

Advances in Computer Networks			
Course Code	22SCS13	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:2	SEE Marks	50
Total Hours of Pedagogy	50	Total Marks	100
Credits	04	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/case study/web content		
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/case study/web content		
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/case study/web content		
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/case study/web content		
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/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:

1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
2. The question paper will have ten full questions carrying equal marks.
3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
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. *Computer Networks: A System Approach*, Larry Peterson and Bruce S Davis, Elsevier, 5th Edition 2014
2. *Internetworking with TCP/IP, Principles, Protocols and Architecture*, Douglas E Comer, PHI, 6th Edition 2014.

Reference Books:

1. *Computer Networks, Protocols, Standards and Interfaces*, Uyless Black , PHI, 2nd Edition
2. *TCP /IP Protocol Suite*, Behrouz A Forouzan, 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>

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 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							
C03		x	x									

Internet of Things and Applications			
Course Code	22SCS14	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">• Able to interpret the application areas of IOT .• Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks .• Able to interpret building blocks of Internet of Things and characteristics.			
Module-1			
What is The Internet of Things? Overview and Motivations, Examples of Applications, IPV6 Role, Areas of Development and Standardization, Scope of the Present Investigation.Internet of Things Definitions and frameworks-IoT Definitions, IoT Frameworks, Basic Nodal Capabilities. Internet of Things Application Examples- Overview, Smart Metering/Advanced Metering Infrastructure-Health/Body Area Networks, City Automation, Automotive Applications, Home Automation, Smart Cards, Tracking, OverThe-Air-Passive Surveillance/Ring of Steel, Control Application Examples, Myriad Other Applications.			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-2			
Fundamental IoT Mechanism and Key Technologies-Identification of IoT Object and Services, Structural Aspects of the IoT, Key IoT Technologies. Evolving IoT Standards-Overview and Approaches, IETF IPV6 Routing Protocol for RPL Roll, Constrained Application Protocol, Representational State Transfer, ETSI M2M,Third Generation Partnership Project Service Requirements for Machine-Type Communications, CENELEC, IETF IPV6 Over Low power WPAN, Zigbee IP(ZIP),IPSO			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-3			
Layer ½ Connectivity: Wireless Technologies for the IoT-WPAN Technologies for IoT/M2M, Cellular and Mobile Network Technologies for IoT/M2M,Layer 3 Connectivity:IPv6 Technologies for the IoT: Overview and Motivations. Address Capabilities,IPv6 Protocol Overview, IPv6 Tunnelling, IPsec in IPv6,Header Compression Schemes, Quality of Service in IPv6, Migration Strategies to IPv6.			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-4			
Case Studies illustrating IoT Design-Introduction, Home Automation, Cities, Environment, Agriculture, Productivity Applications.			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-5			
Data Analytics for IoT – Introduction, Apache Hadoop, Using HadoopMapReduce for Batch Data Analysis, Apache Oozie, Apache Spark, Apache Storm, Using Apache Storm for Real-time Data Analysis, Structural Health Monitoring Case Study.			
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:

1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
2. The question paper will have ten full questions carrying equal marks.
3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
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. Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications, Daniel Minoli, Wiley, 2013.
2. Internet of Things: A Hands on Approach, Arshdeep Bahga, Vijay Madisetti, Universities Press, 2015.

Reference Books:

1. The Internet of Things, Michael Miller, Pearson, 2015 First Edition
2. Designing Connected Products, Claire Rowland, Elizabeth Goodman et.al, O'Reilly, First Edition, 2015

Web links and Video Lectures (e-Resources):

- <https://www.coursera.org/specializations/internet-of-things>
- <https://www.youtube.com/watch?v=lc63-yf-zuc&list=PL3uLubnzL2Tm5PAw88N1jR9MLTJpuPEnX>

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	Develop schemes for the applications of IOT in real time scenarios	L3
C02	Manage the Internet resources	L1
C03	Model the Internet of things to business	L2
C04	Interpret data sets received through IoT devices and tools used for analysis	L1

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			x							

Advanced Algorithms			
Course Code	22SCS15	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">• 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		
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		
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		
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		
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		

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:

1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
2. The question paper will have ten full questions carrying equal marks.
3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
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. T. H Cormen, C E Leiserson, R L Rivest and C Stein. *Introduction to Algorithms*. PHI, 3rd Edition, 2010.
2. Kenneth A. Berman. *Algorithms*. Cengage Learning, 2002.

Reference Books:

1. Ellis Horowitz, Sartaj Sahni, 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>

Algorithm design and analysis is a fundamental and important part of computer science. This course introduces students to advanced techniques for the design and analysis of algorithms, and explores a variety of applications.

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	Apply iterative and recursive algorithms	L2
C02	Work optimization algorithms in specific applications.	L2
C03	Choose appropriately shared objects and concurrent objects for applications.	L2

Mapping of COS and POs

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

Common to all M tech programs in CSE board			
Research Methodology and IPR			
Course Code	22RMI16	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 introduce various technologies of conducting research.• To choose an appropriate research design for the chosen problem.• Choose appropriate tool for the conduction of research.• To explain the art of interpretation and the art of writing research reports.• To explain various forms of the intellectual property, its relevance and business impact in the changing global business environment• To discuss leading International Instruments concerning Intellectual Property Rights.			
Module-1			
Research Methodology: Introduction, Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Importance of Knowing How Research is Done, Research Process, Criteria of Good Research, and Problems Encountered by Researchers in India. Defining the Research Problem: Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, An Illustration			
Teaching-Learning Process	Chalk and talk/PPT/case study		
Module-2			
Reviewing the literature: Place of the literature review in research, Bringing clarity and focus to your research problem, Improving research methodology, Broadening knowledge base in research area, Enabling contextual findings, How to review the literature, searching the existing literature, reviewing the selected literature, Developing a theoretical framework, Developing a conceptual framework, Writing about the literature reviewed. Research Design: Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs, Important Experimental Designs.			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-3			
Design of Sampling: Introduction, Sample Design, Sampling and Non-sampling Errors, Sample Survey versus Census Survey, Types of Sampling Designs. Measurement and Scaling: Qualitative and Quantitative Data, Classifications of Measurement Scales, Goodness of Measurement Scales, Sources of Error in Measurement Tools, Scaling, Scale Classification Bases, Scaling Technics, Multidimensional Scaling, Deciding the Scale. Data Collection: Experimental and Surveys, Collection of Primary Data, Collection of Secondary Data, Selection of Appropriate Method for Data Collection, Case Study Method.			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-4			

Testing of Hypotheses: Hypothesis, Basic Concepts Concerning Testing of Hypotheses, Testing of Hypothesis, Test Statistics and Critical Region, Critical Value and Decision Rule, Procedure for Hypothesis Testing, Hypothesis Testing for Mean, Proportion, Variance, for Difference of Two Mean, for Difference of Two Proportions, for Difference of Two Variances, P-Value approach, Power of Test, Limitations of the Tests of Hypothesis. Chi-square Test: Test of Difference of more than Two Proportions, Test of Independence of Attributes, Test of Goodness of Fit, Cautions in Using Chi Square Tests	
Teaching-Learning Process	Chalk and talk/PPT/case study/web content
Module-5	
Interpretation and Report Writing: Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports. Intellectual Property: The Concept, Intellectual Property System in India, Development of TRIPS Complied Regime in India, Patents Act, 1970, Trade Mark Act, 1999, The Designs Act, 2000, The Geographical Indications of Goods (Registration and Protection) Act 1999, Copyright Act, 1957, The Protection of Plant Varieties and Farmers' Rights Act, 2001, The Semi-Conductor Integrated Circuits Layout Design Act, 2000, Trade Secrets, Utility Models, IPR and Biodiversity, The Convention on Biological Diversity (CBD) 1992, Competing Rationales for Protection of IPRs, Leading International Instruments Concerning IPR, World Intellectual Property Organisation (WIPO), WIPO and WTO, Paris Convention for the Protection of Industrial Property, National Treatment, Right of Priority, Common Rules, Patents, Marks, Industrial Designs, Trade Names, Indications of Source, Unfair Competition, Patent Cooperation Treaty (PCT), Advantages of PCT Filing, Berne Convention for the Protection of Literary and Artistic Works, Basic Principles, Duration of Protection, Trade Related Aspects of Intellectual Property Rights (TRIPS) Agreement, Covered under TRIPS Agreement, Features of the Agreement, Protection of Intellectual Property under TRIPS, Copyright and Related Rights, Trademarks, Geographical indications, Industrial Designs, Patents, Patentable Subject Matter, Rights Conferred, Exceptions, Term of protection, Conditions on Patent Applicants, Process Patents, Other Use without Authorization of the Right Holder, Layout-Designs of Integrated Circuits, Protection of Undisclosed Information, Enforcement of Intellectual Property Rights, UNSECO.	
Teaching-Learning Process	Chalk and talk/PPT
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: <ol 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 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: <ol 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:**Text Books:**

1. *Research Methodology: Methods and Techniques*, C.R. Kothari, Gaurav Garg, New Age International, 4th Edition, 2018.. Douglas E Comer, "Internetworking with TCP/IP, Principles, Protocols and Architecture," PHI, 6th Edition
2. *Research Methodology a step-by-step guide for beginners*. (For the topic Reviewing the literature under module 2), RanjitKumar, SAGE Publications, 3rd Edition, 2011.

Reference Books:

1. *Research Methods: the concise knowledge base*, Trochim, Atomic Dog Publishing, 2005.
2. *Conducting Research Literature Reviews: From the Internet to Paper*, Fink A, Sage Publications, 2009.

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=A7oioOJ4g0Y&list=PLVf5enqoJ-yVQ2RXUI6mCfLPf3J_JUfoc

Course outcome (Course Skill Set)

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

Sl. No.	Description	Blooms Level
C01	Conduct research independently	L2
C02	Choose research designs, sampling designs, measurement and scaling techniques and also different methods of data collections.	L2
C03	Statistically interpret the data and draw inferences	L2

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01		x		x								x
C02		x	x									x
C03				x	x							x

Internet of Things Laboratory			
Course Code	22SCS17	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	1:2:0	SEE Marks	50
Credits	02	Exam Hours	03
Course objectives: <ul style="list-style-type: none">• Describe what IoT is and how it works today• Design and program IoT devices• Use real IoT protocols for communication			
Sl.NO	Experiments		
1	Transmit a string using UART		
2	Point-to-Point communication of two Motes over the radio frequency		
3	Multi-point to single point communication of Motes over the radio frequency. AN (Subnetting).		
4	I2C protocol study		
5	Reading Temperature and Relative Humidity value from the sensor		
6	Study of Connectivity and Configuration of Raspberry-Pi/ Beagle Board circuit with basic peripherals, LEDs, Understanding GPIO and its use in program.		
7	Study of different operating systems for Raspberry Pi / Beagle board. Understanding the process of Os installation on Raspberry – Pi/ Beagle board.		
8	Familiarization with the concept of IOT, Arduino / Raspberry Pi and perform necessary software installation.		
Course outcomes (Course Skill Set): At the end of the course the student will be able to: <ul style="list-style-type: none">• Apply key Internet applications and their protocols, and ability to develop their own applications (e.g. Client Server applications, Web Services) using the sockets API.• Design and evaluate application layer protocol• Analyze the vulnerabilities in any computing system and hence be able to design a security solution.• Identify the security issues in the network and resolve it.• Evaluate security mechanisms using rigorous approaches, including theoretical.			

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. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. The student has to secure not less than 40% of maximum marks in the semester-end examination(SEE). In total of CIE and SEE student has to secure 50% maximum marks of the course.

Continuous Internal Evaluation (CIE):

CIE marks for the practical course is **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment to be evaluated for conduction with observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments designed by the faculty who is handling the laboratory session and is made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to 30 marks (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct 02 tests for 100 marks, the first test shall be conducted after the 8th week of the semester and the second test shall be conducted after the 14th week of the semester.
- In each test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The average of 02 tests is scaled down to **20 marks** (40% of the maximum marks).

The Sum of **scaled-down** marks scored in the report write-up/journal and average marks of two tests is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

SEE marks for the practical course is 50 Marks.

SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the University.

All laboratory experiments are to be included for practical examination.

(Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.

Students can pick one question (experiment) from the questions lot prepared by the internal /external examiners jointly.

Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly

by examiners.

General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

Change of experiment is allowed only once and 10% Marks allotted to the procedure part to be made zero.

The duration of SEE is 03 hours

Big Data Analytics			
Course Code	22SCS21	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">• Explore the Hadoop framework and Hadoop Distributed File system• Interpret HDFS and MapReduce concepts• Employ MapReduce programming model to process the big data• Explore the working of pig and SPARK tool			
Module-1			
Meet Hadoop: Data!, Data Storage and Analysis, Querying All Your Data, Beyond Batch, Comparison with Other Systems: Relational Database Management Systems, Grid Computing, Volunteer Computing Hadoop Fundamentals MapReduce: A Weather Dataset: Data Format, Analyzing the Data with Unix Tools, Analyzing the Data with Hadoop: Map and Reduce, Java MapReduce, Scaling Out: Data Flow, Combiner Functions, Running a Distributed MapReduce Job, Hadoop Streaming The Hadoop Distributed File systemThe Design of HDFS, HDFS Concepts: Blocks, Namenodes and Datanodes, HDFS Federation, HDFS High-Availability, The Command-Line Interface, Basic Filesystem Operations, HadoopFilesystems Interfaces, The Java Interface, Reading Data from a Hadoop URL, Reading Data Using the FileSystem API, Writing Data, Directories, Querying the Filesystem, Deleting Data, Data Flow: Anatomy of a File Read, Anatomy of a File Write.			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-2			
YARN Anatomy of a YARN Application Run: Resource Requests, Application Lifespan, Building YARN Applications, YARN Compared to MapReduce, Scheduling in YARN: The FIFO Scheduler, The Capacity Scheduler, The Fair Scheduler, Delay Scheduling, Dominant Resource Fairness. Hadoop I/O Data Integrity, Data Integrity in HDFS, Local FileSystem, Checksum File System, Compression, Codecs, Compression and Input Splits, Using Compression in MapReduce, Serialization, The Writable Interface, Writable Classes, Implementing a Custom Writable, Serialization Frameworks, File-Based Data Structures: SequenceFile			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-3			
Developing a MapReduce Application The Configuration API, Combining Resources, Variable Expansion, Setting Up the Development Environment, Managing Configuration, Generic Options Parser, Tool, and Tool Runner, Writing a Unit Test with MRUnit: Mapper, Reducer, Running Locally on Test Data, Running a Job in a Local Job Runner, Testing the Driver, Running on a Cluster, Packaging a Job, Launching a Job, The MapReduce Web UI, Retrieving the Results, Debugging a Job, Hadoop Logs, Tuning a Job, Profiling Tasks, MapReduce Workflows: Decomposing a Problem into MapReduce Jobs, JobControl, Apache Oozie How MapReduce WorksAnatomy of a MapReduce Job Run, Job Submission, Job Initialization, Task Assignment, Task Execution, Progress and Status Updates, Job Completion, Failures: Task Failure, Application Master Failure, Node Manager Failure, Resource Manager Failure, Shuffle and Sort: The Map Side, The Reduce Side, Configuration Tuning, Task Execution: The Task Execution Environment, Speculative Execution, Output Committers.			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-4			

MapReduce Types and Formats: MapReduce Types, Input Formats: Input Splits and Records, Text Input, Binary Input, Multiple Inputs, Database Input (and Output) Output Formats: Text Output, Binary Output, Multiple Outputs, Lazy Output, Database Output, FlumeInstalling Flume, An Example, Transactions and Reliability, Batching, The HDFS Sink, Partitioning and Interceptors, File Formats, Fan Out, Delivery Guarantees, Replicating and Multiplexing Selectors, Distribution: Agent Tiers, Delivery Guarantees, Sink Groups, Integrating Flume with Applications, Component Catalog	
Teaching-Learning Process	Chalk and talk/PPT/case study/web content
Module-5	
Pig Installing and Running Pig, Execution Types, Running Pig Programs, Grunt, Pig Latin Editors, An Example: Generating Examples, Comparison with Databases, Pig Latin: Structure, Statements, Expressions, Types, Schemas, Functions, Data Processing Operators: Loading and Storing Data, Filtering Data, Grouping and Joining Data, Sorting Data, Combining and Splitting Data. Spark An Example: Spark Applications, Jobs, Stages and Tasks, A Java Example, A Python Example, Resilient Distributed Datasets: Creation, Transformations and Actions, Persistence, Serialization, Shared Variables, Broadcast Variables, Accumulators, Anatomy of a Spark Job Run, Job Submission, DAG Construction, Task Scheduling, Task Execution, Executors and Cluster Managers: Spark on YARN	
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: <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50. 2. The question paper will have ten full questions carrying equal marks. 3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module. 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: <ol style="list-style-type: none"> 1. Hadoop: The Definitive Guide, Tom White, Third Edition, O'Reilley, 2012. 2. Hadoop Operations, Eric Sammer, O'Reilley, 2012. Refence Books: <ol style="list-style-type: none"> 1. <i>Big data analytics with R and Hadoop</i>, Vignesh Prajapati, SPD 2013. 2. <i>Programming Hive</i>, E. Capriolo, D. Wampler, and J. Rutherglen, O'Reilley, 2012. 	

3. *HBase: The Definitive Guide*, Lars George, O'Reilley, 2011.
4. *Programming Pig*, Alan Gates, O'Reilley, 2011

Web links and Video Lectures (e-Resources):

- <https://tinyurl.com/dbhejmz>
- https://www.tutorialspoint.com/big_data_analytics/index.htm

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	Interpret managing big data using Hadoop and SPARK technologies	L1
C02	Explain HDFS and MapReduce concepts	L1
C03	Install, configure, and run Hadoop and HDFS	L2
C04	Perform map-reduce analytics using Hadoop and related tools	L3
C05	Explain SPARK concepts	L3

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							
C04			x	x	x							
C05		x		x								

Artificial Intelligence and Machine Learning				
Course Code		22SCS22	CIE Marks	50
Teaching Hours/Week (L:P:SDA)		3:2:0	SEE Marks	50
Total Hours of Pedagogy		40 hours Theory + 10 hours Lab	Total Marks	100
Credits		04	Exam Hours	03
Course Learning objectives: <ul style="list-style-type: none">To interpret the concept of Artificial Intelligence and problem solving.To study advanced problem solving paradigms and knowledge representation.To interpret neural networks, build neural networks to solve various classification problems.				
Module-1				
Introduction, problem Solving: state space search and control strategies				
Teaching-Learning Process	Chalk and talk/PPT/case study/web content			
Module-2				
Problem reduction and Game playing, Logic concepts and logic programming				
Teaching-Learning Process	Chalk and talk/PPT/case study/web content			
Module-3				
Advanced problem-solving paradigm: planning Knowledge representation				
Teaching-Learning Process	Chalk and talk/PPT/case study/web content			
Module-4				
Uncertainty Measure: Probability Theory, Bayesian Belief Networks, Machine Learning Paradigms: Machine learning system, supervised and unsupervised learnings, Inductive, deductive learning, Clustering				
Teaching-Learning Process	Chalk and talk/PPT/case study/web content			
Module-5				
Support vector Machine, case-based reasoning and learning. ANN: Single Layer, Multilayer. RBF, Design issues in ANN, Recurrent Network				
Teaching-Learning Process	Chalk and talk/PPT/case study/web content			

PRACTICAL COMPONENT OF IPCC *(May cover all / major modules)*

Sl.NO	Experiments
1	Case study on Artificial Intelligence (Assigned by the instructor) Hint: students can go through , https://github.com/topics/artificial-intelligence-projects
2	Case study on Machine Learning (Assigned by the instructor) Hint: students can go through, https://github.com/topics/machine-learning-projects

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

CIE for the theory component of IPCC

1. Two Tests each of **20 Marks**
2. Two assignments each of **10 Marks/One Skill Development Activity of 20 marks**
3. Total Marks of two tests and two assignments/one Skill Development Activity added will be CIE for 60 marks, marks scored will be proportionally scaled down to **30 marks**.

CIE for the practical component of IPCC

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The **15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to 15 marks.
- The laboratory test at the end /after completion of all the experimentsshall be conducted for 50 marks and scaled down to 05 marks.

Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **20 marks**.

SEE for IPCC

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (duration 03 hours)

1. The question paper will be set for 100 marks and marks scored will be scaled down proportionately to 50 marks.
2. The question paper will have ten questions. Each question is set for 20 marks.
3. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
4. The students have to answer 5 full questions, selecting one full question from each module.

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper shall include questions from the practical component).

- The minimum marks to be secured in CIE to appear for SEE shall be the 15 (50% of maximum marks-30) in the theory component and 10 (50% of maximum marks -20) in the practical component. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included. The maximum of 04/05 questions to be set from the practical component of IPCC, the total marks of all questions should not be more than the 20 marks.
- SEE will be conducted for 100 marks and students shall secure 40% of the maximum marks to qualify in the SEE. Marks secured will be scaled down to 50. (Student has to secure an aggregate of 50% of maximum marks of the course(CIE+SEE))

Suggested Learning Resources:

Text Books:

1. *Artificial Intelligence: Saroj Kaushik*, Cengage Learning, 2014.
2. *Artificial Intelligence: Structures and Strategies for Complex Problem Solving*, George F Luger, Pearson Addison Wesley 6 th Ed, 2008.

Reference Books:

1. *Artificial Intelligence*, E Rich, K Knight, and S B Nair Tata Mc-Graw Hill, 3rd Ed, 2009.
2. *Artificial Intelligence: A Modern Approach*, Stuart Russell and Peter Norvig, Prentice Hall 3rd, 2009.

Web links and Video Lectures (e-Resources):

- <https://nptel.ac.in/courses/106102220>

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

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	Define Artificial intelligence and identify problems for AI. Characterize the search techniques to solve problems and recognize the scope of classical search techniques	L2
C02	Define knowledge and its role in AI. Demonstrate the use of Logic in solving AI problems	L3
C03	Demonstrate handling of uncertain knowledge and reasoning in probability theory.	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												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01		x		x						x		
C02	x			x								
C03		x								x		

Wireless Networks & Mobile Computing			
Course Code	22SCS231	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">• 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		
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		
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		
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		
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
Assessment Details (both CIE and SEE) <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> <ol style="list-style-type: none"> 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 <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> <ol style="list-style-type: none"> 1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50. 2. The question paper will have ten full questions carrying equal marks. 3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module. 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: <ol style="list-style-type: none"> 1. <i>Mobile Computing, Technology, Applications and Service Creation</i>. Ashok Talukder, RoopaYavagal, Hasan Ahmed. Tata McGraw Hill. 2nd Edition, 2010. 2. <i>Mobile and Wireless Design Essentials</i>, Martyn Mallik. Wiley India. 2003. Reference Books: <ol style="list-style-type: none"> 1. <i>Mobile Computing</i>. Raj kamal. Oxford University Press. 2007. 2. <i>Wireless Communications and Networks, 3G and Beyond</i>. ItiSahaMisra. Tata McGraw Hill. 2009. 	
Web links and Video Lectures (e-Resources): <ul style="list-style-type: none"> • https://www.javatpoint.com/mobile-computing • https://tinyurl.com/2zk9sdp7 	
Skill Development Activities Suggested <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
C01	Explain state of art techniques in wireless communication.	L2
C02	Discover CDMA, GSM, Mobile IP, WiMAX	L2
C03	Demonstrate program for CLDC, MIDP let model and security concerns	L2

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					

Mobile Application Development			
Course Code	22SCS232	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">• 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		
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		
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		
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		
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-	Chalk and talk/PPT/case study/web content		

Process	
<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> <ol style="list-style-type: none"> 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 <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> <ol style="list-style-type: none"> 1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50. 2. The question paper will have ten full questions carrying equal marks. 3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module. 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 	
<p>Suggested Learning Resources:</p> <p>Text Books:</p> <ol style="list-style-type: none"> 1. <i>Mobile Computing: (technologies and Applications)</i>. N. N. Jani. S chand 2. <i>Android programming</i>. B.M.Hirwani. Pearson publications. 2013. 3. <i>Android in Action</i>. W. Frank Ableson, RobiSen and C. E. Ortiz. DreamTech Publisher. Third Edition-2012. <p>Refence Books:</p> <ol style="list-style-type: none"> 1. <i>Android Application development</i>. James C. Sheusi. Cengage learning. 2017. 	
<p>Web links and Video Lectures (e-Resources):</p> <ul style="list-style-type: none"> • https://tinyurl.com/5du53uam • https://www.ibm.com/cloud/learn/mobile-application-development-explained • https://tinyurl.com/mscezade 	
<p>Skill Development Activities Suggested</p> <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 iPhone marketplace for distribution	L3

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							

Natural Language Processing			
Course Code	22SCS233	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">• To Analyze the natural language text.• To Generate the natural language.• To Demonstrate Text mining.• To Apply information retrieval techniques.			
Module-1			
OVERVIEW AND LANGUAGE MODELLING: Overview: Origins and challenges of NLP-Language and Grammar-Processing Indian Languages- NLP Applications-Information Retrieval. Language Modelling: Various Grammar-based Language Models-Statistical Language Model.			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-2			
WORD LEVEL AND SYNTACTIC ANALYSIS: Word Level Analysis: Regular Expressions-FiniteState Automata-Morphological Parsing-Spelling Error Detection and correction-Words and Word Classes-Part-of Speech Tagging. Syntactic Analysis: Context-free Grammar-Constituency- ParsingProbabilistic Parsing.			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-3			
Extracting Relations from Text: From Word Sequences to Dependency Paths: Introduction, Subsequence Kernels for Relation Extraction, A Dependency-Path Kernel for Relation Extraction and Experimental Evaluation. Mining Diagnostic Text Reports by Learning to Annotate Knowledge Roles: Introduction, Domain Knowledge and Knowledge Roles, Frame Semantics and Semantic Role Labelling, Learning to Annotate Cases with Knowledge Roles and Evaluations. A Case Study in Natural Language Based Web Search: InFact System Overview, The GlobalSecurity.org Experience.			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-4			
Evaluating Self-Explanations in iSTART: Word Matching, Latent Semantic Analysis, and Topic Models: Introduction, iSTART: Feedback Systems, iSTART: Evaluation of Feedback Systems, Textual Signatures: Identifying Text-Types Using Latent Semantic Analysis to Measure the Cohesion of Text Structures: Introduction, Cohesion, Coh-Metrix, Approaches to Analysing Texts, Latent Semantic Analysis, Predictions, Results of Experiments. Automatic Document Separation: A Combination of Probabilistic Classification and Finite-State Sequence Modelling: Introduction, Related Work, Data Preparation, Document Separation as a Sequence Mapping Problem, Results. Evolving Explanatory Novel Patterns for Semantically Based Text Mining: Related Work, A Semantically Guided Model for Effective TextMining.			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-5			
INFORMATION RETRIEVAL AND LEXICAL RESOURCES: Information Retrieval: Design features of Information Retrieval Systems-Classical, Non classical, Alternative Models of Information Retrieval – valuation Lexical Resources: World Net-Frame Net- Stemmers-POS Tagger- Research Corpora.			

Teaching-Learning Process	Chalk and talk/PPT/case study/web content
<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> <ol style="list-style-type: none"> 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 <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> <ol style="list-style-type: none"> 1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50. 2. The question paper will have ten full questions carrying equal marks. 3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module. 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 <p>Suggested Learning Resources:</p> <p>Text Books</p> <ol style="list-style-type: none"> 1. <i>Natural Language Processing and Information Retrieval</i>, Tanveer Siddiqui, U.S. Tiwary, Oxford University Press, 2008. 2. <i>Natural Language Processing and Text Mining</i>. Anne Kao and Stephen R. Potee, Springer-Verlag London Limited. 2007. <p>Reference Books:</p> <ol style="list-style-type: none"> 1. <i>Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition</i>. Daniel Jurafsky and James H Martin. Prentice Hall, 2008 2nd Edition. 2. <i>Natural Language Understanding</i>. James Allen. Benjamin/Cumming publishing company, 2nd edition, 1995. 3. <i>Information Storage and Retrieval systems</i>. Gerald J. Kowalski and Mark.T. Maybury. Kluwer academic Publishers, 2000. 4. <i>Natural Language Processing with Python</i>. Steven Bird, Ewan Klein, Edward Loper. O'Reilly Media, 2009. <p>Web links and Video Lectures (e-Resources):</p>	

- <https://www.youtube.com/watch?v=fM4qTMfCoak&list=PLZoTAE LRMXVMdJ5sqbCK2LiM0HhQVWNzm>

This course focuses on learning key concepts, tools and methodologies for natural language processing with an emphasis on hands-on learning through guided tutorials and real-world examples.

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	Analyze the natural language text.	L1
C02	Generate the natural language.	L2
C03	Demonstrate Text mining.	L2

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							

Cyber Security and Cyber law			
Course Code	22SCS234	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">• Define cyber security, cyber law and their roles• Demonstrate cyber security cybercrime and forensics.• Infer legal issues in cybercrime,• Demonstrate tools and methods used in cybercrime and security.• Illustrate evidence collection and legal challenges			
Module-1			
Introduction to Cybercrime: Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals?, Classifications of Cybercrimes, Cybercrime: The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes, Cybercrime Era: Survival Mantra for the Netizens. Cyberoffenses: How Criminals Plan Them: How Criminals Plan the Attacks, Social Engineering, Cyberstalking, Cybercafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-2			
Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-3			
Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks. Phishing and Identity Theft: Introduction, Phishing, Identity Theft (ID Theft).			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-4			
Understanding Computer Forensics: Introduction, Historical Background of Cyberforensics, Digital Forensics Science, The Need for Computer Forensics, Cyberforensics and Digital Evidence, Forensics Analysis of E-Mail, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Approaching a Computer Forensics Investigation, Setting up a Computer Forensics Laboratory: Understanding the Requirements, Computer Forensics and Steganography, Relevance of the OSI 7 Layer Model to Computer Forensics, Forensics and Social Networking Sites: The Security/Privacy Threats, Computer Forensics from Compliance Perspective, Challenges in Computer Forensics, Special Tools and Techniques, Forensics Auditing, Antiforensics.			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-5			

Introduction to Security Policies and Cyber Laws: Need for An Information Security Policy, Information Security Standards – Iso, Introducing Various Security Policies and Their Review Process, Introduction to Indian Cyber Law, Objective and Scope of the it Act, 2000, Intellectual Property Issues, Overview of Intellectual - Property - Related Legislation in India, Patent, Copyright, Law Related to Semiconductor Layout and Design, Software License.	
Teaching-Learning Process	Chalk and talk/PPT/case study/web content
Assessment Details (both CIE and SEE) <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> <ol style="list-style-type: none"> 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 <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> <ol style="list-style-type: none"> 1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50. 2. The question paper will have ten full questions carrying equal marks. 3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module. 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 <ol style="list-style-type: none"> 1. <i>Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives.</i> Sunit Belapure and Nina Godbole. Wiley India Pvt Ltd. 2013. 2. <i>Introduction to information security and cyber laws.</i> Surya Prakash Tripathi, Ritendra Goyal, Praveen Kumar Shukla. Dreamtech Press. 2015. Reference Books: <ol style="list-style-type: none"> 1. <i>Cybersecurity: Managing Systems, Conducting Testing, and Investigating Intrusions.</i> Thomas J. Mowbray. John Wiley & Sons, 2. <i>Cyber Security Essentials.</i> James Graham, Ryan Olson, Rick Howard. CRC Press, 2010. 	
Web links and Video Lectures (e-Resources): <ul style="list-style-type: none"> • https://www.udemy.com/course/cybersecurity-law-policy/ • https://www.youtube.com/watch?v=BS5v5Rr-oVo&list=PL-JyKqQx2Atelbm-z4X709scVr9OaHplY <p>Cybersecurity Law is one of the most rapidly growing areas of law, and issues like privacy, cybercrime, bitcoin banking, international legal issues and internet governance are some of the important areas that will be covered in this course.</p>	

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	Demonstrate cyber security cybercrime and forensics.	L3
C02	Demonstrate tools and methods used in cybercrime and security.	L3
C03	Illustrate evidence collection and legal challenges	L2

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							

Decision Support System			
Course Code	22SCS235	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">Recognize the relationship between business information needs and decision makingAppraise the general nature and range of decision support systemsAppraise issues related to the development of DSSSelect appropriate modeling techniquesAnalyze, design and implement a DSS			
Module-1			
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, 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, Chapter summary.			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-2			
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, Chapter summary			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-3			
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, chapter summary			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-4			
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.			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-5			
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.			
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:

1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
2. The question paper will have ten full questions carrying equal marks.
3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
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. Decision support system. George M. Marakas. PHI, 2011.

Reference Books:

1. Decision Support Systems, Marakas. 2Nd Edn, Pearson India, 2015.

Web links and Video Lectures (e-Resources):

- <https://www.coursera.org/lecture/business-intelligence-tools/decision-support-systems-video-lecture-E8P9x>

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	Appraise issues related to the development of DSS	L1
CO2	Select appropriate modeling techniques	L1
CO3	Analyze, design and implement a DSS	L2

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							

DIGITAL IMAGE PROCESSING			
Course Code	22SCS241	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">To become familiar with digital image fundamentalsTo get exposed to simple image enhancement techniques in Spatial and Frequency domain.To learn concepts of degradation function and restoration techniques.To study the image segmentation and representation techniques.To become familiar with image compression and recognition methods			
Module-1			
DIGITAL IMAGE FUNDAMENTALS: Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels - Color image fundamentals - RGB, HSI models, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT.			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-2			
IMAGE ENHANCEMENT: Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters, Homomorphic filtering, Color image enhancement.			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-3			
IMAGE RESTORATION: Image Restoration - degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-4			
IMAGE SEGMENTATION: Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation – Region growing – Region splitting and merging – Morphological processing- erosion and dilation, Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-5			
IMAGE COMPRESSION AND RECOGNITION: Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching.			
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:

1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
2. The question paper will have ten full questions carrying equal marks.
3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
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. *Digital Image Processing*, Rafael C. Gonzalez, Richard E. Woods, Pearson, Third Edition, 2010.
2. *Fundamentals of Digital Image Processing*, Anil K. Jain, Pearson, 2002.

Reference Books:

1. *Digital Image Processing*, Kenneth R. Castleman, Pearson, 2006.
2. *Digital Image Processing using MATLAB*, Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, Pearson Education, Inc., 2011.
3. *Multidimensional Digital Signal Processing*, D.E. Dudgeon and R.M. Mersereau, Prentice Hall Professional Technical Reference, 1990.
4. *Digital Image Processing*, William K. Pratt, John Wiley, New York, 2002
5. *Image processing, analysis and machine vision*, Milan Sonka et al , Brookes/Cole, Vikas Publishing House, 2nd edition, 1999.

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=sa7vO6YXBik&list=PL3rE2jS8zxAykJjinlf6EsucLv5EA03_m

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	Explain the basics and fundamentals of digital image processing, such as digitization, sampling, quantization, and 2D-transforms.	L1
C02	Operate on images using the techniques of smoothing, sharpening and enhancement.	L3
C03	Interpret the basics of segmentation, features extraction, compression and recognition methods for color models.	L2

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							

OBJECT ORIENTED DESIGN			
Course Code	22SCS242	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">To Introduce various designing techniques and methods for object oriented.Performance analysis with real time system.Demonstrate a familiarity with object oriented data and system.To give clear idea on implementing design with UML diagram like state diagram , activity diagram , use case diagram etc.			
Module-1			
The Motivation for Object-Oriented Programming, Classes and Objects: The Building Blocks of the Object-Oriented ParadigmTopologies of Action-Oriented Versus Object-Oriented Applications			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-2			
The Relationships Between Classes and ObjectsThe Inheritance Relationship			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-3			
Multiple Inheritance, The Association Relationship,			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-4			
Class-Specific Data and Behaviour, Physical Object-Oriented Design,			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-5			
The Relationship Between Heuristics and Patterns, The Use of Heuristics in Object-Oriented Design			
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:

1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
2. The question paper will have ten full questions carrying equal marks.
3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
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. *Object Oriented Design Heuristic*. Arthur J Riel. Addison-Wesley. 1996.

Refence Books:

1. *Elements of Reusable ObjectOriented Software*. Ralph Johnson, Erich Gamma, Richard Helm, John Vlissides. Pearson.
2. *Object - Oriented Modeling and Design With UM*. Paperback, Michael R. Blaha. Pearson. 2007

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=WpJ_yiwbGyk&list=PLJ5C_6qdAvBHslIkD7JB7kBdgv1SeXy3P
- <https://www.geeksforgeeks.org/oops-object-oriented-design/>

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 heuristics of the object-oriented programming	L1
CO2	Explain the fundamentals of OOP	L1
CO3	Examine fine object-oriented relations	L2
CO4	Explain the role of Physical Object-Oriented Design,	L2
CO5	Make use of Heuristics in The Use of Heuristics in Object-Oriented Design	L2

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							
C04			x	x	x							
C05		x		x								

MULTIMEDIA COMMUNICATIONS			
Course Code	22SCS243	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">• Improve your reading, speaking, writing and listening skills in English in a technical context.• Build up your knowledge of technical language in English• demonstrate learner autonomy by maximizing use of learning resources and producing quality work			
Module-1			
Introduction, multimedia information representation, multimedia networks, multimedia applications, Application and networking terminology, network QoS and application QoS, Digitization principles,.Text, images, audio and video.			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-2			
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			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-3			
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.			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-4			
Video compression standards: H.261, H.263, MPEG, MPEG 1, MPEG 2, MPEG-4 and Reversible VLCs, MPEG 7 standardization process of multimedia content description, MPEG 21 multimedia framework.			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-5			
Notion of synchronization, presentation requirements, reference model for synchronization, Introduction to SMIL, Multimedia operating systems, Resource management, process management techniques.			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		

Assessment Details (both CIE and SEE)

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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:

1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
2. The question paper will have ten full questions carrying equal marks.
3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
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. *Multimedia Communications*. Fred Halsall. Pearson education. 2001.
2. *Multimedia: Computing, Communications and Applications*. Raif Steinmetz, Klara Nahrstedt. Pearson education. 2002.

Reference Books:

1. *Multimedia Communication Systems*. K. R. Rao, Zoran S. Bojkovic, Dragorad A. Milovanovic. Pearson education. 2004.
2. *Multimedia: An Introduction*. John Billamil, Louis Molina. PHI. 2002.

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=NPQW-UwR6vQ&list=PL6wr_B29b3UR5weQ80W8aYMkxEAz92IIC

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	Deploy the right multimedia communication models.	L2
CO2	Apply QoS to multimedia network applications with efficient routing techniques.	L2
CO3	Solve the security threats in the multimedia networks.	L2
CO4	Work on real-time multimedia network applications	L3

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							
C04			x	x	x							

AGILE TECHNOLOGIES			
Course Code	22SCS244	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">To interpret the fundamental principles and practices associated with each of the agile development methods.To apply the principles and practices of agile software development on a project of interest.To interpret how agile methods reduce risk via incremental learning and delivery.			
Module-1			
Why Agile?: Understanding Success, Beyond Deadlines, The Importance of Organizational Success, Enter Agility, How to Be Agile?: Agile Methods, Don't Make Your Own Method, The Road to Mastery, Find a Mentor			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-2			
Understanding XP: The XP Lifecycle, The XP Team, XP Concepts, Adopting XP: Is XP Right for Us?, Go!, Assess Your Agility			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-3			
Practicing XP: Thinking: Pair Programming, Energized Work, Informative Workspace, Root-Cause Analysis, Retrospectives, Collaborating: Trust, Sit Together, Real Customer Involvement, Ubiquitous Language, Stand-Up Meetings, Coding Standards, Iteration Demo, Reporting,Releasing:"Done Done", No Bugs, Version Control, Ten-Minute Build, Continuous Integration, Collective Code Ownership, Documentation. Planning: Vision, Release Planning, The Planning Game, Risk Management, Iteration Planning, Slack, Stories, Estimating. Developing: Incremental requirements, Customer Tests, TestDriven Development, Refactoring, Simple Design ,Incremental Design and Architecture, Spike Solutions, Performance Optimization, Exploratory Testing			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-4			
Mastering Agility: Values and Principles: Commonalities, About Values, Principles, and Practices, Further Reading, Improve the Process: Understand Your Project, Tune and Adapt, Break the Rules, Rely on People :Build Effective Relationships, Let the Right People Do the Right Things, Build the Process for the People, Eliminate Waste :Work in Small, Reversible Steps, Fail Fast, Maximize Work Not Done, Pursue Throughput			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-5			
Deliver Value: Exploit Your Agility, Only Releasable Code Has Value, Deliver Business Results, Deliver Frequently, Seek Technical Excellence :Software Doesn't Exist, Design Is for Understanding, Design Trade-offs, Quality with a Name, Great Design, Universal Design Principles, Principles in Practice, Pursue Mastery			
Teaching-Learning	Chalk and talk/PPT/case study/web content		

Process		
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: 1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50. 2. The question paper will have ten full questions carrying equal marks. 3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module. 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. <i>The Art of Agile Development</i> , James shore, Chromatic, O'Reilly 2007 Reference Books: 1. <i>Agile Software Development, Principles, Patterns, and Practices</i> , Robert C. Martin Prentice Hall 1st edition, 2002 2. <i>Agile and Iterative Development A Manger's Guide</i> , Craig Larman Pearson Education First Edition, India, 2004		
Web links and Video Lectures (e-Resources): <ul style="list-style-type: none">https://www.tutorialspoint.com/agile/index.htmhttps://www.javatpoint.com/agilehttps://www.udemy.com/topic/agile/free/		
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	Define XP Lifecycle, XP Concepts, Adopting XP	L1
C02	Examine on Pair Programming, Root-Cause Analysis, Retrospectives, Planning, Incremental Requirements, Customer Tests	L3
C03	Demonstrate concepts to Eliminate Waste	L3

Mapping of COS and POs

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

NoSQL Database			
Course Code	22SCS245	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">To interpret various NoSQL systems and their featuresTo build projects that use NoSQL databasesTo compare NoSQL databases with each other and relational systemsTo practice development skills critical for employersTo have fun experimenting and learning			
Module-1			
Overview and History of NoSQL Databases. Definition of the Four Types of NoSQL Database, The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL, Key Points.			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-2			
Comparison of relational databases to new NoSQL stores, MongoDB, Cassandra, HBASE, Neo4j use and deployment, Application, RDBMS approach, Challenges NoSQL approach, Key-Value and Document Data Models, Column-Family Stores, Aggregate-Oriented Databases. Replication and sharding, MapReduce on databases. Distribution Models, Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication.			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-3			
NoSQL Key/Value databases using MongoDB, Document Databases, Document oriented Database Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analytics or Real-Time Analytics, E-Commerce Applications, Complex Transactions Spanning Different Operations, Queries against Varying Aggregate Structure.			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-4			
Column- oriented NoSQL databases using Apache HBASE, Column-oriented NoSQL databases using Apache Cassandra, Architecture of HBASE, Column-Family Data Store Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Counters, Expiring Usage.			
Teaching-Learning Process	Chalk and talk/PPT/case study/web content		
Module-5			

NoSQL Key/Value databases using Riak, Key-Value Databases, Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preferences, Shopping Cart Data, Relationships among Data, Multi operation Transactions, Query by Data, Operations by Sets. Graph NoSQL databases using Neo4, NoSQL database development tools and programming languages, Graph Databases, Graph Database. Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases.	
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: <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50. 2. The question paper will have ten full questions carrying equal marks. 3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module. 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: <ol style="list-style-type: none"> 1. <i>NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence</i>, Sadalage, P. & Fowler, Wiley Publications, 1st Edition, 2019. Reference Books: <ol style="list-style-type: none"> 1. <i>Seven Databases in Seven Weeks: A Guide to Modern Databases and the NoSQL Movement (1st Ed.)</i>. Redmond, E. & Wilson, J. (2012). Raleigh, NC: The Pragmatic Programmers, LLC. ISBN-13: 978-1934356920 ISBN-10: 1934356921 	
Web links and Video Lectures (e-Resources): <ul style="list-style-type: none"> • https://www.geeksforgeeks.org/introduction-to-nosql/ • https://www.javatpoint.com/nosql-databases 	
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	Explain NoSQL Key/Value databases using riak.	L2
C02	Apply Nosql Development tools with suitable usecase.	L3
C03	Explain the detailed architecture and performance tune of Graph NoSQL databases	L2

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							

Big Data Analytics Laboratory			
Course Code	22SCSL26	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	1:2:0	SEE Marks	50
Credits	02	Exam Hours	03
Course objectives: <ul style="list-style-type: none">Practice java concepts required for developing map reduce programs.Impart the architectural concepts of Hadoop and introducing map reduce paradigm.Practice programming tools PIG and HIVE in Hadoop eco system.Implement best practices for Hadoop development.			
Sl.NO	Experiments		
	<ul style="list-style-type: none">Install VMWare to setup the Hadoop environment and its ecosystems.Implement the basic commands of LINUX Operating System – File/Directory creation, deletion, update operations.		
1	Implement the following file management tasks in Hadoop: <ul style="list-style-type: none">i. Adding files and directoriesii. Retrieving filesiii. Deleting files Hint: A typical Hadoop workflow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilities		
2	Run a basic word count Map Reduce program to understand Map Reduce Paradigm.		
3	Write a Map Reduce program that mines weather data. Hint: Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for analysis with Map Reduce, since it is semi structured and record-oriented.		
4	Implement matrix multiplication with Hadoop Map Reduce		
5	Run the Pig Latin Scripts to find Word Count.		
6	Run the Pig Latin Scripts to find a max temp for each and every year.		
7	Use Hive to create, alter, and drop databases, tables, views, functions, and indexes.		
Course outcomes (Course Skill Set): At the end of the course the student will be able to: <ul style="list-style-type: none">Professional Skills: The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexity.Problem-Solving Skills: The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.Successful Career and Entrepreneurship: The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, and a zest for higher studies.			

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. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. The student has to secure not less than 40% of maximum marks in the semester-end examination(SEE). In total of CIE and SEE student has to secure 50% maximum marks of the course.

Continuous Internal Evaluation (CIE):

CIE marks for the practical course is **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment to be evaluated for conduction with observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments designed by the faculty who is handling the laboratory session and is made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to 30 marks (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct 02 tests for 100 marks, the first test shall be conducted after the 8th week of the semester and the second test shall be conducted after the 14th week of the semester.
- In each test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The average of 02 tests is scaled down to **20 marks** (40% of the maximum marks).

The Sum of **scaled-down** marks scored in the report write-up/journal and average marks of two tests is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

SEE marks for the practical course is 50 Marks.

SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the University.

All laboratory experiments are to be included for practical examination.

(Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.

Students can pick one question (experiment) from the questions lot prepared by the internal /external examiners jointly.

Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.

General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

Change of experiment is allowed only once and 10% Marks allotted to the procedure part to be made zero.

The duration of SEE is 03 hours