MOOGAMBIGAI CHARITABLE AND EDUCATIONAL TRUST

Rajarajeswari College of Engineering

(An Autonomous Institution under Visvesvaraya Technological University, Belagavi)
#14, Ramohalli Cross, Kumbalagodu, Mysore Road, Bengaluru–560074

M.Tech in Computer Science and Engineering

II Semester Scheme and Syllabus

(2024 Scheme)

VISION

To empower young minds through technology, research and innovation, to produce technically competent and socially responsible professionals in higher education.

MISSION

1. To deliver excellence in education through innovative teaching, impactful research, and continuous skill development, preparing students to meet global challenges with technical expertise and ethical responsibility.
2. To foster a transformative learning environment that integrates technology, research and practical experience, empowering students to become skilled professionals and socially conscious leaders.
3. To cultivate a culture of lifelong learning and professional excellence by encouraging creativity, research, and community engagement, equipping students with the skills to thrive in a dynamic world.
4. To provide a holistic educational experience that combines advanced technology, hands-on research, and community-focused learning, shaping students into competent, ethical professionals who contribute positively to society.

QUALITY POLICY

Rajarajeswari College of Engineering is committed to imparting quality technical education that nurtures competent, ethical professionals with global relevance. We ensure academic excellence through a dynamic, outcome-based curriculum, experienced faculty, and cutting-edge infrastructure. Continuous improvement is driven by innovation, research and strong industry collaboration. We foster holistic development and a progressive environment that supports lifelong learning, teamwork, and professional growth.

CORE VALUES

Academic Excellence, Integrity, Innovation, Global Competence, Continuous Improvement.

INDEX

MOOGAMBIGAI CHARITABLE AND EDUCATIONAL TRUST

Rajarajeswari College of Engineering

(An Autonomous Institution under Visvesvaraya Technological University, Belagavi)

M. Tech in Computer Science and Engineering

Scheme of Teaching and Examinations – 2024

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2025-26)

II Semester

S. No	Course Category and Course Code		Course Title	TD/PSB	Teaching Hours/ Week			Examination				Credits
					Lecture	Tutorial/ SDA	Practical/ Seminar	SEE Duration Hours	CIE Marks	SEE Marks	Total Marks	
					L	T/S	P					
1.	**PCC**	**P24SCS201**	Advanced Operating System	CSE	**3**	**2**	**0**	**3**	**50**	**50**	**100**	**4**
2.	**IPCC**	**P24SCS202**	Advances in computer Networks	CSE	**3**	**0**	**2**	**3**	**50**	**50**	**100**	**4**
3.	**PCC**	**P24SCS203**	Network programming	CSE	**3**	**0**	**0**	**3**	**50**	**50**	**100**	**3**
4.	**PCC**	**P24SCSX214**	Professional Elective - 1	CSE	**3**	**0**	**0**	**3**	**50**	**50**	**100**	**3**
5.	**PCC**	**P24SCSX215**	Professional Elective - 2	CSE	**3**	**0**	**0**	**3**	**50**	**50**	**100**	**3**
6.	**PROJ**	**P24SCSP206**	Mini Project	CSE	**0**	**0**	**6**	**3**	**50**	**50**	**100**	**3**
7.	**PCCL**	**P24SCSL207**	Network Programming Lab	CSE	**0**	**0**	**2**	**3**	**50**	**50**	**100**	**1**
8.	**SEC**	**P24SCS208**	Skill Enhancement For Research Excellence – 1 (MCQ)	CSE	**1**	**0**	**0**	**1**	**50**	**50**	**100**	**1**
TOTAL									**400**	**400**	**800**	**22**

PCC: Professional core Course, IPCC-Integrated Professional Core Courses, PCC(PB): Professional Core Courses (Project Based), PCCL-Professional Core Course lab ,NCMC- None Credit Mandatory Course, ,L-Lecture, T/SDA-Tutorial / Skill Development Activities, P-Practical.

Professional Elective - 1		Professional Elective - 2	
Course Code	**Name of the Course**	**Course Code**	**Name of the Course**
P24SCSA214	Blockchain Technology	P24SCSA215	Computer Vision
P24SCSB214	Information and Network Security	P24SCSB215	Wireless Network and Mobile Computing
P24SCSC214	Deep Learning	P24SCSC215	Software Project Planning and Management
P24SCSD214	Decision Support Systems	P24SCSD215	Multimedia Communications

HOD **Dean-Academics** **Principal**

SEMESTER-II					
ADVANCED OPERATING SYSTEM **Category: PCC**					
Course Code	:	P24SCS201	CIE	:	50 Marks
Teaching Hours L : P : SDA	:	3:2:0	SEE	:	50 Marks
Total Hours	:	50	Total	:	100 Marks
Credits	:	4	SEE Duration	:	3 Hrs

Course Objectives	
1.	Analyze the Characteristics of operating systems for multiprocessor and multicomputer architectures.
2.	Understand and address the challenges related to designing operating systems.
3.	Explore the latest trends in developing mobile operating systems.
4.	Evaluate the implications of these trends on performance and user experience.
5.	Analyze how architectural differences influence operating system design functionality.

Module 1	**No. of Hours.**
Multiprocessor Operating Systems: System Architectures – Structures of OS – OS design issues – Process synchronization – Process Scheduling and Allocation – Memory Management.	10
Module 2	**No. of Hours.**
Distributed Operating Systems: System Architectures – Design issues – Communication models – clock synchronization – mutual exclusion – election algorithms – Distributed Deadlock detection.	10
Module 3	**No. of Hours.**
Distributed scheduling – Distributed shared memory – Distributed File system – Multimedia file systems – File placement – catching.	10
Module 4	**No. of Hours.**
Database Operating Systems: Requirements of Database OS – Transaction process model – Synchronization primitives – Concurrency control algorithms.	10
Module 5	**No. of Hours.**
Mobile Operating Systems: ARM and Intel architectures – Power management – Mobile OS Architectures, Underlying OS – Kernel structure and native level programming – Runtime issues – Approaches to power management.	10

Course Outcomes: At the end of the course, the students will be able to	
CO1	Analyze the characteristics of operating systems for multiprocessor and multi computer architectures.
CO2	Understand and address the challenges related to designing operating systems and their implications.
CO3	Explore the latest trends in developing mobile operating systems and evaluate their impact on performance.
CO4	Equip students with a deep understanding on transaction processing models, synchronization mechanisms, and concurrency control algorithms.
CO5	Provide students with a comprehensive understanding of mobile operating system design across ARM and Intel architectures.

Text Books	
1.	M singhal and NG Shivaratri, Advanced Concepts in Operating Systems, Tata McGraw Hill Inc, 2001
2.	

Reference Text Books	
1.	A S Tanenbaum, Distributed Operating Systems, Pearson Education Asia, 2001
2.	Source Wikipedia, Mobile Operating Systems, General Books LLC, 2010

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 marks for the CIE is 50% of the maximum marks and Minimum passing marks for the SEE is 40% of the maximum marks of SEE. The minimum passing marks is 50% i.e. sum of the CIE and SEE together.

CONTINUOUS INTERNAL EVALUATION (CIE):

Component	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks
Theory	Internal Assessment1	50	30 (Average of Best Two Assessments)	50
	Internal Assessment2	50		
	Internal Assessment3	50		
Self learning	Two Assignments	20	10	
	Seminar Presentation	20	10	
SEE	Semester End Examination	100	50	50
Grand Total				100

SEMESTER END EXAMINATION

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. Two questions of 20 marks (with minimum of 3 sub questions) from each module with internal choice.
3. Students should answer five full questions, selecting one full question from each module.
4. Question papers to be set as per the Blooms Taxonomy levels.

SEMESTER-II					
ADVANCES IN COMPUTER NETWORKS **Category: IPCC**					
Course Code	:	P24SCS202	CIE	:	50 Marks
Teaching Hours L:T:P	:	3:0:2	SEE	:	50 Marks
Total Hours	:	45+30	Total	:	100 Marks
Credits	:	4	SEE Duration	:	3 Hrs

Course Objectives	
1.	To understand various network protocols of their respective layers.
2.	To introduce the foundational concepts and mechanisms of internetworking, including, switching, bridging, IP-Based communication, addressing and core protocols.
3.	To provide an in-depth understanding of advanced internetworking concepts, including dynamic routing protocols, inter-domain routing, IPv6, and mobility support.
4.	To develop a thorough understanding of end-to-end communication protocols, particularly UDP and TCP, with emphasis on reliability, flow and performance optimization.
5.	To explore key internet application protocols and network management systems such as DNS, email protocols, HTTP and SNMP.

Module - 1	**No. of Hours**
Foundation: Building a network, Requirements, Perspectives, Scalable Connectivity, Cost-Effective Resources 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.	9
Module – 2	**No. of Hours**
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.	9
Module - 3	**No. of Hours**
Internetworking II: Network as a Graph, Distance Vector (RIP), Link state (OSPF), Metrics, The Global Internet, routing areas, routing autonomous systems (BGP), IP Version 6 (IPv6), mobility and mobile IP.	9
Module - 4	**No. of Hours**
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	9
Module – 5	**No. of Hours**
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)	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Identify the vulnerabilities in any computing system and hence be able to design a security solution
CO2	Identify the security issues in the network and resolve it.
CO3	Analyze security mechanisms using rigorous approaches, including theoretical
CO4	Apply various protocols for network security to protect against the threats in the networks
CO5	To analyze and apply congestion control mechanisms and resource allocation strategies in computer networks, and demonstrate working knowledge of key internet protocols

Text Books	
1.	Larry Peteson and Bruce S Davis, Computer Networks: A System Approach, Elsevier, 5th Edition, 2014
2.	Douglas E Comer, Internetworking with TCP/IP, Principles, Protocols and Architecture, PHI, 6th edition, 2014

Reference Text Books	
1.	Uyless Black, Computer Networks, protocols, Standards and Interfaces, PHI, 2nd edition.
2.	Behruoz A Forouzan, TCP/IP Protocol Suite, Tata McGraw Hill, 4th 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

Sl. No	List of Experiments
1.	Write a program to archive Traffic management at Flow level by implementing Closed Loop Control technique. (Leaky Bucket Algorithm)
2.	Write a program to implement dynamic routing strategy in finding optimal path for data transmission. (Bellman ford algorithm).
3.	Write a program to implement Link State Routing (Dijkstra Algorithm).
4.	Write a program for providing security for transfer of data in the network. (RSA Algorithm)
5.	Write a program for encrypting 64 bit playing text using DES algorithm
6.	Apply the RSA algorithm on a text file to produce cipher text file
7.	Develop a mechanism to setup a security channel using Diffie-Hellman Key Exchange between client and server
8.	Implement secure hash algorithm for Data Integrity. Implement MD5 and SHA-1 algorithm, which accepts a string input, and produce a fixed size number - 128 bits for MD5; 160 bits for SHA-1, this number is a hash of the input. Show that a small change in the input results in a substantial change in the output.
Simulation Programs using OPNET /NS2/NS3 or any other equivalent software 9	
9.	Simulate a 3 node point to point network with duplex links between them. Set the Queue size and vary the bandwidth and find the number of packets dropped.
10.	Simulate a four-node point-to-point network, and connect the links as follows: n0->n2, n1- >n2 and n2 >n3. Apply TCP agent changing the parameters and determine the number of packets sent/received by TCP/UDP

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 marks for the CIE is 50% of the maximum marks and Minimum passing marks for the SEE is 40% of the maximum marks of SEE. The minimum passing marks is 50% i.e. sum of the CIE and SEE together.

CONTINUOUS INTERNAL EVALUATION (CIE):

Component	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks
Theory	Internal Assessment-1	50	30 (Average of Best Two Assessments)	50/2 = 25
	Internal Assessment-2	50		
	Internal Assessment-3	50		
Self Learning	Two Assignments	10+10	20	
Laboratory	Record & Observation	Evaluating each expt. for 10 marks*12 expts.	10	25
	Lab Internal Test	50	15	
SEE	Semester End Examination	100	50	50
Grand Total				100

SEMESTER END EXAMINATION

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. Two questions of 20 marks (with minimum of 3 sub questions) from each module with internal choice.
3. Students should answer five full questions, selecting one full question from each module.
4. Question papers to be set as per the Blooms Taxonomy levels.

SEMESTER-II					
NETWORK PROGRAMMING **Category: PCC**					
Course Code	:	P24SCS203	CIE	:	50 Marks
Teaching Hours L:T:P	:	3:0:0	SEE	:	50 Marks
Total Hours	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs.

Course Objectives	
1.	Define the key protocols which support the Internet.
2.	Explore working of the TCP/UDP Sockets.
3.	Demonstrate applications using techniques such as multiplexing, forking, multithreading.
4.	To enable them to implement Unix domain protocols for both stream and datagram client/server communication models.
5.	To enable students to understand and implement various TCP-based client/server design models, exploring iterative, concurrent, preforked, and multithreaded architectures.

Module - 1	**No. of Hours.**
Introduction to network application, client/server communication, OSI Model, BSD Networking history, Test Networks and Hosts, Unix Standards, 64-bit architectures, Transport Layer: TCP, UDP and SCTP	9
Module - 2	**No. of Hours.**
Sockets Introduction – socket address structures, value-result arguments, byte ordering and manipulation functions, address conversion functions, Elementary TCP Sockets – socket, connect, bind, listen, accept , fork and concurrent server design, getcsockname and getpeername functions and TCP Client/Server Example.	9
Module - 3	**No. of Hours.**
I/O Multiplexing and Socket Options – I/O Modules, select function, str_cli function, batch input and buffering, shutdown function, TCP Echo Server, pselect function, poll function.	9
Module - 4	**No. of Hours.**
Advanced I/O functions – Socket timeouts, recv and send functions, readv, writev, sendmsg and recvmsg. Unix domain protocols - socket address structure, socketpair functions, socket functions Unix domain stream client/server , Unix domain Datagram client/server .	9
Module - 5	**No. of Hours.**
Client/Server Design Alternatives – TCP Client Alternatives, TCP Test Client, TCP Iterative server, TCP Concurrent server, TCP preforked server, no locking around accept, TCP preforked server, file locking around accept, TCP preforked server, thread locking around accept, TCP preforked server, descriptor passing, TCP concurrent server, one thread per client.	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Explain the concept of Networking and Transport Layer: TCP, UDP and SCTP.
CO2	Illustrate the working of Sockets.
CO3	To implement and optimize I/O multiplexing techniques using functions like select, pselect, and poll, and efficiently handle socket options and buffering in networked applications.
CO4	To effectively utilize advanced I/O functions such as socket timeouts, recv, send, readv, writev, and sendmsg/recvmsg.
CO5	Implement, and evaluate various TCP-based client/server architectures, applying appropriate synchronization techniques, connection handling models, and inter-process communication mechanisms.

Text Books	
1.	W. Richard Stevens, Bill Fenner, Andrew M. Rudoff, UNIX Network Programming, Pearson Volume 1, 3rd edition 2004

Reference Text Books	
1.	Network Programming in C Barry Nance, PHI 2002
2.	Bob Quinn, windows Socket Network Programming, Dave Shute Pearson, 2003
3.	Richard Stevens, UNIX Network Programming, 2nd edition.

Web links and Video lectures (e-Resources)
• https://www.coursera.org/learn/advanced-data-structures • https://nptel.ac.in/courses/106106133 • https://pages.cs.wisc.edu/~shuchi/courses/787-F07/about.html • https://www.youtube.com/watch?v=0JUN9aDxVmI&list=PL2SOU6wwxB0uP4rJgf5ayhHWgw7akUWSf

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 marks for the CIE is 50% of the maximum marks and Minimum passing marks for the SEE is 40% of the maximum marks of SEE. The minimum passing marks is 50% i.e. sum of the CIE and SEE together.

CONTINUOUS INTERNAL EVALUATION (CIE):

Component	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks
Theory	**Internal Assessment1**	**50**	**30 (Average of Best Two Assessments)**	**50**
	Internal Assessment2	**50**		
	Internal Assessment3	**50**		
Self learning	**Two Assignments**	**20**	**10**	
	Seminar Presentation	**20**	**10**	
SEE	**Semester End Examination**	**100**	**50**	**50**
Grand Total				**100**

SEMESTER END EXAMINATION

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. Two questions of 20 marks (with minimum of 3 sub questions) from each module with internal choice.
3. Students should answer five full questions, selecting one full question from each module.
4. Question papers to be set as per the Blooms Taxonomy levels.

SEMESTER-II					
BLOCKCHAIN TECHNOLOGY **Category: PCC**					
Course Code	:	P24SCSA214	CIE	:	50 Marks
Teaching Hours L:T:P	:	3:0:0	SEE	:	50 Marks
Total Hours	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs.

Course Objectives	
1.	Explain the strong technical knowledge of Blockchain technologies.
2.	Analyzing the blockchain decentralization and cryptography concepts.
3.	Explore the driving force behind the cryptocurrency Bitcoin, along with the Decentralization.

Module - 1	**No. of Hours.**
Blockchain 101: Distributed systems, History of blockchain, Introduction to blockchain, Types of blockchain, CAP theorem and blockchain, Benefits and limitations of blockchain.	9
Module - 2	**No. of Hours.**
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	9
Module - 3	**No. of Hours.**
Bitcoin and Alternative Coins A: Bitcoin, Transactions, Blockchain, Bitcoin payments B: Alternative Coins, Theoretical foundations, Bitcoin limitations, Namecoin, Litecoin, Primecoin, Zcash	9
Module - 4	**No. of Hours.**
Smart Contracts and Ethereum 101: Smart Contracts: Definition, Ricardian contracts. Ethereum 101: Introduction, Ethereum blockchain, Elements of the Ethereum blockchain, Precompiled contracts.	9
Module - 5	**No. of Hours.**
Alternative Blockchains: Blockchains Blockchain-Outside of Currencies: Internet of Things, Government, Health, Finance, Media	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Explore the emerging abstract models for Blockchain Technology and to familiarise with the functional/operational concepts.
CO2	Analyze the various consensus mechanisms, applications, research challenges and future directions.
CO3	Practical implementation of Blockchain operations and solutions using Ethereum

Text Books	
1.	Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder, Bitcoin and Cryptocurrency Technologies, Princeton University, 2016

Reference Text Books	
1.	Daniel Drescher, Blockchain Basics: A Non-Technical Introduction in 25 Steps, Apress, 1st Edition, 2017
2.	Andreas M. Antonopoulos, Mastering Bitcoin: Unlocking Digital Cryptocurrencies, O'Reilly Media, 1st 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/

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 marks for the CIE is 50% of the maximum marks and Minimum passing marks for the SEE is 40% of the maximum marks of SEE. The minimum passing marks is 50% i.e. sum of the CIE and SEE together.

CONTINUOUS INTERNAL EVALUATION (CIE):

Component	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks
Theory	**Internal Assessment1**	**50**	**30 (Average of Best Two Assessments)**	**50**
	Internal Assessment2	**50**		
	Internal Assessment3	**50**		
Self learning	**Two Assignments**	**20**	**10**	
	Seminar Presentation	**20**	**10**	
SEE	**Semester End Examination**	**100**	**50**	**50**
Grand Total				**100**

SEMESTER END EXAMINATION

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. Two questions of 20 marks (with minimum of 3 sub questions) from each module with internal choice.
3. Students should answer five full questions, selecting one full question from each module.
4. Question papers to be set as per the Blooms Taxonomy levels.

SEMESTER-II					
INFORMATION AND NETWORK SECURITY **Category: PCC**					
Course Code	:	P24SCSB214	CIE	:	50 Marks
Teaching Hours L:T:P	:	3:0:0	SEE	:	50 Marks
Total Hours	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs.

Course Objectives	
1.	Explain the basics of Cryptography and Network Security.
2.	Secure a message over insecure channel by various means.
3.	Maintain the Confidentiality, Integrity, Reliability and Availability of a data.

Module - 1	**No. of Hours.**
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	9
Module - 2	**No. of Hours.**
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	9
Module - 3	**No. of Hours.**
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.	9
Module - 4	**No. of Hours.**
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	9
Module - 5	**No. of Hours.**
Electronic Mail Security: Pretty good privacy, notation, operational; description, S/MIME, RFC5322, Multipurpose internet mail extensions, S/MIME functionality, S/MIME messages, S/MIME	9

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.	

Course Outcomes: At the end of the course, the students will be able to	
CO1	Identify the vulnerabilities in any computing system and hence be able to design a security solution.
CO2	Identify the security issues in the network and resolve it.
CO3	Analyze security mechanisms using rigorous approaches, including theoretical.
CO4	Apply various protocols for network security to protect against the threats in the networks.

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

Web links and Video lectures (e-Resources)
• https://www.coursera.org/specializations/computer-network-security

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 marks for the CIE is 50% of the maximum marks and Minimum passing marks for the SEE is 40% of the maximum marks of SEE. The minimum passing marks is 50% i.e. sum of the CIE and SEE together.

CONTINUOUS INTERNAL EVALUATION (CIE):

Component	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks
Theory	Internal Assessment1	50	30 (Average of Best Two Assessments)	50
	Internal Assessment2	50		
	Internal Assessment3	50		
Self learning	Two Assignments	20	10	
	Seminar Presentation	20	10	
SEE	Semester End Examination	100	50	50
Grand Total				100

SEMESTER END EXAMINATION

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. Two questions of 20 marks (with minimum of 3 sub questions) from each module with internal choice.
3. Students should answer five full questions, selecting one full question from each module.
4. Question papers to be set as per the Blooms Taxonomy levels.

SEMESTER-II					
DEEP LEARNING **Category: PCC**					
Course Code	:	P24SCSC214	CIE	:	50 Marks
Teaching Hours L:T:P	:	3:0:0	SEE	:	50 Marks
Total Hours	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs.

Course Objectives	
1.	Discuss the context of neural networks and deep learning
2.	Have a working knowledge of neural networks and deep learning
3.	Explore the parameters for neural networks

Module - 1	**No. of Hours.**
Machine Learning Basics: Learning Algorithms, Capacity, Overfitting and Underfitting, Hyperparameters and Validation Sets, Estimator, Bias and Variance, Maximum Likelihood Estimation, Bayesian Statistics, Supervised Learning Algorithms, Unsupervised Learning Algorithms, Stochastic Gradient Descent, building a Machine Learning Algorithm, Challenges Motivating Deep Learning.	9
Module - 2	**No. of Hours.**
Deep Feedforward Networks: Gradient-Based Learning, Hidden Units, Architecture Design, BackPropagation. Regularization: Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under Constrained Problems, Dataset Augmentation, Noise Robustness, SemiSupervised Learning, Multi-Task Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Bagging, Dropout.	9
Module - 3	**No. of Hours.**
Optimization for Training Deep Models: How Learning Differs from Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms. Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates. Convolutional Networks: The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features.	9
Module - 4	**No. of Hours.**
Sequence Modelling: Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks. Long short-term memory	9
Module - 5	**No. of Hours.**
Practical Methodology: Performance Metrics, Default Baseline Models, Determining Whether to Gather More Data, Selecting Hyperparameters, Debugging Strategies, Example: Multi-Digit Number Recognition. Applications: Vision, NLP, Speech.	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains.
CO2	Implement deep learning algorithms and solve real-world problems.
CO3	Execute performance metrics of deep learning techniques.
CO4	Compare modelling aspects of various neural network architectures.

Text Books	
1.	Lan Good fellow and YoshuaBengio, Deep Learning, MIT Press https://www.deeplearn ingbook.org/ 2016.
2.	Raúl Rojas, Neural Networks: Asystematic Introduction, 1996.
3.	Chirstopher Bishop, Pattern Recognition and machine Learning, 2007.

Web links and Video lectures (e-Resources)

- https://www.simplilearn.com/tutorials/deep-learning-tutorial
- https://www.kaggle.com/learn/intro-to-deep-learning
- https://www.javatpoint.com/deep-learning

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 marks for the CIE is 50% of the maximum marks and Minimum passing marks for the SEE is 40% of the maximum marks of SEE. The minimum passing marks is 50% i.e. sum of the CIE and SEE together.

CONTINUOUS INTERNAL EVALUATION (CIE):

Component	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks
Theory	Internal Assessment1	50	30 (Average of Best Two Assessments)	50
	Internal Assessment2	50		
	Internal Assessment3	50		
Self learning	Two Assignments	20	10	
	Seminar Presentation	20	10	
SEE	Semester End Examination	100	50	50
Grand Total				100

SEMESTER END EXAMINATION

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. Two questions of 20 marks (with minimum of 3 sub questions) from each module with internal choice.
3. Students should answer five full questions, selecting one full question from each module.
4. Question papers to be set as per the Blooms Taxonomy levels.

SEMESTER-II					
DECISION SUPPORT SYSTEM **Category: PCC**					
Course Code	:	P24SCSD214	CIE	:	50 Marks
Teaching Hours L:T:P	:	3:0:0	SEE	:	50 Marks
Total Hours	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs.

Course Objectives	
1.	Recognize the relationship between business information needs and decision making
2.	Select appropriate modeling techniques
3.	To analyze, design and implement a DSS

Module - 1	**No. of Hours.**
Introduction to decision support systems: DSS Defined, History of decision support systems, Ingredients of a DSS, Data and model management, DSS Knowledge base, User interfaces, User interfaces, The DSS user, Categories and classes of DSSs, Chapter Summary. Decisions and decision makers Decision makers: who are they, Decision styles, Decision effectiveness, How can a DSS help?, A Typology of decisions, Decision theory and simon's model of problem solving, Bounded decision making, The process of choice, Cognitive processes, Biases and heuristics in decision making	9
Module - 2	**No. of Hours.**
Decisions in the organization: Understanding the organization, Organizational culture. Modelling decision processes: Defining the problem and its structures, Decision models, Types of probability, Techniques for forecasting probabilities, Calibration and sensitivity	9
Module - 3	**No. of Hours.**
Group decision support and groupware technologies: Group Decision making, the problem with groups, MDM support technologies, Managing MDM activities, the virtual workspace, chapter summary. Executive information systems: What exactly is an EIS, Some EIS history, Why area top executives so different?, EIS components, Making the EIS work, The future of executive decision making and the EIS.	9
Module - 4	**No. of Hours.**
Designing and building decision support systems: Strategies for DSS analysis and design, The DSS developer, DSS user interface issues, chapter summary. Implementing and integrating decision support systems: DSS implementation, System evaluation, The importance of integration, chapter summary.	9
Module - 5	**No. of Hours.**
Creative decision making and problem solving What is creativity?, Creativity defined, The occurrence of creativity, Creative problem solving techniques, Creativity and the role of technology, chapter summary.	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Appraise issues related to the development of DSS
CO2	Select appropriate modeling techniques
CO3	Analyze and implement a DSS
CO4	Demonstrate qualitative and quantitative skills and critical thinking to proficiencies in the application of theory surrounding the DSS.

Text Books	
1.	George M.Marakas, Decision support system, PHI, 2011.
2.	Marakas, Decision Support Systems, 2nd Edition, Pearson India, 2015.

Web links and Video lectures (e-Resources)
• https://www.coursera.org/lecture/business-intelligence-tools/decision-supportsystems-videolecture-E8P9x

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 marks for the CIE is 50% of the maximum marks and Minimum passing marks for the SEE is 40%

of the maximum marks of SEE. The minimum passing marks is 50% i.e. sum of the CIE and SEE together.

CONTINUOUS INTERNAL EVALUATION (CIE):

Component	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks
Theory	Internal Assessment1	50	30 (Average of Best Two Assessments)	50
	Internal Assessment2	50		
	Internal Assessment3	50		
Self learning	Two Assignments	20	10	
	Seminar Presentation	20	10	
SEE	Semester End Examination	100	50	50
Grand Total				100

SEMESTER END EXAMINATION

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. Two questions of 20 marks (with minimum of 3 sub questions) from each module with internal choice.
3. Students should answer five full questions, selecting one full question from each module.
4. Question papers to be set as per the Blooms Taxonomy levels.

SEMESTER-II					
COMPUTER VISION **Category: PCC**					
Course Code	:	P24SCSA215	CIE	:	50 Marks
Teaching Hours L:T:P	:	3:0:0	SEE	:	50 Marks
Total Hours	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs.

Course Objectives	
1.	Explore the fundamentals of image formation.
2.	Discuss the major ideas, methods, and techniques of computer vision and pattern recognition.
3.	To implement algorithms and techniques to analyze and interpret the visible world around us.

Module - 1	**No. of Hours.**
CAMERAS: Pinhole Cameras, Radiometry – Measuring Light: Light in Space, Light Surfaces, Important Special Cases, Sources, Shadows, And Shading: Qualitative Radiometry, Sources and Their Effects, Local Shading Models, Application: Photometric Stereo, Interreflections: Global Shading Models, Color: The Physics of Color, Human Color Perception, Representing Color, A Model for Image Color, Surface Color from Image Color.	9
Module - 2	**No. of Hours.**
Linear Filters: Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transforms, Sampling and Aliasing, Filters as Templates, Edge Detection: Noise, Estimating Derivatives, Detecting Edges, Texture: Representing Texture, Analysis (and Synthesis) Using Oriented Pyramids, Application: Synthesis by Sampling Local Models, Shape from Texture.	9
Module - 3	**No. of Hours.**
The Geometry of Multiple Views: Two Views, Stereopsis: Reconstruction, Human Stereposis, Binocular Fusion, Using More Cameras, Segmentation by Clustering: What Is Segmentation?, Human Vision: Grouping and Getstalt, Applications: Shot Boundary Detection and Background Subtraction, Image Segmentation by Clustering Pixels, Segmentation by Graph-Theoretic Clustering.	9
Module - 4	**No. of Hours.**
Segmentation by Fitting a Model: The Hough Transform, Fitting Lines, Fitting Curves, Fitting as a Probabilistic Inference Problem, Robustness, Segmentation and Fitting Using Probabilistic Methods: Missing Data Problems, Fitting, and Segmentation, The EM Algorithm in Practice, Tracking With Linear Dynamic Models: Tracking as an Abstract Inference Problem, Linear Dynamic Models, Kalman Filtering, Data Association, Applications and Examples.	9
Module - 5	**No. of Hours.**
Geometric Camera Models: Elements of Analytical Euclidean Geometry, Camera Parameters and the Perspective Projection, Affine Cameras and Affine Projection Equations, Geometric Camera Calibration: Least-Squares Parameter Estimation, A Linear Approach to Camera Calibration, Taking Radial Distortion into Account, Analytical Photogrammetry, An Application: Mobile Robot Localization, Model- Based Vision: Initial Assumptions, Obtaining Hypotheses by Pose Consistency, Obtaining Hypotheses by pose Clustering, Obtaining Hypotheses Using Invariants, Verification, Application: Registration In Medical Imaging Systems, Curved Surfaces and Alignment.	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Implement fundamental image processing techniques required for computer vision.
CO2	Perform shape analysis.
CO3	Implement boundary tracking techniques.
CO4	Apply chain codes and other region descriptors.

Text Books	
1.	David A. Forsyth and Jean Ponce, Computer Vision – A Modern Approach, PHI Learning, 2009.
2.	E. R. Davies, Computer and Machine Vision – Theory, Algorithms and Practicalities, Elsevier 4th Edition, 2013

Web links and Video lectures (e-Resources)
• https://www.digimat.in/nptel/courses/video/108103174/L19.html

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 marks for the CIE is 50% of the maximum marks and Minimum passing marks for the SEE is 40% of the maximum marks of SEE. The minimum passing marks is 50% i.e. sum of the CIE and SEE together.

CONTINUOUS INTERNAL EVALUATION (CIE):

Component	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks
Theory	Internal Assessment1	50	30 (Average of Best Two Assessments)	50
	Internal Assessment2	50		
	Internal Assessment3	50		
Self learning	Two Assignments	20	10	
	Seminar Presentation	20	10	
SEE	Semester End Examination	100	50	50
Grand Total				100

SEMESTER END EXAMINATION

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. Two questions of 20 marks (with minimum of 3 sub questions) from each module with internal choice.
3. Students should answer five full questions, selecting one full question from each module.
4. Question papers to be set as per the Blooms Taxonomy levels.

SEMESTER-II					
WIRELESS NETWORK AND MOBILE COMPUTING **Category: PCC**					
Course Code	:	P24SCSB215	CIE	:	50 Marks
Teaching Hours L:T:P	:	3:0:0	SEE	:	50 Marks
Total Hours	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs.

Course Objectives	
1.	Define the Mobile computing technologies, GPRS Network Architecture.
2.	Interpret Spread Spectrum technology.
3.	Define Mobile OS.
4.	Build Wireless Internet Applications.

Module - 1	**No. of Hours.**
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.	9
Module - 2	**No. of Hours.**
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.	9
Module - 3	**No. of Hours.**
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.	9
Module - 4	**No. of Hours.**
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.	9
Module - 5	**No. of Hours.**
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	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Explain state of art techniques in wireless communication.
CO2	Discover CDMA, GSM. Mobile IP, WiMAX.
CO3	Demonstrate program for CLDC, MIDP let model and security concerns.

Text Books	
1.	Ashok Talukder, Roopa Yavagal, Hasan Ahmed, Mobile Computing, Technology, Applications and Service Creation , Tata McGraw Hill, 2nd Edition, 2010
2.	Martyn Mallik, Mobile and Wireless Design Essentials, Wiley India, 2003

Reference Text Books	
1.	Raj kamal, Mobile Computing, Oxford University Press, 2007
2.	ItiSahaMisra, Wireless Communications and Networks, 3G and Beyond, Tata McGraw Hill, 2009

Web links and Video lectures (e-Resources)
• https://www.digimat.in/nptel/courses/video/106106147/L01.html

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 marks for the CIE is 50% of the maximum marks and Minimum passing marks for the SEE is 40% of the maximum marks of SEE. The minimum passing marks is 50% i.e. sum of the CIE and SEE together.

CONTINUOUS INTERNAL EVALUATION (CIE):

Component	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks
Theory	Internal Assessment1	50	30 (Average of Best Two Assessments)	50
	Internal Assessment2	50		
	Internal Assessment3	50		
Self learning	Two Assignments	20	10	
	Seminar Presentation	20	10	
SEE	Semester End Examination	100	50	50
Grand Total				100

SEMESTER END EXAMINATION

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. Two questions of 20 marks (with minimum of 3 sub questions) from each module with internal choice.
3. Students should answer five full questions, selecting one full question from each module.
4. Question papers to be set as per the Blooms Taxonomy levels.

SEMESTER-II					
SOFTWARE PROJECT PLANNING AND MANAGEMENT **Category: PCC**					
Course Code	:	P24SCSC215	CIE	:	50 Marks
Teaching Hours L:T:P	:	3:0:0	SEE	:	50 Marks
Total Hours	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs.

Course Objectives	
1.	Enhance software delivery predictability and includes requirements gathering, planning and designing the product.
2.	Planning a framework enables the manager to make reasonable estimates of resources, cost, and schedule.

Module - 1	**No. of Hours.**
Metrics: Introduction, The Metrics Roadmap, A Typical Metrics Strategy, What Should you Measure?, Set Targets and track Them, Understanding and Trying to minimize variability, Act on data, People and Organizational issues in Metrics Programs, the processes and activities of software configuration management, configuration status accounting, configuration audit, software configuration management in geographically distributed teams, Metrics in software configuration management, software configuration management tools and automation.	9
Module - 2	**No. of Hours.**
Risk Management: Introduction, What is risk management and why is it important?, Risk management cycle, Risk identification: common tools and techniques, Risk Monitoring, Risk Mitigation, Risks and Mitigation in the context of global project teams, some practical techniques risk management, Metrics in risk management. Project Planning and Tracking: Components of Project Planning and Tracking, The "What " Part of a Project Plan, The "What Cost " Part of a Project Plan, The "When " Part of Project Planning, The "How " Part of a Project Planning: Tailoring of Organizational Processes For the Project, The " By Whom " Part of the Project Management Plan : Assigning Resources, Putting it all together : The Software Management Plan, Activities Specific to Project Tracking, Interfaces to the Process Database.	9
Module - 3	**No. of Hours.**
Software Requirements gathering: Inputs and start criteria for requirements gathering, Dimensions of requirements gathering, Steps to be followed during requirements gathering, outputs and quality records from the requirements phase, Metrics for requirements phase. Estimation: What is Estimation? When and why is Estimation done?, the three phases of Estimation, Estimation methodology, formal models for size Estimation, Metrics for the Estimation processes. Design and Development Phases: Some differences in our chosen approach, salient features of design, evolving an architecture/ blueprint, design for reusability, technology choices/ constraints, design to standards, design for testability, design for diagnose ability, design for install ability, interoperability design, challenges during design and development phases, metrics for design and development phases.	9
Module - 4	**No. of Hours.**
Project management in the testing phase: Introduction, What is testing?.Project management in the Maintenance Phase: Introduction, Activities during Maintenance Phase, management issues during Maintenance Phase, Configuration management during Maintenance Phase, skill sets for people in the maintenance phase, estimating size, effort, and people resources for the maintenance phase, advantages of using geographically distributed teams for the maintenance phase, metrics for the maintenance phase.	9
Module - 5	**No. of Hours.**
Globalization issues in project management: Evolution of globalization, challenges in building global teams, Models for the execution of global projects, some effective management techniques for managing global teams. Impact of the internet on project management: Introduction, the effect of internet on project management, managing projects for the internet, Effect on the project management activities. People focused process models: Growing emphasis on people centric models, people capability maturity model (P-CMM), other people focused models in the literature, how does an organization choose the models to use?	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Identify the resources required for a project and to produce a work plan and resource schedule.

CO2	Monitor the progress of a project and to assess the risk of slippage, revising targets counteract drift.
CO3	Use appropriate metrics to management the software development outcome.

Text Books	
1.	Ramesh Gopalaswamy: "Managing Global Projects ", Tata McGraw Hill, 2013.

Reference Text Books	
1.	Watts Humphrey, "Managing the Software Process ", Pearson Education, New Delhi, 2000
2.	Pankaj Jalote, "Software Project Management in practice", Pearson Education, New Delhi, 2002.

Web links and Video lectures (e-Resources)

- https://onlinecourses.nptel.ac.in/noc19_cs70/preview
- https://www.tutorialspoint.com/software_engineering/software_requirements.htm
- https://prezi.com/p/9aroyjox8hce/globalization-issues-in-project-management/
- https://www.youtube.com/watch?v=ZRaZVLRXctU

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 marks for the CIE is 50% of the maximum marks and Minimum passing marks for the SEE is 40% of the maximum marks of SEE. The minimum passing marks is 50% i.e. sum of the CIE and SEE together.

CONTINUOUS INTERNAL EVALUATION (CIE):

Component	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks
Theory	Internal Assessment1	50	30 (Average of Best Two Assessments)	50
	Internal Assessment2	50		
	Internal Assessment3	50		
Self learning	Two Assignments	20	10	
	Seminar Presentation	20	10	
SEE	Semester End Examination	100	50	50
Grand Total				100

SEMESTER END EXAMINATION

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. Two questions of 20 marks (with minimum of 3 sub questions) from each module with internal choice.
3. Students should answer five full questions, selecting one full question from each module.
4. Question papers to be set as per the Blooms Taxonomy levels.

SEMESTER-II					
MULTIMEDIA COMMUNICATIONS **Category: PCC**					
Course Code	:	P24SCSD215	CIE	:	50 Marks
Teaching Hours L:T:P	:	3:0:0	SEE	:	50 Marks
Total Hours	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs.

Course Objectives	
1.	Discuss the multimedia communications systems, application and basic principles.
2.	To analyze the multimedia streaming.
3.	Performing and establishing multimedia communication terminals.

Module - 1	**No. of Hours.**
Introduction, multimedia information representation, multimedia networks, multimedia applications, Application and networking terminology, network QoS and application QoS, Digitization principles,.Text, images, audio and video.	9
Module - 2	**No. of Hours.**
Text and image compression, compression principles, text compression- Runlength, Huffman, LZW, Document Image compression using T2 and T3 coding, image compression- GIF, TIFF and JPEG	9
Module - 3	**No. of Hours.**
Audio and video compression, audio compression – principles, DPCM, ADPCM, Adaptive and Linear predictive coding, Code-Excited LPC, Perceptual coding, MPEG and Dolby coders video compression, video compression principles.	9
Module - 4	**No. of Hours.**
Video compression standards: H.261, H.263, MPEG, MPEG 1, MPEG 2, MPEG-4 and Reversible VLCs, Standards for multimedia communications: Reference models, standards relating to interpersonal communications.	9
Module - 5	**No. of Hours.**
Notion of synchronization, presentation requirements, reference model for synchronization, Introduction to SMIL, Multimedia operating systems, Resource management, process management techniques.	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Deploy the right multimedia communication models.
CO2	Apply QoS to multimedia network applications with efficient routing techniques.
CO3	Communicate clearly and concisely, visually, verbally and in writing, using techniques appropriate for the intended audience.
CO4	Identify the basic components of a multimedia project.

Text Books	
1.	Fred Halsall, Multimedia Communications, Pearson education, 2001.
2.	Raif Steinmetz, KlaraNahrstedt, Multimedia: Computing, Communications and Applications, Pearson education, 2002.
3.	K. R. Rao, Zoran S. Bojkovic, Dragorad A. Milovanovic, Multimedia Communication Systems, Pearson education, 2004.

Reference Text Books	
1.	Watts Humphrey, “Managing the Software Process “, Pearson Education, New Delhi, 2000
2.	Pankaj Jalote, “Software Project Management in practice”, Pearson Education, New Delhi, 2002.

Web links and Video lectures (e-Resources)
• https://www.tutorialspoint.com/multimedia/index.htm
• https://www.youtube.com/watch?v=NPQWUwR6vQ&list=PL6wr_B29b3UR5weQ80W8aYMkxEA z92IIC

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 marks for the CIE is 50% of the maximum marks and Minimum passing marks for the SEE is 40% of the maximum marks of SEE. The minimum passing marks is 50% i.e. sum of the CIE and SEE together.

CONTINUOUS INTERNAL EVALUATION (CIE):

Component	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks
Theory	Internal Assessment1	50	30 (Average of Best Two Assessments)	50
	Internal Assessment2	50		
	Internal Assessment3	50		
Self learning	Two Assignments	20	10	
	Seminar Presentation	20	10	
SEE	Semester End Examination	100	50	50
Grand Total				100

SEMESTER END EXAMINATION

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. Two questions of 20 marks (with minimum of 3 sub questions) from each module with internal choice.
3. Students should answer five full questions, selecting one full question from each module.
4. Question papers to be set as per the Blooms Taxonomy levels.

SEMESTER-II					
MINI PROJECT WITH SEMINAR **Category: PCCL**					
Course Code	:	P24SCS206	CIE	:	50 Marks
Teaching Hours L:T:P	:	0:0:2	SEE	:	50 Marks
Total Hours	:	15	Total	:	100 Marks
Credits	:	1	SEE Duration	:	3 Hrs

Course Objectives	
1.	To support independent learning and innovative attitude.
2.	To guide to select and utilize adequate information from varied resources upholding ethics.
3.	To guide to organize the work in the appropriate manner and present information (acknowledging the sources) clearly.
4.	To develop interactive, communication, organization, time management, and presentation skills.
5.	To impart flexibility and adaptability.
6.	To inspire independent and team working.
7.	To expand intellectual capacity, credibility, judgment, intuition.
8.	To adhere to punctuality, setting and meeting deadlines.
9.	To instill responsibilities to oneself and others.
10.	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.

Mini-Project: 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.

Course outcomes: At the end of the course the student will be able to:	
CO1	Present the mini-project and be able to defend it.
CO2	Make links across different areas of knowledge and to generate, develop and evaluate ideas an d information so as to apply these skills to the project task.
CO3	Habituated to critical thinking and use problem solving skills.
CO4	Communicate effectively and to present ideas clearly and coherently in both the written and oral forms.
CO5	Work in a team to achieve common goal.
CO6	Learn on their own, reflect on their learning and take appropriate actions to improve it.

CIE PROCEDURE FOR MINI - PROJECT:

The CIE marks awarded for Mini - Project, shall be based on the evaluation of Mini - Project Report, Project Presentation skill and Question and Answer session in the ratio 50:25:25.The marks awarded for Mini - Project report shall be the same for all the batch mates.

SEMESTER END EXAMINATION:

SEE marks for the mini-project shall be awarded based on the evaluation of Mini-Project Report, Presentation skill and Question and Answer session in the ratio 50:25:25 by the examiners appointed by the University.

SEMESTER-I					
NETWORKING PROGRAMMING LAB **Category: PCCL**					
Course Code	:	P24SCSL207	CIE	:	50 Marks
Teaching Hours L:T:P	:	0:0:2	SEE	:	50 Marks
Total Hours	:	15	Total	:	100 Marks
Credits	:	1	SEE Duration	:	3 Hrs

Sl. No.	**Course objectives**
1.	Create client and server applications using the "Sockets" API and the implementation of Data link layer protocol and TCP layer.
2.	Ability to conduct computer communication network simulations. Development of computer network simulation and modeling techniques using OPNET simulation software.

Sl. No.	**List of Experiments**
1.	Write a C program to implement daytime client/server program using TCP sockets
2.	Write a TCP client/server program in which client sends three numbers to the server in a single message. Server returns sum, difference and product as a result single message. Client program should print the results appropriately
3.	Develop a C program to extract and save the socket options for both the IP and TCP layers into a separate output file
4.	Exercises on Socket Programming using C and Java 5 Exercises using OPNET Network Simulator a) Setting up of various network topologies b) Implementation of various MAC protocols c) Measurement of routing protocols d) Analysis of TCP/IP protocol under various mechanisms
5.	Setting up of network that carries various application protocols and analyzing the performances.
6.	Comparison of TCP/IP, Socket, Pipes. Analyze which is the best.

Course Outcomes: At the end of the course, the students will be able to	
CO1	Understanding of the working principle of Socket Programming.
CO2	Familiarization with the OPNET Toolkit.

ASSESSMENT STRUCTURE FOR LABORATORY:

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing marks for the CIE is 50% of the maximum marks and Minimum passing marks for the SEE is 40% of the maximum marks of SEE. The minimum passing marks is 50% i.e. sum of the CIE and SEE together.

CONTINUOUS INTERNAL EVALUATION (CIE):

Component	**Type of Assessment**	**Max. Marks**	**Max. Marks Scaling Down to**	**Total Marks**
Laboratory	**Lab Conduction & Record**	**Evaluating Each Expt. For 10marks*12 expts.**	**15**	**50**
	Laboratory Test 1: After 6 expts	**50**	**15**	
	Laboratory Test 1: After 12 expts	**50**	**20**	

SEE	**Semester End Examination**	**100**	**50**	**50**
Grand Total				**100**

SEMESTER-II					
SKILL ENHANCEMENT FOR RESEARCH EXCELLENCE-1 **Category: SEC**					
Course Code	:	P24SCS208	CIE	:	50 Marks
Teaching Hours L:T:P	:	0:0:2	SEE	:	50 Marks
Total Hours	:	15	Total	:	100 Marks
Credits	:	1	SEE Duration	:	1 Hrs

The M.Tech Research Skills Development program equips students with essential skills for successful research and publication, including understanding research fundamentals, conducting literature reviews, selecting appropriate methodologies, writing proposals and papers, analyzing data, presenting findings, adhering to ethical standards, and engaging in networking and collaboration, culminating in the effective publication of only 1 research article to Scopus-indexed conferences.

Course Objectives	
1.	To produce high-quality research papers that meet the standards of international conferences or peer-reviewed journals.
2.	To effectively identify suitable journals for publication based on the scope and impact of research findings.
3.	To demonstrate proficiency in writing and structuring research papers according to academic conventions.
4.	To engage in the peer review process, providing and receiving constructive feedback to enhance research quality.
5.	To develop skills for presenting research at conferences, including crafting effective abstracts and posters.
6.	To cultivate a strong understanding of ethical considerations in research and publication practices.
7.	To utilize citation management tools to organize references and ensure proper attribution in publications.
8.	To enhance collaboration skills for co-authoring papers and working within research teams.
9.	To stay informed about current trends and advancements in the field to ensure relevance in publications.
10.	To refine the ability to respond to reviewer comments and revise manuscripts effectively.
11.	To understand the importance of open access and alternative publication models in disseminating research.
12.	To build a professional network that supports research collaborations and publication opportunities.

1. Understanding Research Fundamentals

- **Definition of Research:** Understand what constitutes research and its significance in technology and engineering.
- **Types of Research:**
  a) **Basic Research:** Focused on gaining comprehensive knowledge without immediate applications.
  b) **Applied Research:** Aimed at solving specific problems.
  c) Literature Review
- **Conducting a Literature Survey:**
  a) Identify relevant academic papers, journals, and conference proceedings.
  b) Summarize key findings and methodologies from existing literature.
- **Critical Analysis:**
  a) Evaluate the strengths and weaknesses of existing research.
  b) Identify gaps in the literature that your research can address.

2. Research Methodology

- **Selecting a Research Topic:**
  Choose a topic that aligns with your interests and current trends in technology.
- **Research Design:**
  Decide on qualitative, quantitative, or mixed methods based on your research objectives.
- **Data Collection Techniques:**
  Surveys, interviews, experiments, and simulations.

3. Writing Research Proposals

- **Structure of a Proposal:**

Introduction, Literature Review, Methodology, Expected Outcomes, and References.

- **Proposal Presentation:**
  Practice presenting your proposal to peers and faculty for feedback.

4. **Data Analysis**
   - **Statistical Tools:**
     Familiarize yourself with tools like MATLAB, R, or Python for data analysis.
   - **Interpreting Results:**
     Learn to draw meaningful conclusions from your data and relate them back to your research questions.

5. **Writing Research Papers**
   - **Structure of a Research Paper:**
     Abstract, Introduction, Methodology, Results, Discussion, Conclusion, and References.
   - **Academic Writing Skills:**
     Focus on clarity, coherence, and proper citation of sources.
   - **Peer Review Process:**
     Understand the importance of peer review and how to respond to reviewers' comments.

6. **Presentation Skills**
   - **Effective Communication:**
     Develop skills to present your research findings clearly and confidently.
   - **Use of Visual Aids:**
     Incorporate slides, charts, and graphs to enhance your presentations.

7. **Ethical Considerations in Research**
   - **Understanding Ethics:**
     Familiarize yourself with ethical guidelines related to research involving human subjects, data privacy, and plagiarism.
   - **Responsible Conduct of Research:**
     Promote integrity and accountability in your research practices.

Submitting Manuscripts to Scopus-Indexed Conferences or Web of Science or Proceedings /Book Chapters

1. **Identify Relevant Conferences**
   - **Research Scopus-Indexed Conferences:**
     Use platforms like Conference Alerts, IEEE Xplore, or the Scopus website to find conferences in your field.
   - **Check Conference Indexing:**
     Ensure that the conference is indexed in Scopus by checking its official website or the Scopus database.

2. **Prepare Your Manuscript**
   - **Follow Conference Guidelines:**
     Each conference has specific formatting and submission guidelines.
   - **Adhere to these requirements. Structure of the Manuscript:**
     Title, Abstract, Introduction, Methodology, Results, Discussion, Conclusion, and References.
   - **Language and Clarity:**
     Use clear and concise language. Consider having your manuscript proofread by peers or professionals.
   - **Submission of manuscript, Registration and Presentation finally Publication**

Course outcomes: At the end of the course the student will be able to:	
CO1	Produce High-Quality Research Papers: Create research papers that meet international conference and peer-reviewed journal standards.
CO2	Identify Suitable Journals: Effectively select appropriate journals for publication based on research scope and impact.
CO3	Proficiency in Writing: Demonstrate skill in writing and structuring research papers according to academic conventions.
CO4	Engage in Peer Review: Actively participate in the peer review process by providing and receiving constructive feedback.
CO5	Develop Presentation Skills: Acquire skills for presenting research at conferences, including crafting effective abstracts and posters.
CO6	Understand Ethical Considerations: Cultivate a strong understanding of ethical issues in research and publication practices.
CO7	Utilize Citation Management Tools: Use citation management tools to organize references and ensure proper attribution.
CO8	Respond to Reviewer Comments: Refine the ability to address reviewer comments and revise manuscripts effectively.

ASSESSMENT DETAILS: CIE AND SEE

The weightage of Continuous Internal Evaluation (CIE) is 50% and Semester End Examination is 50%. The minimum passing mark for CIE is 50% of the maximum marks (25 out of 50). The minimum passing marks for SEE is 40% of maximum marks (20 out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course if the student secures not less than 50% (50 out of 100) in the sum total of CIE and SEE together.

SEMESTER END EXAMINATION (SEE)

The SEE assessment for 01 credit AEC/SEC courses is written as theory with MCQ type question paper. SEE paper shall be set for 50 questions each of the 01 mark. The pattern of the question paper is Multiple Choice Questions (MCQ). The time allotted for SEE is 01 hour. The student has to score a minimum of 40% of the maximum marks (20/50). The examination duration is 1 hour.