoin: Unlocking Digital Cryptocurrencies*, Andreas M. Antonopoulos, O'Reilly Media, First Edition, 2014

Web links and Video Lectures (e-Resources):

- <https://nptel.ac.in/courses/106105184>
- https://ocw.mit.edu/courses/15-s12-blockchain-and-money-fall-2018/video_galleries/video-lectures/

Skill Development Activities Suggested

The students with the help of the course teacher can take up relevant technical –activities which will enhance their skill. The prepared report shall be evaluated for CIE marks.

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Level
C01	Explore the emerging abstract models for Blockchain Technology and to familiarise with the functional/operational concepts.	L1
C02	Analyze the various consensus mechanisms, applications, research challenges and future directions.	L3
C03	Practical implementation of Blockchain operations and solutions using Ethereum	L3

Program Outcome of this course

Sl. No.	Description	POs
1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and computer science and business systems to the solution of complex engineering and societal problems.	PO1
2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering and business problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	PO2
3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	PO3
4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	PO4
5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations	PO5
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering and business practices.	PO6
7	Environment and sustainability: Understand the impact of the professional engineering solutions in business societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	PO7
8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering and business practices.	PO8
9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	PO9
10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	PO10
11	Project management and finance: Demonstrate knowledge and understanding of the engineering, business and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	PO11
12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	PO12

Mapping of COS and POs

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01		x		x			x					
C02	x			x								
C03		x								x		

SCE 2022 Syllabus

Object Oriented Software Engineering			
Course Code	22SCE323	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	2:0:2	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
<p>Course Learning objectives:</p> <ul style="list-style-type: none"> • Reduce the development time, and resources required to maintain existing applications. • Increase code reuse, and provide a competitive advantage to organizations that uses it. 			
Module-1			
INTRODUCTION: What is software engineering? Software Engineering Concepts, Development Activities, Managing Software Development, Modelling with UML, Project Organization and Communication.			
Teaching-Learning Process	Chalk and Talk/ PPT		
Module-2			
REQUIREMENT ELICITATION AND ANALYSIS: Requirements Elicitation: Requirements Elicitation Concepts, Requirements Elicitation Activities, Managing Requirements Elicitation, Analysis: Analysis Concepts, Analysis Activities, Managing Analysis.			
Teaching-Learning Process	Chalk and Talk/ PPT		
Module-3			
SYSTEM DESIGN: System design-Decomposing the system: Overview of System Design, System Design Concepts, System Design Activities: Objects to Subsystems, System Design – Addressing design goals: Activities: An overview of system design activities, UML deployment diagrams, Addressing Design Goals, Managing System Design.			
Teaching-Learning Process	Chalk and Talk/ PPT		
Module-4			
OBJECT DESIGN, IMPLEMENTATION AND TESTING : Object design-Reusing pattern solutions: An Overview of Object Design, Reuse Concepts: Design Patterns, Reuse Activities, Managing Reuse, Object design-Specifying interface: An overview of interface specification, Interfaces Specification Concepts, Interfaces Specification Activities, Managing Object Design, Mapping model to code: Mapping Models to Code Overview, Mapping Concepts, Mapping Activities, Managing Implementation, Testing: An overview of testing, Testing concepts, Managing testing.			
Teaching-Learning Process	Chalk and Talk/ PPT		
Module-5			
SOFTWARE MAINTENANCE AND SOFTWARE CONFIGURATION MANAGEMENT: Software maintenance: What is Software Maintenance?, Factors that Mandate Change, Lehman's Laws of system evolution, Types of software maintenance, Software maintenance process and activities, Reverse Engineering, Software Re-engineering, Patterns for Software Maintenance, Tool support for Software Maintenance. Software Configuration Management: The baseline of Software Life Cycle, What is Software Configuration Management, Why Software Configuration Management, Software Configuration Management Functions, Software Configuration Management Tools.			

Teaching-Learning Process	Chalk and Talk/ PPT													
<p>Assessment Details (both CIE and SEE)</p> <p>The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.</p> <p>Continuous Internal Evaluation:</p> <ul style="list-style-type: none"> • Three Unit Tests each of 20 Marks • Two assignments each of 20 Marks or one Skill Development Activity of 40 marks • to attain the COs and POs <p>The sum of three tests, two assignments/skill Development Activities, will be scaled down to 50 marks CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.</p> <p>Semester End Examination:</p> <ul style="list-style-type: none"> • The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50. • The question paper will have ten full questions carrying equal marks. • Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module. • Each full question will have a sub-question covering all the topics under a module. • The students will have to answer five full questions, selecting one full question from each module 														
<p>Suggested Learning Resources:</p> <p>Books</p> <ol style="list-style-type: none"> 3. Object-Oriented Software Engineering, Bernd Bruegge, Alan H Dutoit, Pearson Education, 3 rd edition, 2014. 4. Object oriented software engineering, David C. Kung, Tata McGraw Hill 2015. 5. Object oriented software engineering, Stephan R. Schach, Tata McGraw Hill 2008. 6. Applying UML and Patterns, Craig Larman, Pearson Education 3rd ed, 2005 														
<p>Web links and Video Lectures (e-Resources):</p>														
<ol style="list-style-type: none"> 1. https://medium.com/javarevisited/my-favorite-courses-to-learn-object-oriented-programming-and-design-in-2019-197bab351733 2. https://www.youtube.com/watch?v=BqVqjJq7_vI 														
<p>Skill Development Activities Suggested</p> <p>The students with the help of the course teacher can take up relevant technical activities which will enhance their skill. The prepared report shall be evaluated for CIE marks.</p>														
<p>Course outcome (Course Skill Set)</p> <p>At the end of the course the student will be able to :</p> <table border="1" data-bbox="188 1771 1513 1939"> <thead> <tr> <th data-bbox="188 1771 304 1805">Sl. No.</th> <th data-bbox="304 1771 1305 1805">Description</th> <th data-bbox="1305 1771 1513 1805">Blooms Level</th> </tr> </thead> <tbody> <tr> <td data-bbox="188 1805 304 1872">CO1</td> <td data-bbox="304 1805 1305 1872">Apply Object Oriented Software Engineering approach in every aspect of software project</td> <td data-bbox="1305 1805 1513 1872">L3</td> </tr> <tr> <td data-bbox="188 1872 304 1906">CO2</td> <td data-bbox="304 1872 1305 1906">Adapt appropriate object oriented design aspects in the development process</td> <td data-bbox="1305 1872 1513 1906">L4</td> </tr> <tr> <td data-bbox="188 1906 304 1939">CO3</td> <td data-bbox="304 1906 1305 1939">Adapt the concepts and tools related to software configuration management</td> <td data-bbox="1305 1906 1513 1939">L4</td> </tr> </tbody> </table>			Sl. No.	Description	Blooms Level	CO1	Apply Object Oriented Software Engineering approach in every aspect of software project	L3	CO2	Adapt appropriate object oriented design aspects in the development process	L4	CO3	Adapt the concepts and tools related to software configuration management	L4
Sl. No.	Description	Blooms Level												
CO1	Apply Object Oriented Software Engineering approach in every aspect of software project	L3												
CO2	Adapt appropriate object oriented design aspects in the development process	L4												
CO3	Adapt the concepts and tools related to software configuration management	L4												

Mapping of COS and POs

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	X					X						
C02		X	X									
C03			X		X							

SCE 2022 Syllabus

ADVANCES IN STORAGE AREA NETWORK			
Course Code	22SCE324	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	2:0:2	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Course Learning objectives:			
<ul style="list-style-type: none"> • Explain the contrast storage centric and server centric systems. • Define metrics used for Designing storage area networks. • Use the data centers for maintaining the data with the concepts of backup and remote mirroring concepts. 			
Module-1			
Introduction: Server Centric IT Architecture and its Limitations; Storage – Centric IT Architecture and its advantages. Case study: Replacing a server with Storage Networks The Data Storage and Data Access problem; The Battle for size and access. Intelligent Disk Subsystems: Architecture of Intelligent Disk Subsystems; Hard disks and Internal I/O Channels; JBOD, Storage virtualization using RAID and different RAID levels; Caching: Acceleration of Hard Disk Access; Intelligent disk subsystems, Availability of disk subsystems.			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-2			
I/O Techniques: The Physical I/O path from the CPU to the Storage System; SCSI; Fibre Channel Protocol Stack; Fibre Channel SAN; IP Storage. Network Attached Storage: The NAS Architecture, The NAS hardware Architecture, The NAS Software Architecture, Network connectivity, NAS as a storage system. File System and NAS: Local File Systems; Network file Systems and file servers; Shared Disk file systems; Comparison of fibre Channel and NAS.			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-3			
Storage Virtualization: Definition of Storage virtualization; Implementation Considerations; Storage virtualization on Block or file level; Storage virtualization on various levels of the storage Network; Symmetric and Asymmetric storage virtualization in the Network.			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-4			
SAN Architecture and Hardware devices: Overview, Creating a Network for storage; SAN Hardware devices; The fibre channel switch; Host Bus Adaptors; Putting the storage in SAN; Fabric operation from a Hardware perspective. Software Components of SAN: The switch's Operating system; Device Drivers; Supporting the switch's components; Configuration options for SANs.			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-5			
Management of Storage Network: System Management, Requirement of management System, Support by Management System, Management Interface, Standardized Mechanisms, Property Mechanisms, Inband Management, Use of SNMP, CIM and WBEM, Storage Management Initiative Specification (SMIS), CMIP and DMI, Optional Aspects of the Management of Storage Networks, Summary			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- Three Unit Tests each of **20 Marks**
- Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
- Each full question will have a sub-question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Books:

- *Storage Networks Explained*, Ulf Troppens, Rainer Erkens and Wolfgang Muller, Wiley India, 2013.
- *Storage Networks The Complete Reference*, Robert Spalding, Tata McGrawHill, 2011.
- *Storage Networking Fundamentals: An Introduction to Storage Devices Subsystems, Applications, Management, and File Systems*, Marc Farley, Cisco Press, 2005.

Web links and Video Lectures (e-Resources):

- <https://www.youtube.com/watch?v=akEr8cUAd5g>
- <https://www.udemy.com/topic/storage-area-network/>

Skill Development Activities Suggested

The students with the help of the course teacher can take up relevant technical –activities which will enhance their skill. The prepared report shall be evaluated for CIE marks.

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Level
CO1	Identify the need for performance evaluation and the metrics used for it	L2
CO2	Apply the techniques used for data maintenance.	L2
CO3	Realize strong virtualization concepts	L2
CO4	Illustrate RAID concepts, policies for LUN masking, file systems	L3

Program Outcome of this course

Sl. No.	Description	Pos
1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and computer science and business systems to the solution of complex engineering and societal problems.	PO1
2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering and business problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	PO2
3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	PO3
4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	PO4
5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations	PO5
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering and business practices.	PO6
7	Environment and sustainability: Understand the impact of the professional engineering solutions in business societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	PO7
8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering and business practices.	PO8
9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	PO9
10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	PO10
11	Project management and finance: Demonstrate knowledge and understanding of the engineering, business and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	PO11
12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	PO12

Mapping of COS and Pos

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01		x					x					
C02	x											x
C03			x		x							
C04		x					x					

SCE 2022 Syllabus

Advances in Data Base Management System			
Course Code	22SCE325	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Course Learning objectives:			
<ul style="list-style-type: none"> • Differentiate the different types of database system architectures. • Implement advanced object oriented database queries using Structured Query Language. • Describe the advanced querying with information retrieval. 			
Module-1			
Review of Relational Data Model and Relational Database Constraints: Relational model concepts; Relational model constraints and relational database schemas; Update operations, anomalies, dealing with constraint violations, Types and violations. Object and Object-Relational Databases: Overview of Object Database Concepts, Object Database Extensions to SQL, The ODMG Object Model and the Object Definition Language ODL, Object Database Conceptual Design, The Object Query Language OQL, Overview of the C++ Language Binding in the ODMG Standard.			
Teaching-Learning Process	Chalk and Talk PPT		
Module-2			
Disk Storage, Basic File Structures, Hashing, and Modern Storage Architectures: Introduction, Secondary Storage Devices, Buffering of Blocks, Placing File Records on Disk Operations on Files, Files of Unordered Records (Heap Files) , Files of Ordered Records (Sorted Files), Hashing Techniques, Other Primary File Organizations, Parallelizing Disk Access Using RAID Technology, Modern Storage Architectures. Distributed Database Concepts: Distributed Database Concepts, Data Fragmentation, Replication, and Allocation Techniques for Distributed Database Design, Overview of Concurrency Control and Recovery in Distributed Databases, Overview of Transaction Management in Distributed Databases, Query Processing and Optimization in Distributed Databases, Types of Distributed Database Systems , Distributed Database Architectures, Distributed Catalog Management.			
Teaching-Learning Process	Chalk and Talk PPT		
Module-3			
NOSQL Databases and Big Data Storage Systems: Introduction to NOSQL Systems, The CAP Theorem, Document-Based NOSQL Systems and MongoDB, NOSQL Key-Value Stores, Column-Based or Wide Column NOSQL Systems, NOSQL Graph Databases and Neo4j. Big Data Technologies Based on MapReduce and Hadoop: What Is Big Data? Introduction to MapReduce and Hadoop, Hadoop Distributed File System (HDFS), MapReduce: Additional Details Hadoop v2 alias YARN, General Discussion			

Teaching-Learning Process	Chalk and Talk PPT
Module-4	
Enhanced Data Models: Introduction to Active, Temporal, Spatial, Multimedia, and Deductive Databases: Active Database Concepts and Triggers, Temporal Database Concepts, Spatial Database Concepts, Multimedia Database Concepts, Introduction to Deductive Databases. Introduction to Information Retrieval and Web Search: Information Retrieval (IR) Concepts, Retrieval Models, Types of Queries in IR Systems, Text Preprocessing, Inverted Indexing, Evaluation Measures of Search Relevance, Web Search and Analysis. Trends in Information Retrieval	
Teaching-Learning Process	Chalk and Talk PPT
Module-5	
Data Mining Concepts: Overview of Data Mining Technology, Association Rules, Classification, Clustering, Approaches to Other Data Mining Problems, Applications of Data Mining, Commercial Data Mining Tools Overview of Data Warehousing and OLAP: Introduction, Definitions, and Terminology, Characteristics of Data Warehouses, Data Modeling for Data Warehouses, Building a Data Warehouse, Typical Functionality of a Data Warehouse, Data Warehouse versus Views, Difficulties of Implementing Data Warehouses	
Teaching-Learning Process	Chalk and Talk PPT
<p>Assessment Details (both CIE and SEE)</p> <p>The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.</p> <p>Continuous Internal Evaluation:</p> <ul style="list-style-type: none"> • Three Unit Tests each of 20 Marks • Two assignments each of 20 Marks or one Skill Development Activity of 40 marks to attain the COs and POs <p>The sum of three tests, two assignments/skill Development Activities, will be scaled down to 50 marks</p> <p>CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.</p> <p>Semester End Examination:</p> <ul style="list-style-type: none"> • The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50. • The question paper will have ten full questions carrying equal marks. • Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module. • Each full question will have a sub-question covering all the topics under a module. • The students will have to answer five full questions, selecting one full question from each module 	

Suggested Learning Resources:**Books**

- Fundamentals of Database Systems Elmasri and Navathe Pearson Education 2013
- Database Management Systems Raghu Ramakrishnan and Johannes Gehrke McGraw-Hill 3rd Edition, 2013.
- Database System Concepts Abraham Silberschatz, Henry F. Korth, S. Sudarshan McGraw Hill 6th Edition, 2010

Web links and Video Lectures (e-Resources):

- <https://www.tutorialspoint.com/dbms/index.htm>
- <https://www.javatpoint.com/dbms-tutorial>
- <https://www.youtube.com/watch?v=hKljaVcCMgg&list=PLANTs44t4TVFZ6i8flu0wOBv3FVUMc89>

Skill Development Activities Suggested

The students with the help of the course teacher can take up relevant technical – activities which will enhance their skill.

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Le
C01	Select the appropriate high performance database like parallel and distributed database	L2
C02	Infer and represent the real world data using object oriented database	L2
C03	Interpret rule set in the database to implement data warehousing of mining	L3
C04	Identify and resolve physical database design and implementation issues.	L2

Program Outcome of this course		
Sl. No.	Description	POs
1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and computer science and business systems to the solution of complex engineering and societal problems.	PO1
2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering and business problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	PO2
3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	PO3
4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	PO4
5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations	PO5
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering and business practices.	PO6
7	Environment and sustainability: Understand the impact of the professional engineering solutions in business societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	PO7
8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering and business practices.	PO8
9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	PO9
10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	PO10
11	Project management and finance: Demonstrate knowledge and understanding of the engineering, business and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	PO11
12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	PO12

Mapping of COS and POs

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P01 0	P01 1	P01 2
C01		x									x	
C02			x		x							x
C03				x	x							
C04		x	x									

SCE 2022 Syllabus

Advances in Computer Networks			
Course Code	22SCE331	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Course Learning objectives: <ul style="list-style-type: none"> Students will be able to explain various network protocols of their respective layers. 			
Module-1			
Foundation: Building a Network, Requirements, Perspectives, Scalable Connectivity, Cost-Effective Resource sharing, Support for Common Services, Manageability, Protocol layering, Performance, Bandwidth and Latency, Delay X Bandwidth Product, Perspectives on Connecting, Classes of Links, Reliable Transmission, Stop-and-Wait, Sliding Window, Concurrent Logical Channels.			
Teaching-Learning Process	Chalk and talk PPT		
Module-2			
Internetworking I: Switching and Bridging, Datagram's, Virtual Circuit Switching, Source Routing, Bridges and LAN Switches, Basic Internetworking (IP), What is an Internetwork?, Service Model, Global Addresses, Datagram Forwarding in IP, sub netting and classless addressing, Address Translation (ARP), Host Configuration (DHCP), Error Reporting (ICMP), Virtual Networks and Tunnels.			
Teaching-Learning Process	Chalk and talk PPT		
Module-3			
Internetworking- II: Network as a Graph, Distance Vector (RIP), Link State (OSPF), Metrics, The Global Internet, Routing Areas, Routing among Autonomous systems (BGP), IP Version 6 (IPv6), Mobility and Mobile IP			
Teaching-Learning Process	Chalk and talk PPT		
Module-4			
End-to-End Protocols: Simple Demultiplexer (UDP), Reliable Byte Stream(TCP), End-to-End Issues, Segment Format, Connecting Establishment and Termination, Sliding Window Revisited, Triggering Transmission, Adaptive Retransmission, Record Boundaries, TCP Extensions, Queuing Disciplines, FIFO, Fair Queuing, TCP Congestion Control, Additive Increase/ Multiplicative Decrease, Slow Start, Fast Retransmit and Fast Recovery			

Teaching-Learning Process	Chalk and talk PPT
Module-5	
Congestion Control and Resource Allocation Congestion-Avoidance Mechanisms, DEC bit, Random Early Detection (RED), Source-Based Congestion Avoidance. The Domain Name System (DNS), Electronic Mail (SMTP,POP,IMAP,MIME), World Wide Web (HTTP), Network Management (SNMP)	
Teaching-Learning Process	Chalk and talk PPT
<p>Assessment Details (both CIE and SEE)</p> <p>The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.</p> <p>Continuous Internal Evaluation:</p> <ul style="list-style-type: none"> • Three Unit Tests each of 20 Marks • Two assignments each of 20 Marks or one Skill Development Activity of 40 marks to attain the COs and POs <p>The sum of three tests, two assignments/skill Development Activities, will be scaled down to 50 marks</p> <p>CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.</p> <p>Semester End Examination:</p> <ul style="list-style-type: none"> • The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50. • The question paper will have ten full questions carrying equal marks. • Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module. • Each full question will have a sub-question covering all the topics under a module. • The students will have to answer five full questions, selecting one full question from each module 	
<p>Suggested Learning Resources:</p> <p>Text Books:</p> <ul style="list-style-type: none"> • <i>Computer Networks: A System Approach</i>, Larry Peterson and Bruce S Davis, Elsevier, 5th Edition 2014 • <i>Internetworking with TCP/IP, Principles, Protocols and Architecture</i>, Douglas E Comer, PHI, 6th Edition 2014. <p>Reference Books:</p> <ul style="list-style-type: none"> • <i>Computer Networks, Protocols, Standards and Interfaces</i>, Uyles Black , PHI, 2 nd Edition • <i>TCP /IP Protocol Suite</i>, Behrouz A Forouzan, Tata McGraw-Hill, 4 th Edition 	
Web links and Video Lectures (e-Resources):	

- <https://www.udemy.com/course/computer-networks-for-beginners-from-zero-to-hero/>
- <https://www.youtube.com/watch?v=f5ksLu5Xjnk&list=PLG9aCp4uE-s3Mmbn4q5J87OriIN3CuFDS>
- <https://sites.google.com/site/computernetworksfall2009/course-outline>

Skill Development Activities Suggested

The students with the help of the course teacher can take up relevant technical – activities which will enhance their skill

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Level
C01	List and classify network services, protocols and architectures, explain why they are layered.	L1
C02	Choose key Internet applications and their protocols and apply to develop their own applications (e.g. Client Server applications, Web Services) using the sockets API.	L3
C03	Develop effective communication mechanisms using techniques like connection establishment, queuing theory, recovery Etc.	L2

Program Outcome of this course		
Sl. No.	Description	POs
1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and computer science and business systems to the solution of complex engineering and societal problems.	PO1
2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering and business problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	PO2
3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	PO3
4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	PO4
5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations	PO5
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering and business practices.	PO6
7	Environment and sustainability: Understand the impact of the professional engineering solutions in business societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	PO7
8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering and business practices.	PO8
9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	PO9
10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	PO10
11	Project management and finance: Demonstrate knowledge and understanding of the engineering, business and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	PO11
12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	PO12

Mapping of COS and POs

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	x			x								
C02			x		x		x			x		
C03		x	x									x

SCE 2022 Syllabus

Advanced Algorithms			
Course Code	22SCE332	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Course Learning objectives: <ul style="list-style-type: none"> • Explore advanced topics in algorithmics and complexity theory. • Engage in analysis and design of complex algorithms for real-world problems in current application domains. • Study advanced / novel algorithm design strategies and techniques • Interpret sturdy / open problems in algorithmics or complexity theory by analyzing known approaches and their limitations. 			
Module-1			
Review of Analysis Techniques: Growth of Functions: Asymptotic notations; Standard notations and common functions; Recurrences and Solution of Recurrence equations- The substitution method, The recurrence – tree method, The master method; Amortized Analysis: Aggregate, Accounting and Potential Methods.			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-2			
Graph Algorithms: Bellman - Ford Algorithm; Single source shortest paths in a DAG; Johnson's Algorithm for sparse graphs; Flow networks and Ford-Fulkerson method; Maximum bipartite matching. Polynomials and the FFT: Representation of polynomials; The DFT and FFT; Efficient implementation of FFT.			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-3			
Number -Theoretic Algorithms: Elementary notions; GCD; Modular Arithmetic; Solving modular linear equations; The Chinese remainder theorem; Powers of an element; RSA cryptosystem; Primality testing; Integer factorization			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-4			
String-Matching Algorithms: Naïve string Matching; Rabin - Karp algorithm; String matching with finite automata; Knuth-Morris-Pratt algorithm; Boyer – Moore algorithms.			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-5			
Probabilistic and Randomized Algorithms: Probabilistic algorithms; Randomizing deterministic algorithms, Monte Carlo and Las Vegas algorithms; Probabilistic numeric algorithms			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content:		

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- Three Unit Tests each of **20 Marks**
- Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
- Each full question will have a sub-question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Text Books:

- T. H Cormen, C E Leiserson, R L Rivest and C Stein. *Introduction to Algorithms*. PHI, 3rd Edition, 2010.
- Kenneth A. Berman. *Algorithms*. Cengage Learning. 2002.

Reference Books:

- Ellis Horowitz, SartajSahni, S.Rajasekharan. *Fundamentals of Computer Algorithms*. Universities press. 2nd Edition, 2007

Web links and Video Lectures (e-Resources):

- <https://pages.cs.wisc.edu/~shuchi/courses/787-F07/about.html>
- <https://www.youtube.com/watch?v=0JUN9aDxVmI&list=PL2SOU6wwxB0uP4rJgf5ayhHWgw7akUWSf>

Skill Development Activities Suggested

- The students with the help of the course teacher can take up relevant technical –activities which will enhance their skill.

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Level
CO1	Apply iterative and recursive algorithms	L2
CO2	Work optimization algorithms in specific applications.	L2
CO3	Choose appropriately shared objects and concurrent objects for applications.	L2

Program Outcome of this course

Sl. No.	Description	POs
1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and computer science and business systems to the solution of complex engineering and societal problems.	PO1
2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering and business problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	PO2
3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	PO3
4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	PO4
5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations	PO5
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering and business practices.	PO6
7	Environment and sustainability: Understand the impact of the professional engineering solutions in business societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	PO7
8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering and business practices.	PO8
9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	PO9
10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	PO10
11	Project management and finance: Demonstrate knowledge and understanding of the engineering, business and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	PO11
12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	PO12

Mapping of COS and POs

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	x		X		x							
C02		x	X		X	x						
C03			x		x	x						

SCE 2022 Syllabus

Mobile Application Development			
Course Code	22SCE333	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Course Learning objectives:			
<ul style="list-style-type: none"> • Able to explain the overview of Mobile App Development • Able to explain the App Design Issues and Considerations • To Develop the Mobile App 			
Module-1			
Introduction to mobile communication and computing: Introduction to mobile computing, Novel applications, limitations and GSM architecture, Mobile services, System architecture, Radio interface, protocols, Handover and security. Smart phone operating systems and smart phones applications.			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content: https://youtu.be/iANBytZ26MI		
Module-2			
Fundamentals of Android Development: Introduction to Android., The Android 4.1 Jelly Bean SDK, Understanding the Android Software Stack, Installing the Android SDK, Creating Android Virtual Devices, Creating the First Android Project, Using the Text View Control, Using the Android Emulator.			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content: https://youtu.be/KqaPMCMHH4g		
Module-3			
The Intent of Android Development, Four kinds of Android Components: Activity, Service, Broadcast Receiver and Content Provider. Building Blocks for Android Application Design, Laying Out Controls in Containers. Graphics and Animation: Drawing graphics in Android, Creating Animation with Android's Graphics API.			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content: https://youtu.be/b-IvmXo00bU		
Module-4			

Creating the Activity, working with views: Exploring common views, using a list view, creating custom views, understanding layout. Using Selection Widgets and Debugging Displaying and Fetching Information Using Dialogs and Fragments. Multimedia: Playing Audio, Playing Video and Capturing Media. Advanced Android Programming: Internet, Entertainment, and Services.

Teaching-Learning Process	Chalk and talk/PPT/case study/web content: https://youtu.be/SqvAaB3vK8U
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Module-5

Displaying web pages and maps, communicating with SMS and emails. Creating and using content providers: Creating and consuming services, publishing android applications

Teaching-Learning Process	Chalk and talk/PPT/case study/web content: https://youtu.be/Ihl7DPBAZ1g
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Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- Three Unit Tests each of **20 Marks**
- Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
- Each full question will have a sub-question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:		
Text Books:		
<ul style="list-style-type: none"> • <i>Mobile Computing: (technologies and Applications.</i> N. N. Jani. S chand • <i>Android programming.</i> B.M.Hirwani. Pearson publications. 2013. • <i>Android in Action.</i> W. Frank Ableson, RobiSen and C. E. Ortiz. DreamTech Publisher. Third Edition-2012. 		
Refence Books:		
<ul style="list-style-type: none"> • <i>Android Application development.</i> James C. Sheusi. Cengage learning. 2017. 		
Web links and Video Lectures (e-Resources):		
<ul style="list-style-type: none"> • https://tinyurl.com/5du53uam • https://www.ibm.com/cloud/learn/mobile-application-development-explained • https://tinyurl.com/mscezade • 		
Skill Development Activities Suggested		
<ul style="list-style-type: none"> • The students with the help of the course teacher can take up relevant technical –activities which will enhance their skill. The prepared report shall be evaluated for CIE marks. 		
Course outcome (Course Skill Set)		
At the end of the course the student will be able to :		
Sl. No.	Description	Blooms Level
C01	Describe the requirements for mobile applications	L2
C02	Explain the challenges in mobile application design and development	L2
C03	Deploy mobile applications in Android and iPone marketplace for distribution	L3

Program Outcome of this course		
Sl. No.	Description	POs
1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and computer science and business systems to the solution of complex engineering and societal problems.	PO1
2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering and business problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	PO2
3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	PO3
4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	PO4
5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations	PO5
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering and business practices.	PO6
7	Environment and sustainability: Understand the impact of the professional engineering solutions in business societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	PO7
8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering and business practices.	PO8
9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	PO9
10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	PO10
11	Project management and finance: Demonstrate knowledge and understanding of the engineering, business and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	PO11
12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	PO12

Mapping of COS and POs

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	x	x										x
C02		x		x								
C03			x		x						x	

SCE 2022 Syllabus

Wireless Networks & Mobile Computing			
Course Code	22SCE334	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Course Learning objectives:			
<ul style="list-style-type: none"> To develop the concept of systems thinking in the context of mobile and wireless systems To develop knowledge of the interplay of concepts and multiple sub-disciplines in mobile and wireless systems. To gain knowledge and experience in applying various computation methods and algorithms as a part of software development 			
Module-1			
Mobile Computing Architecture: Architecture for Mobile Computing, 3-tier Architecture, Design Considerations for Mobile Computing. Emerging Technologies: Wireless broadband (WiMAX), Mobile IP: Introduction, discovery, Registration, Tunneling, Cellular IP, Mobile IP with IPv6. Wireless Networks: Global Systems for Mobile Communication (GSM): GSM Architecture, Entities, Call routing in GSM, PLMN Interface, GSM Addresses and Identities, Network Aspects in GSM, Mobility Management, GSM Frequency allocation. Short Service Messages (SMS): Introduction to SMS, SMS Architecture, SMMT, SMMO, SMS as Information bearer, applications, GPRS and Packet Data Network, GPRS Network Architecture, GPRS Network Operations, Data Services in GPRS, Applications for GPRS, Billing and Charging in GPRS.			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content: https://youtu.be/HorJOe2yl8Q		
Module-2			
Spread Spectrum technology, IS-95, CDMA versus GSM, Wireless Data, Third Generation Networks, Applications on 3G, Mobile Client: Moving beyond desktop, Mobile handset overview, Mobile phones and their features, PDA, Design Constraints in applications for handheld devices.			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content : https://youtu.be/qz0aGYrrlhU		
Module-3			
Mobile OS and Computing Environment: Smart Client Architecture, The Client: User Interface, Data Storage, Performance, Data Synchronization, Messaging. The Server: Data Synchronization, Enterprise Data Source, Messaging. Mobile Operating Systems: WinCE, Palm OS, Symbian OS, Linux, Proprietary OS Client Development: The development process, Need analysis phase, Design phase, Implementation and Testing phase, Deployment phase, Development Tools, Device Emulators			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content: https://youtu.be/6mbwJ2xhgzM?list=PLu0W_9lII9agiCUZYRsvtGTxdxkzPyItg		
Module-4			
Building Wireless Internet Applications: Thin client overview: Architecture, the client, Middleware, messaging Servers, Processing a Wireless request, Wireless Applications Protocol (WAP) Overview, Wireless Languages: Markup Languages, HDML, WML, HTML, cHTML, XHTML, VoiceXML.			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content: https://youtu.be/nVzrfog33j4		
Module-5			
J2ME: Introduction, CDC, CLDC, MIDP; Programming for CLDC, MIDlet model, Provisioning, MIDlet life cycle, Creating new application, MIDlet event handling, GUI in MIDP, Low level GUI Components, Multimedia APIs; Communication in MIDP, Security Considerations in MIDP.			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content: https://youtu.be/6EukZDFE_Zg		

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- Three Unit Tests each of **20 Marks**
- Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
- Each full question will have a sub-question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:**Books:**

1. Steven Holzner, "HTML Black Book", Dremtech press.
2. Web Technologies, Black Book, Dreamtech Press
3. Web Applications : Concepts and Real World Design, Knuckles, Wiley-India
4. Internet and World Wide Web How to program, P.J. Deitel & H.M. Deitel Pearson.

Web links and Video Lectures (e-Resources):

- <https://www.youtube.com/watch?v=JsbxB2l7QGY>
- <https://www.geeksforgeeks.org/web-technology>
- <https://youtu.be/HorlOe2yl8Q>
- https://youtu.be/pWG7ajC_OVo?list=PL4cUxeGkcC9gksOX3Kd9KP0-068ncT05o
- https://youtu.be/6EukZDFE_Zg
- <https://youtu.be/xr6uZDRTna0>

Skill Development Activities Suggested

- The students with the help of the course teacher can take up relevant technical –activities which will enhance their skill. The prepared report shall be evaluated for CIE marks.

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Level
C01	List various tags in html and use these, apply Cascaded style sheet to create web page.	L1
C02	Design and Explain the basic concept of XML and Create XML documents and Schema.	L3
C03	Compare Servlet and JSP concepts and apply JSP concepts to create dynamic web Pages by reducing the code complexity and store data in database.	L2
C04	Illustrate the usage of web servers and use this to develop webpage and store data in database in JSP on Web server.	L3
C05	Develop solution to complex problems using appropriate method, technologies, framework, web services and content management.	L4

Program Outcome of this course

Sl. No.	Description	POs
1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and computer science and business systems to the solution of complex engineering and societal problems.	Po1
2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering and business problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	PO2
3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	PO3
4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	PO4
5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations	PO5
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering and business practices.	PO6
7	Environment and sustainability: Understand the impact of the professional engineering solutions in business societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	PO7
8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering and business practices.	PO8
9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	PO9
10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	PO10
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12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	PO12

Mapping of COS and POs

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	x											x
C02			x									
C03					x							
C04	x											
C05				x								

SCE 2022 Syllabus

Business Intelligence and its Applications			
Course Code	22SCE335	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Course Learning objectives:			
<ul style="list-style-type: none"> • Define the fundamental concepts of Business Intelligence and its implementation. • Appreciate the importance of Business reporting and performance measurement. • Gain the knowledge and skills for using data warehouses and data mining techniques for business intelligence purposes. 			
Module-1			
Development Steps, BI Definitions, BI Decision Support Initiatives, Development Approaches, Parallel Development Tracks, BI Project Team Structure, Business Justification, Business Divers, Business Analysis Issues, Cost – Benefit Analysis, Risk Assessment, Business Case Assessment Activities, Roles Involved In These Activities, Risks Of Not Performing Step, Hardware, Middleware, DBMS Platform, Non Technical Infrastructure Evaluation			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-2			
Managing The BI Project, Defining And Planning The BI Project, Project Planning Activities, Roles And Risks Involved In These Activities, General Business Requirement, Project Specific Requirements, Interviewing Process			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-3			
Differences in Database Design Philosophies, Logical Database Design, Physical Database Design, Activities, Roles And Risks Involved In These Activities, Incremental Rollout, Security Management, Database Backup And Recovery			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-4			
Growth Management, Application Release Concept, Post Implementation Reviews, Release Evaluation Activities, The Information Asset and Data Valuation, Actionable Knowledge – ROI, BI Applications, The Intelligence Dashboard			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-5			
Business View of Information technology Applications: Business Enterprise excellence, Key purpose of using IT, Type of digital data, basics f enterprise reporting, BI road ahead.			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		

Assessment Details (both CIE and SEE)

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4. Each full question will have a sub-question covering all the topics under a module.
5. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:**Text Books:**

1. Larissa T Moss and ShakuAtre, Business Intelligence Roadmap: The Complete Project Lifecycle for Decision Support Applications, Addison Wesley Information Technology Series, 2003.
2. R N Prasad, SeemaAcharya, Fundamentals of Business Analytics, Wiley India, 2011

Reference Books:

1. David Loshin, Business Intelligence: The Savvy Manager's Guide, Morgan Kaufmann
2. Brian Larson, Delivering Business Intelligence with Microsoft SQL Server 2005, McGraw Hill, 2006.
3. Lynn Langit, Foundations of SQL Server 2008 Business Intelligence, Apress, 2011

Web links and Video Lectures (e-Resources):

- <https://www.geeksforgeeks.org/what-is-business-intelligence/>
- <https://www.udemy.com/topic/business-intelligence/>

Skill Development Activities Suggested

- The students with the help of the course teacher can take up relevant technical –activities which will enhance their skill.

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Level
CO1	Explain the complete life cycle of BI/Analytical development	L2
CO2	Illustrate technology and processes associated with Business Intelligence framework	L3
CO3	Demonstrate a business scenario, identify the metrics, indicators and make recommendations to achieve the business goal.	L2

Program Outcome of this course		
Sl. No.	Description	POs
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2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering and business problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	PO2
3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	PO3
4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	PO4
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12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	PO12

Mapping of COS and POs												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01		x					x					
C02	x											x
C03			x		x							

PROJECT WORK PHASE - 1			
Course Code	22SCE34	CIE Marks	100
Number of contact Hours/Week	6	SEE Marks	--
Credits	03	Exam Hours	--
<p>Course objectives:</p> <ul style="list-style-type: none"> • Support independent learning. • Guide to select and utilize adequate information from varied resources maintaining ethics. • Guide to organize the work in the appropriate manner and present information (acknowledging the sources) clearly. • Develop interactive, communication, organisation, time management, and presentation skills. • Impart flexibility and adaptability. • Inspire independent and team working. • Expand intellectual capacity, credibility, judgement, intuition. • Adhere to punctuality, setting and meeting deadlines. • Instil responsibilities to oneself and others. • Train students to present the topic of project work in a seminar without any fear, face audience confidently, enhance communication skill, involve in group discussion to present and exchange ideas. 			
<p>Project Phase-1 Students in consultation with the guide/s shall carry out literature survey/ visit industries to finalize the topic of the Project. Subsequently, the students shall collect the material required for the selected project, prepare synopsis and narrate the methodology to carry out the project work.</p> <p>Seminar: Each student, under the guidance of a Faculty, is required to</p> <ul style="list-style-type: none"> • Present the seminar on the selected project orally and/or through power point slides. • Answer the queries and involve in debate/discussion. • Submit two copies of the typed report with a list of references. <p>The participants shall take part in discussion to foster friendly and stimulating environment in which the students are motivated to reach high standards and become self-confident.</p>			
<p>Course outcomes:</p> <p>At the end of the course the student will be able to:</p> <ul style="list-style-type: none"> • Demonstrate a sound technical knowledge of their selected project topic. • Undertake problem identification, formulation, and solution. • Design engineering solutions to complex problems utilising a systems approach. • Communicate with engineers and the community at large in written and oral forms. • Demonstrate the knowledge, skills and attitudes of a professional engineer. 			
<p>Continuous Internal Evaluation</p> <p>CIE marks for the project report (50 marks), seminar (30 marks) and question and answer (20 marks) shall be awarded (based on the quality of report and presentation skill, participation in the question and answer session by the student) by the committee constituted for the purpose by the Head of the Department. The committee shall consist of three faculty from the department with the senior most acting as the Chairperson.</p>			

Societal Project			
Course Code	22SCE35	CIE Marks	100
Number of contact Hours/Week	6	SEE Marks	
Credits	3	Exam Hours	03
Course objectives:			
<ul style="list-style-type: none"> • Build creative solutions for development problems of current scenario in the Society. • Utilize the skills developed in the curriculum to solve real life problems. • Improve understanding and develop methodology for solving complex issues. 			
Some of the domains to choose for societal projects:			
<ul style="list-style-type: none"> • Infrastructure • Health Care • Social security • Security for women • Transportation • Business Continuity • Remote working and Education • Digital Finance • Food Security • Rural employment • Water and land management • Pollution • Financial Independence • Agricultural Finance • Primary Health care • Nutrition • Child Care • E-learning • Distance parenting • Mentorship Etc • 			
Course outcomes:			
At the end of the course the student will be able to:			
<ul style="list-style-type: none"> • Building solution for real life societal problems. • Improvement of their technical/curriculum skills 			
Continuous Internal Evaluation:			
Identifying the real life problems and producing literature report : 20 marks			
Data sampling and Cleaning :10 Marks			
Establishing the right Objective: 10 Marks			
Developing the solution : 20 Marks			
Propagating the solution to the stake holders 1)Lectures 2)Social Meetings 3)Social media 4)Street plays 5)Advertisement Either of the 3(evidence of the work through geo tag photo) certified by stake holders and authorized by concerned government authorities			
Project Report: 20 marks. The basis for awarding the marks shall be the involvement of the student in the project and in the preparation of project report. To be awarded by the internal guide in consultation with external guide if any.			
Project Presentation: 10 marks.			
The Project Presentation marks of the Project Work Phase -II shall be awarded by the committee constituted for the purpose by the Head of the Department. The committee shall consist of three faculty from the department with the senior most acting as the Chairperson.			
Evaluation: 10 marks.			
The student shall be evaluated based on the ability in the Question and Answer session for 10 marks.			

INTERNSHIP / PROFESSIONAL PRACTICE			
Course Code	22SCEI36	CIE Marks	50
Number of contact Hours/Week	3	SEE Marks	50
Credits	06	Exam Hours	03
<p>Course objectives: Internship/Professional practice provide students the opportunity of hands-on experience that include personal training, time and stress management, interactive skills, presentations, budgeting, marketing, liability and risk management, paperwork, equipment ordering, maintenance, responding to emergencies etc. The objective are further, To put theory into practice. To expand thinking and broaden the knowledge and skills acquired through course work in the field. To relate to, interact with, and learn from current professionals in the field. To gain a greater understanding of the duties and responsibilities of a professional. To understand and adhere to professional standards in the field. To gain insight to professional communication including meetings, memos, reading, writing, public speaking, research, client interaction, input of ideas, and confidentiality. To identify personal strengths and weaknesses. To develop the initiative and motivation to be a self-starter and work independently.</p>			
<p>Internship/Professional practice: Students under the guidance of internal guide/s and external guide shall take part in all the activities regularly to acquire as much knowledge as possible without causing any inconvenience at the place of internship. Seminar: Each student, is required to</p> <ul style="list-style-type: none"> • Present the seminar on the internship orally and/or through power point slides. • Answer the queries and involve in debate/discussion. • Submit the report duly certified by the external guide. • The participants shall take part in discussion to foster friendly and stimulating environment in which the students are motivated to reach high standards and become self-confident. 			
<p>Course outcomes: At the end of the course the student will be able to:</p> <ul style="list-style-type: none"> • Gain practical experience within industry in which the internship is done. • Acquire knowledge of the industry in which the internship is done. • Apply knowledge and skills learned to classroom work. • Develop a greater understanding about career options while more clearly defining personal career goals. • Experience the activities and functions of professionals. • Develop and refine oral and written communication skills. • Identify areas for future knowledge and skill development. • Expand intellectual capacity, credibility, judgment, intuition. • Acquire the knowledge of administration, marketing, finance and economics. 			
<p>Continuous Internal Evaluation CIE marks for the Internship/Professional practice report (30 marks), seminar (10 marks) and question and answer session (10 marks) shall be awarded (based on the quality of report and presentation skill, participation in the question and answer session by the student) by the committee constituted for the purpose by the Head of the Department. The committee shall consist of three faculty from the department with the senior most acting as the Chairperson.</p>			
<p>Semester End Examination SEE marks for the internship report (20 marks), seminar (20 marks) and question and answer session (10 marks) shall be awarded (based on the quality of report and presentation skill, participation in the question and answer session) by the examiners appointed by the University.</p>			

PROJECT WORK PHASE -2			
Course Code	22SCE41	CIE Marks	100
Number of contact Hours/Week	8	SEE Marks	100
Credits	18	Exam Hours	03
<p>Course objectives:</p> <ul style="list-style-type: none"> • To support independent learning. • To guide to select and utilize adequate information from varied resources maintaining ethics. • To guide to organize the work in the appropriate manner and present information (acknowledging the sources) clearly. • To develop interactive, communication, organization, time management, and presentation skills. • To impart flexibility and adaptability. • To inspire independent and team working. • To expand intellectual capacity, credibility, judgement, intuition. • To adhere to punctuality, setting and meeting deadlines. • To instil responsibilities to oneself and others. • To train students to present the topic of project work in a seminar without any fear, face audience confidently, enhance communication skill, involve in group discussion to present and exchange ideas. 			
<p>Project Work Phase - II: Each student of the project batch shall involve in carrying out the project work jointly in constant consultation with internal guide, co-guide, and external guide and prepare the project report as per the norms avoiding plagiarism.</p> <ul style="list-style-type: none"> • Follow the Software Development life cycle • Data Collection ,Planning • Design the Test cases • Validation and verification of attained results • Significance of parameters w.r.t scientific quantified data. • Publish the project work in reputed Journal. 			
<p>Course outcomes:</p> <p>At the end of the course the student will be able to:</p> <ul style="list-style-type: none"> • Present the project and be able to defend it. • Make links across different areas of knowledge and to generate, develop and evaluate ideas and information so as to apply these skills to the project task. • Habituated to critical thinking and use problem solving skills • Communicate effectively and to present ideas clearly and coherently in both the written and oral forms. • Work in a team to achieve common goal. • Learn on their own, reflect on their learning and take appropriate actions to improve it. 			
<p>Continuous Internal Evaluation:</p> <p>Project Report: 20 marks. The basis for awarding the marks shall be the involvement of the student in the project and in the preparation of project report. To be awarded by the internal guide in consultation with external guide if any.</p> <p>Project Presentation: 20 marks.</p> <p>The Project Presentation marks of the Project Work Phase -II shall be awarded by the committee constituted for the purpose by the Head of the Department. The committee shall consist of three faculty from the department with the senior most acting as the Chairperson.</p> <p>Project Execution: 50 Marks</p> <p>The Project Execution marks of the Project Work Phase -II shall be awarded by the committee constituted for the purpose by the Head of the Department. The committee shall consist of three faculty from the department with the senior most acting as the Chairperson.</p> <p>Question and Answer: 10 marks.</p> <p>The student shall be evaluated based on the ability in the Question and Answer session for 10 marks.</p> <p>Semester End Examination</p> <p>SEE marks for the project report (60 marks), seminar (30 marks) and question and answer session (10 marks) shall be awarded (based on the quality of report and presentation skill, participation in the question and answer session) by the examiners appointed by the University.</p>			