|| Jai Sri Gurudev ||

Sri Adichunchanagiri Shikshana Trust (R)

SJB Institute of Technology

An AUTONOMOUS INSTITUTION UNDER VISVESVARAYA TECHNOLOGICAL UNIVERSITY

Approved by AICTE, 2(f) and 12(B) recognized by UGC, New Delhi
Accredited by NAAC, Accredited by NBA, Certified by ISO 9001 - 2015

B.E.

Autonomous Scheme & Syllabus

Third Year

Department of Computer Science and Engineering

2023 Scheme -UG

V and VI Semesters

SERVICE TO MANKIND IS SERVICE TO GOD

His Divine Soul Padmabhushana
Sri Sri Sri Dr. Balagangadharanath MahaSwamiji
Founder President, Sri Adichunchanagiri Shikshana Trust®

Belief in God is not ignorance or illusion. It is a belief that there is an unseen, ineffable Power that transcends all our powers of muscles, mind and lives.

His Holiness Parama Pujya
Sri Sri Sri Dr. Nirmalanandanatha MahaSwamiji
President, Sri Adichunchanagiri Shikshana Trust ®

True richness is the generosity of heart. Cultivate it and work to help the less fortunate ones in life.

Revered Sri Sri Dr. Prakashanatha Swamiji
Managing Director, BGS & SJB Group of Institutions & Hospitals

People and prosperity follow the path which the leaders take. So the elders and leaders should make sure that they give the right lead and take the right path.

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Sri Adichunchanagiri Shikshana Trust (R)
SJB Institute of Technology
BGS Health and Education City, Dr. Vishnuvardhana Road, Kengeri, Bengaluru-560060
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2023 Scheme - UG

Syllabus Book for Computer Science and Engineering

Syllabus for 5th & 6th Semester

The syllabus, scheme and guidelines are provided in detail.
The syllabus, scheme and guidelines are subjected to changes if any needed.
The updates will be done timely.
Regularly access the institution website for the updated information.

The Syllabus book is available on	www.sjbit.edu.in
For any queries, please write to	academicdean@sjbit.edu.in

UPDATES

Release / Revision	Date	Remarks
Release	16/05/2025	First release
Version 2	10/02/2025	Changed CIE and SEE Guidelines

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Autonomous Scheme of Teaching & Examinations (ST&E) (Tentative) UG - BE 3rd Year CSE

SCHEME: 2023 **SEM: V** **Revision date: 15.05.2025**

S. #	Course Type	Course type Series	Course Code	Course Title	Teaching Dept.	QP setting dept	Credits	Teaching Hrs/Week				Examinations				
								L	T	P	O		SEE (Dur. & Marks)			
								Lecture	Tutorial	Practical	PBL/ABL / SL/etc.	CIE Marks	Dur.	Th.	Lab	Tot.
1	PCC	3	23CST501	Computer Networks	CSE	CSE	**3**	3	0	0		50	03	50	-	100
2	IPCC	5	23CSI502	Software Engineering and Project Management	CSE	CSE	**4**	3	0	2	@	50	03	50	-	100
3	IPCC	6	23CSI503	Database Management Systems	CSE	CSE	**4**	3	0	2	@	50	03	50	-	100
4	PCCL	3	23CSL504	Computer Networks Laboratory	CSE	CSE	**1**	0	0	2		50	03	-	50	100
5	PEC	1	23CSP51y	Professional Elective Course - 1	CSE	CSE	**3**	3	0	0		50	03	50	-	100
6	ETC	3	23CSE53y	Emerging Technology Course - 3	CSE	CSE	**3**	3	0	0	@	50	03	50	-	100
7	HSMC	6	23SFHH06/ 23UHVH07	Bioscience or UHV-Universal Human Values	any dept	any dept	**1**	0	2	0	@	50	02	50	-	100
8	AEC	5	23CSAE5y	Ability Enhancement Course - 5	CSE	CSE	**1**	1	0	0		50	02	50	-	100
								(or)								
								0	0	2		50	02	-	50	100
9	NCMC	4	23PASN01	Physical Education - Sports and Athletics	PED	PED	**PP/NP**	-	-	-	2	50	-	-	-	50
			23YOGN02	Yoga	PED	PED										
			23NSSN03	NSS - National Service Scheme	NSS	NSS										
			23NCCN04	NCC - National Cadet Corps	NCC	NCC										
			23IKSN05	Indian Knowledge System	HSS	HSS										
Total							**20**	**16**	**2**	**8**	**2**	**450**		**350**	**100**	**850**

PCC: Professional Course; IPCC: Integrated Professional Core Course; PCCL: Professional Core Course Laboratory; AEC: Ability Enhancement Course; HSMC: Humanities, Social Sciences & Management Course; NCMC: Non Credit Mandatory Course;
{@ - Compulsory one activity during the semester};
{I.E.-Industry Experts}.
PBL: project Based learning; ABL: Activity Based Learning; SL: Self-Learning

ETC (Emerging Technology Course):

For ETC (L:T:P:O) can be plaanned by the depts considering practicality & possibility of conduction, same shall be indicated along with course title in the list, if altered than above. If planned altering the prescription, the same shall be approved at the department BOS & authorities. Atleast one activity is mandatory during the delivery of the course. The guidelines is applicable to all the semesters III to VI semesters (ETC-1 to ETC-4).

Bioscience & UHV-Universal Human Values:

1) Any one of the course will be offered by the departments in each semester of IV & V based on the institutional planning.
2) Both the courses shall be studied and completed by the students registering each in the two semesters. For example, if Bioscience is offered in the IV semester, UHV-Universal Human Values is offered in the V semester.

Ability Enhancement Course-5: 23xxAE5y - 1 Credit course

1) The courses and the syllabus shall be defined by the respective dept. BOS.
2) SEE will be MCQ if offered as theory course. If offered as LAB course, SEE will be practical, with two internal examiners. Handled by Controller of Examinations.

NCMC (Non Credit Mandatory Course) for course type series-4: Refer to guidelines in III SEM.

Professional Elective Course - 1		Emerging Technology Course - 3		Ability Enhancement Course - 5	
Course Code	**Course Title**	**Course Code**	**Course Title**	**Course Code**	**Course Title**
23CSP511	Unix System Programming	23CSE531	Digital Image Processing	23CSAE51	Mobile Application Development
23CSP512	Advanced JAVA	23CSE532	Data Visualization Techniques	23CSAE52	Cloud Computing
23CSP513	Human Computer Interaction	23CSE533	Web Application and Database Security	23CSAE53	DevOps
23CSP514	Advanced Computer Architecture	23CSE534	React JS	23CSAE54	JavaScript

SJBIT/RS/CSE/2024/06

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Self Learning course list for UG BE - Computer Science and Engineering

SCHEME: 2023

Release date: 19-12-2024

Self-Learning course - 1 (NPTEL) (23CSS1yy)			Self-Learning course - 2 (NPTEL) (23CSS2yy)		
Course Code	Course Title	NPTEL Code	Course Code	Course Title	NPTEL Code
23CSS101*	Advanced Distributed Systems	noc24-cs99	23CSS201	Understanding Incubation and Entrepreneurship	noc25-de07
23CSS102*	Artificial Intelligence: Search Methods For Problem solving	noc24-cs88	23CSS202*	System Design for Sustainability	noc24-de16
23CSS103	Reinforcement Learning	noc25-cs62	23CSS203*	Fiber Optic Communication Technology	noc24-ee131
23CSS104*	Social Network Analysis	noc24-cs90	23CSS204*	Introduction to Semiconductor Devices	noc24-ee99
23CSS105	Social Networks	noc25-cs65	23CSS205*	Pattern Recognition and Application	noc24-ee118
23CSS106*	Statistical Learning for Reliability Analysis	noc24-cs107	23CSS206*	Real-Time Digital Signal Processing	noc24-ee136
23CSS107	Introduction to Industry 4.0 and Industrial Internet of Things	noc25-cs43	23CSS207*	5G Wireless Standard Design	noc24-ee152
23CSS108*	Algorithmic Game Theory	noc24-cs109	23CSS208*	Mathematics for Machine Learning	noc24-ma61
23CSS109*	Design & Implementation of Human-Computer Interfaces	noc24-cs126	23CSS209	Patent Law for Engineers and Scientists	noc25-hs61
23CSS110*	Responsible & Safe AI Systems	noc24-cs132	23CSS210*	Business to Business Marketing (B2B)	noc24-mg91
23CSS111	Affective Computing	noc25-cs04	23CSS211	Predictive Analytics - Regression and Classification	noc25-ec07
23CSS112	Business Intelligence & Analytics	noc25-cs09	23CSS212	Neural Science for Engineers	noc25-ee55
23CSS113	Games and Information	noc25-cs35	23CSS213	Rural Water Resources Management	noc25-ge31
23CSS114	Getting Started with Competitive Programming	noc25-cs36	23CSS214	Introduction to Brain and Behaviour	noc25-hs39
23CSS115	Human Computer Interaction (In English)	noc25-cs38	23CSS215	AI in Human Resource Management	noc25-mg05
23CSS116	Introduction to Embedded System Design	noc25-cs41	23CSS216	AI in Marketing	noc25-mg06
23CSS117	Parallel Computer Architecture	noc25-cs54	23CSS217	AI in Product Management	noc25-mg07

Note:* Represents course is not running for Jan-Apr 2025 semester course in NPTEL.

HOD 19/12/24

Academic Dean 19/12/24

Principal 23.12.2024

Guidelines for Self-learning courses – Under Graduation (UG)

1) As per the Scheme of Teaching & Examinations (ST&E) the UG students to earn totally 06 credits by studying and completing 02 NPTEL/SWAYAM courses of 12 weeks each earning 03 credits.
2) The credits so earned by successful completion of the courses will be credited in the 8th SEM grade card.
3) The successful completion of the courses means earning of the course completion certificates from NPTEL/SWAYAM.
4) The courses shall be studied and completed starting from 3rd Semester and shall be completed before the announcement of 8th Semester End Examinations. However, it is advised to complete both the courses before the 7th SEM of their graduation.
5) The respective department BOS shall identify the professional courses related to the respective discipline either core or multidisciplinary from the list of courses released by NPTEL/SWAYAM every season. At least ten such courses shall be identified and finalized after the discussions in the respective BOS meetings, and the list shall be approved by the Academic Dean.
6) The approved list shall be published by the departments to the students at the beginning of the 3rd SEM itself and the student shall be given an option to choose up to 02 courses for the study and earn certificates of completion.
7) The practicing of studying and completion of NPTEL/SWAYAM courses starting from 3rd SEM itself has multi-fold effect:
   i) Enhances the self-learning ability of the students.
   ii) Study of self-learning courses will have impact on the learning of other courses in the scheme of teaching & examinations.
   iii) Will address the real time challenges/difficulties/differences in the calendars of NPTEL/SWAYAM & Institution.
8) The respective departments shall make holistic efforts to bring awareness to the students about the objectives and importance of self-learning courses. The departments shall thrive towards fulfilment of the objectives.
9) The departments shall continuously monitor & track the progress of the accomplishment of the courses by the students.
10) The departments shall assign course mentors as per the guidelines of the NPTEL/SWAYAM.

11) The departments shall take care that the registered courses and the examinations shall be under the local chapter of the Institution.
12) Every care must be taken by the departments to guide, motivate, to help the students in completing the courses as the academic calendar of the institution and the calendar of the NPTEL/SWAYAM does not match. The faculty advisory system or Mentor System must play a significant role.
13) Every season new courses may be added to the identified list and a fresh list of courses shall be prepared based on the list announced by the NPTEL/SWAYAM every season. However, the courses published from the first list shall be maintained if the NPTEL/SWAYAM list has the courses.
14) If the students are unable to successfully complete the course, they shall be given an option to re-register for the same course multiple times if the courses are available during the respective seasons in NPTEL/SWAYAM list.
15) An option for making fresh choice shall be given to the students until the successful completion of the courses and earning of required number of credits within the defined time.
16) The list of students registered for the courses and completion of the courses shall be submitted to the dean office on completion of every season.
17) All the regulations such as "Dropping of courses", "Withdrawal of Courses", etc. as described in the academic regulations shall be applicable to the Self Learning Courses (SLC).
18) The performance of the students in the assignments and the certification exam of the NPTEL/SWAYAM shall be considered for awarding the grade points to the students in the self-learning courses.
19) If the students are successfully completing more than the prescribed number of courses in their period of study, best performed courses (group wise) may be considered for the award of credits.
20) The CIE & SEE marks as prescribed in the Scheme of Teaching & Examinations (ST&E) shall be considered as per the performance of the student in the successfully completed NPTEL/SWAYAM course. The obtained assignment marks in the successfully completed NPTEL/SWAYAM course shall be mapped to the CIE and obtained exam certification percentage in the successfully completed NPTEL/SWAYAM course shall be mapped for SEE marks.
21) The students unable to complete the self-learning courses and earn the required credits will not be awarded the degree. Degree shall be awarded only after successful completion and earning of credits.

Academic Dean
Dr. Babu N V

Principal
Dr. K V Mahendra Prashanth

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Autonomous Scheme of Teaching & Examinations (ST&E) (Tentative) UG - BE 3rd Year CSE

SCHEME: 2023 **SEM: VI** **Revision date: 15.05.2025**

S. #	Course Type	Course type Series	Course Code	Course Title	Teaching Dept.	QP setting dept	Credits	Teaching Hrs/Week				Examinations				
								L	T	P	O	CIE Marks	SEE (Dur. & Marks)			
								Lecture	Tutorial	Practical	PBL/ABL /SL/etc.		Dur.	Th.	Lab	Tot.
1	PCC	4	23CST601	Artificial Intelligence & Machine Learning	CSE	CSE	**3**	3	0	0		50	03	50	-	100
2	IPCC	7	23CSI602	Theory of Computation	CSE	CSE	**4**	3	0	2	@	50	03	50	-	100
3	PCCL	4	23CSL603	Artificial Intelligence & Machine Learning Lab	CSE	CSE	**1**	0	0	2		50	03	-	50	100
4	PEC	2	23CSP62y	Professional Elective Course - 2	CSE	CSE	**3**	3	0	0		50	03	50	-	100
5	OEC	1	23CSO61y	Open Elective Course - 1	CSE	CSE	**3**	3	0	0		50	03	50	-	100
6	ETC	4	23CSE64y	Emerging Technology Course - 4	CSE	CSE	**3**	3	0	0	@	50	03	50	-	100
7	AEC	6	23RMAE61	Research Methodology & IPR	CSE	CSE	**3**	3	0	0	@	50	03	50	-	100
8	PRJ	1	23CSPRJ1	Project - Phase I	CSE	CSE	**2**	0	0	4	@	50	03	-	50	100
9	HSMC	7	23SCRH08	Social Connect & Responsibility	Any dept	Any dept	**1**	1	0	0	@	50	-	-	-	50
10	NCMC	4	23PASN01	Physical Education - Sports and Athletics	PED	PED	**PP/NP**	-	-	-	2	50	-	-	-	50
			23YOGN02	Yoga	PED	PED										
			23NSSN03	NSS - National Service Scheme	NSS	NSS										
			23NCCN04	NCC - National Cadet Corps	NCC	NCC										
			23IKSN05	Indian Knowledge System	HSS	HSS										
Total							**23**	**19**	**0**	**8**	**2**	**500**		**300**	**100**	**900**

PCC: Professional Course; IPCC: Integrated Professional Core Course; PCCL: Professional Core Course Laboratory; PEC: Professional Elective Course; OEC: Open Elective Course;
HSMC: Humanities, Social Sciences & Management Course; AEC: Ability Enhancement Course; NCMC: Non Credit Mandatory Course; PRJ: Project work.
{@ - Compulsory one activity during the semester}; {I.E.-Industry Experts}; PBL: project Based learning; ABL: Activity Based Learning; SL: Self-Learning
NOTE: CIE & SEE guidelines for S. #7: AEC-23RMAE61-Reserach Methodology & IPR will be same as 3 credit courses BSC/ESC/PCC/ETC/PEC/OEC as mentioned in serial no. 1 of CIE & SEE guidelines.

Open Elective Courses (OEC):

1) Open Electives listed here are to offer for other department students.

2) Students shall select open elective courses offered from other departments, separate consolidated list of courses offered from various departments will be published time to time.

ETC (Emerging Technology Course):

For ETC (L:T:P:O) can be plaanned by the depts considering practicality & possibility of conduction, same shall be indicated along with course title in the list, if altered than above. If planned altering the prescription, the same shall be approved at the department BOS & authorities. Atleast one activity is mandatory during the delivery of the course. The guidelines is applicable to all the semesters III to VI semesters (ETC-1 to ETC-4).

NCMC (Non Credit Mandatory Course) for course type series-4: Refer to guidelines in III SEM.

Professional Elective Course - 2		Open Elective Course - 1		Emerging Technology Course - 4	
Course Code	**Course Title**	**Course Code**	**Course Title**	**Course Code**	**Course Title**
23CSP621	C# and .NET	23CSO611	Introduction to Data Structures	23CSE641	Computer Vision
23CSP622	Storage Area Networks	23CSO612	Object-Oriented Programming with JAVA	23CSE642	Big Data Analytics
23CSP623	Process Automation	23CSO613	Software Testing	23CSE643	Cryptography and Network Security
23CSP624	Mobile Computing	23CSO614	Data Visualization using Python	23CSE644	Full Stack Development

5th Semester Syllabus

Semester:	V	**Course Type:**	PCC		
Course Title: Computer Networks					
Course Code:	**23CST501**			**Credits:**	03
Teaching Hours/Week (L:T:P:O)			3:0:0:0	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3 Hours

I. Course Objectives:

- Study the TCP/IP protocol suite, switching criteria and Medium Access Control protocols for reliable channels.
- Learn network layer services and IP versions.
- Discuss transport layer services and understand UDP and TCP protocols.
- Demonstration of application layer protocols

II. Teaching-Learning Process (General Instructions):

Teachers can use following strategies to accelerate the attainment of the various course outcomes.

1. Chalk and Talk with Black Board
2. ICT based Teaching
3. Demonstration based Teaching

III. COURSE CONTENT

III(a).Theory PART

Module-1: Introduction	8 Hrs

Introduction: Data Communications, Networks, Network Types, Networks Models: Protocol Layering, TCP/IP Protocol suite, The OSI model, Introduction to Physical Layer: Transmission Media, Guided Media, Unguided Media: Wireless.
Textbook 1: Chapter 1: 1.1 - 1.3, Chapter 2: 2.1 - 2.3, Chapter 7: 7.1 - 7.3.

Self-Learning: Wireless Network

Pre-requisites Basic knowledge of Mathematics and Physics (Fundamental Knowledge) Basic knowledge of Computer Hardware	
RBT Levels:L1 – Remembering, L2 – Understanding	
Module-2: Data Link Layer	8 Hrs
Data Link Layer: Error Detection and Correction: Introduction, Block Coding, Cyclic Codes, Check Sum. Data link control: DLC Services: Framing, Flow Control, Error Control, Connectionless and Connection Oriented, Data link layer protocols, High Level Data Link Control, Point to Point Protocol. Media Access Control: Random Access. **Textbook 1:** Chapter 10: 10.1-10.4, Chapter 11: 11.1 -11.4, Chapter 12:12.1 – 12.1.1	
Self-Learning: Data Link Control	
Pre-requisites Basic knowledge of Physical Layer Basic knowledge of Network Topologies	
RBT Levels:L1 – Remembering, L2 – Understanding, L3 – Applying	
Module-3: The Network layer	8 Hrs
Router: Input Processing, Switching, Output Processing, Queuing, Routing control plane. The Internet Protocol(IP): Datagram Format, IPv4 Addressing, ICMP, IPv6, A Brief foray into IP Security, Routing Algorithms: The Link-State (LS) Routing Algorithm, The Distance-Vector (DV) Routing Algorithm, Hierarchical Routing, Routing in the Internet. **Textbook 2**: Chapter 4: 4.3-4.5	
Pre-requisites Basic Networking Concepts Basic knowledge of the Data Link Layer	
RBT Levels:L1 – Remembering, L2 – Understanding, L3 – Applying	
Module-4: Transport Layer	8 Hrs
Transport Layer : Introduction and Transport-Layer Services: Relationship Between Transport and Network Layers, Overview of the Transport Layer in the Internet, Multiplexing and Demultiplexing, Connectionless Transport: UDP,UDP Segment Structure, UDP Checksum, Principles of Reliable Data Transfer: Building a Reliable Data Transfer Protocol, Pipelined Reliable Data Transfer Protocols, Go-Back-N, Selective repeat, Connection-Oriented Transport TCP: TCP Connection Management. **Textbook 2:** Chapter 3 : 3.1 – 3.4 , 3.5.6	

Pre-requisites:
Basic Networking Concepts
Basics of TCP/IP Suite
Understanding of IP and Ports

RBT Levels:L2 – Understanding, L3 – Applying

Module-5: Application Layer	8 Hrs

Application Layer: Principles of Network Applications: Network Application Architectures, Processes Communicating, Transport Services Available to Applications, Transport Services Provided by the Internet, Application-Layer Protocols. The Web and HTTP: Overview of HTTP, Non-persistent and Persistent Connections, HTTP Message Format, User-Server Interaction: Cookies, Web Caching, The Conditional GET, File Transfer: FTP Commands & Replies, Electronic Mail in the Internet: SMTP, Comparison with HTTP, Mail Message Format, Mail Access Protocols, DNS- The Internet's Directory Service: Services Provided by DNS, Overview of How DNS Works, DNS Records and Messages.
Textbook 2: Chapter 2: 2.1- 2.5

Pre-requisites:
Basic Understanding of Session and Presentation Layers
Understanding of Client-Server Architecture
Basic Programming Knowledge

RBT Levels: L2 – Understanding

IV. COURSE OUTCOMES

Students will be able to

CO1	Learn the basic needs of communication system
CO2	Interpret the communication challenges and its solution
CO3	Identify and Organize the communication system network components
CO4	Recognize Transport layer services and infer UDP/TCP Protocols
CO5	Demonstration of application layer protocols

V. CO-PO-PSO MAPPING(mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3
CO1	2					1							2		
CO2	2	2	2			1								2	
CO3	2	2	2			1								2	
CO4	2		1										2		
CO5	2					2							2		

VI. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023 Dated on 10-02-2025.

Continuous Internal Evaluation (CIE): Refer Annexure section 1

Semester End Examination (SEE): Refer Annexure section 1

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
01	Data Communications and Networking	Behrouz A. Forouzan	5th Edition, 2013	Tata McGraw-Hill
02	Computer Networking, A Top-Down Approach	James F Kurose and Keith W Ross	Sixth edition, 2017	Pearson

VII(b): Reference Books:

01	Computer Networks – A Systems Approach	Larry L. Peterson and Bruce S. Davie	4th Edition, 2019	Elsevier
02	Computer and Communication Networks	Nader F. Mir	2nd Edition, 2015	Pearson Education
03	Data and Computer Communication	William Stallings	10th Edition, 2014	Pearson Education

VII(c): Web links and Video Lectures (e-Resources):

- https://www.digimat.in/nptel/courses/video/106105183/L01.html
- http://www.digimat.in/nptel/courses/video/106105081/L25.html
- https://nptel.ac.in/courses/10610

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

- Case Study-1
- Programming Assignment
- Gate Based Aptitude Test
- MOOC Assignment for selected Module

Semester:	V	**Course Type:**	IPCC		
Course Title: Software Engineering and Project Management					
Course Code:	**23CSI502**			**Credits:**	04
Teaching Hours/Week (L:T:P:O)			3:0:2:@	**Total Hours:**	40+(10-12 lab slots)
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3 Hours

I. Course Objectives:

- Understand Software Engineering methods, software process models, ethical and professional issues.
- Analyse various system models in design and implementation
- Evaluate software to verify and validate using various testing methods.
- Create a quality project plan for software development.
- Apply advanced software development methods like agile programming for better software development practice.

II. Teaching-Learning Process (General Instructions):

Teachers can use following strategies to accelerate the attainment of the various course outcomes.
1. Chalk and Talk with Black Board
2. ICT based Teaching
3. Demonstration based Teaching

III. COURSE CONTENT

III(a). Theory PART

Module-1: Introduction to Software Engineering	8 Hrs

Software and Software Engineering: The nature of Software, The unique nature of WebApps, Software Engineering, The software Process, The software Engineering practice, The software myths, Project initiation.

Process Models: A generic process model, Process assessment and improvement, Prescriptive process models, Waterfall model, Incremental process models, Evolutionary process models, Concurrent models, Specialized process models.

Textbook 1: Chapter 1: 1.1 to 1.7, Chapter 2: 2.1 to 2.4

RBT Levels: L1 – Remembering, L2 – Understanding, L3 – Applying

Module-2: Requirements Engineering	
Understanding Requirements: Requirements Engineering, Establishing the ground work, Eliciting Requirements, developing use cases, Building the requirements model, Negotiating Requirements, Validating Requirements, Requirements Modeling Scenarios, Information and Analysis classes: Requirement Analysis, Scenario based modeling, UML models that supplement the Use Case, Data modeling Concepts class Based Modeling. **Textbook 1:** Chapter 5: 5.1 to 5.7, Chapter6: 6.1 to 6.5	8 Hrs
RBT Levels: L1 – Remembering, L2 – Understanding, L3 – Applying	
Module-3: Agile Development	8 Hrs
Agile Development: Agility, Agility and the cost of change. Agile Process, Extreme Programming (XP), Other Agile Process Models, A tool set for Agile process**.** **Textbook 1:** Chapter 3: 3.1 to 3.6	
RBT Levels: L1 – Remembering, L2 – Understanding, L3 – Applying,	
Module-4: Project Management, Project Planning & Quality Management	8 Hrs
Project Management: Management activities, Project planning, Project scheduling, Risk management. **Quality management:** Process and Product quality, Quality assurance and standards, Quality planning, Quality control **Textbook 2:** Chapter 5: 5.1 to 5.4, Chapter 27	
Self-Learning: Case Studies	
RBT Levels: L2 – Understanding, L3 – Applying	
Module-5: Software Testing:	8 Hrs
Software Testing, Component testing, Test case design, Test automation **Textbook 2:** Chapter 23	
Self-Learning: Case Studies	
RBT Levels: L2 – Understanding, L3 – Applying	
III(b). Practical Part	
Prepare the following documents and develop the software project startup prototype model, using software engineering methodology for at least two real-time scenarios or for the sample experiments. •Problem Analysis and Project Planning: Thorough study of the problem; Identification of Project scope, Objectives, and Infrastructure. •Software Requirement Analysis –Describe the individual Phases/modules of the project and Identify deliverables. Identify functional and non-functional requirements.	

•Data Modeling –Use work products –data dictionary.

•Software Designing -Develop use case diagrams and activity diagrams, build and test class diagrams, sequence diagrams and add interface to class diagrams.

•Prototype model –Develop the prototype of the product.

The SRS and prototype model should be submitted at the end-of-semester examination.

List of Sample Experiments:

1 Hostel Management System

Objectives

- Automate student registration and room allotment.
- Manage fee payments and generate receipts.
- Track complaints and maintenance requests.
- Provide real-time reports for administrators.

2 Library Management System

Objectives

- Manage book catalogue and inventory efficiently.
- Automate book issuance, renewal, and return processes.
- Implement fine calculation for overdue books.
- Provide search functionality for books by title, author, or genre.
- Enable role-based access (Librarian, Student, Faculty).

3 Class Timetable Automation System

Objectives

- Automatically generate optimized class timetables.
- Ensure no faculty, student, or room conflicts.
- Allow modifications and customizations by administrators.
- Provide real-time access to students and faculty**.**

4 College transportation System

Objectives

- Allow students to register for bus routes online.
- Generate optimized bus schedules based on student locations.
- Provide real-time bus tracking using GPS.
- Send notifications about bus arrivals, delays, or route changes

IV. COURSE OUTCOMES

Students will be able to

CO1	Understand the activities involved in software engineering and analyse the role of various process models
CO2	Explain the basics of object-oriented concepts and build a suitable class model using modelling techniques
CO3	Describe various software testing methods and to understand the importance of agile methodology and DevOps
CO4	Illustrate the role of project planning and quality management in software development
CO5	Understand the importance of activity planning and different planning models

V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3
CO1	1		2	1	2					1	1			2	
CO2			2		2					2	2				
CO3		2	2		2							1			
CO4					1		2			2	3				2
CO5	2	2								2	2				

VI. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023 Dated on 10-02-2025.

Continuous Internal Evaluation (CIE): Refer Annexure section 2

Semester End Examination (SEE): Refer Annexure section 2

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
01	Software Engineering-A Practitioners approach	Roger S. Pressman	7th Edition	Tata McGraw Hill.

02	Software Engineering	Ian Sommerville	10th Edition, 2015	Pearson Education
VII(b): Reference Books:				
01	Object Oriented Modelling and Design with UML	Michael Blaha, James Rumbaugh	2nd Edition,2005.	Pearson Education
02	Software Project Management	Bob Hughes, Mike Cotterell, Rajib Mall	6th Edition, 2018.	McGraw Hill Education
VII(c): Web links and Video Lectures (e-Resources):				
https://onlinecourses.nptel.ac.in/noc20_cs68/preview http://elearning.vtu.ac.in/econtent/CSE.php https://nptel.ac.in/courses/128/106/128106012/ http://elearning.vtu.ac.in/econtent/courses/video/CSE/15CS42.html				
VIII: Activity Based Learning / Practical Based Learning/Experiential learning:				
Case studies Team building activities				

Semester:	V	**Course Type:**	IPCC		
Course Title: Database Management Systems					
Course Code:	**23CSI503**			**Credits:**	4
Teaching Hours/Week (L:T:P:O)			3:0:2:@	**Total Hours:**	40 +(10-12 lab slots)
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3

I. Course Objectives:

This course will enable students to:

- Provide a strong foundation in database concepts, technology, and practice.
- Practice SQL programming through a variety of database problems.
- Design and build database applications for real world problems.
- To become familiar with database storage structures and access techniques.

II. Teaching-Learning Process (General Instructions):

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) need not to be only traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) learning in the class.
4. Ask at least three HOT (Higher Order Thinking) questions in the class, which promotes critical thinking.

5. Adopt Problem Based Learning (PBL), which fosters student's analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce topics in manifold representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world and when that's possible, it helps to improve the student's understanding.

III. COURSE CONTENT

III(a). Theory PART

Module-1: Introduction to Databases	8 Hrs

Introduction to Databases: Introduction, Characteristics of database approach, Advantages of using the DBMS approach.

Overview of Database Languages and Architectures: Data Models, Schemas, and Instances. Three schema architecture and data independence, database languages, and interfaces, The Database System environment.

Conceptual Data Modelling using Entities and Relationships: Entity types, Entity sets, attributes, roles, and structural constraints, Weak entity types, ER diagrams, examples,

Textbook 1: Chapter 1.1 to 1.8, 2.1 to 2.6, 3.1 to 3.10

Self-Learning: Specialization and Generalization.

Pre-requisites: Computer Architecture

RBT Levels: L1 – Remembering, L2 – Understanding, L3 – Applying

Module-2: Relational Model:	8 Hrs

Relational Model Concepts, Relational Model Constraints and relational database schemas, Update operations, transactions, and dealing with constraint violations.

Relational Algebra: Unary and Binary relational operations, additional relational operations (aggregate, grouping, etc.).

Mapping Conceptual Design into a Logical Design: Relational Database Design using ER-to-Relational mapping.

Textbook 1: Chapter 5: 5.1 to 5.3, Chapter 8: 8.1 to 8.5; Chapter 9: 9.1 to 9.2

Textbook 2: Chapter 3: 3.5

Self-Learning: Examples of Queries in relational algebra.	
Pre-requisites: Discrete Mathematics Structures	
RBT Levels:L1 – Remembering, L2 – Understanding, L3 – Applying	
Module-3: SQL	8 Hrs
SQL data definition and data types, specifying constraints in SQL, retrieval queries in SQL, INSERT, DELETE, and UPDATE statements in SQL. **SQL:** Advanced Queries: More complex SQL retrieval queries, Specifying constraints as assertions and action triggers, Views in SQL. **Textbook 1:** Chapter 6: 6.1 to 6.5, Chapter 7: 7.1 to 7.3,	
Self-Learning: Additional features of SQL	
Pre-requisites: Microsoft Excel, and basic programming	
RBT Levels:L1 – Remembering, L2 – Understanding, L3 – Applying	
Module-4: Normalization	8 Hrs
Introduction to Normalization using Functional and Multivalued Dependencies: Informal design guidelines for relation schema, Functional Dependencies, Normal Forms based on Primary Keys, Second and Third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form. **Textbook 1:** Chapter 14: 14.1 to 14.7	
Self-Learning: Case Studies	
Pre-requisites: Relational Database Fundamentals	
RBT Levels:L1 – Remembering, L2 – Understanding, L3 – Applying	
Module-5: NOSQL	8 Hrs
Introduction to NOSQL Systems, The CAP Theorem, Document-Based NOSQL Systems and MongoDB, NOSQL Key-Value Stores, Column-Based or Wide Column NOSQL Systems, NOSQL Graph Databases **Textbook 1:** Chapter 24: 24.1 to 24.6	
Self-Learning: Case Studies	
Pre-requisites: Understanding concepts of SQL	
RBT Levels:L1 – Remembering, L2 – Understanding, L3 – Applying	
III(b). PRACTICAL PART	
Sl. No.	**Programs**

1	Create a table called Employee that contain attributes EMPNO,ENAME,JOB, MGR,SAL & execute the following. 1. Add a column commission with domain to the Employeetable. 2. Insert any five records into the table. 3. Update the column details of job 4. Rename the column of Employ table using alter command. 5. Delete the employee whose Empno is 105.
2	Queries using aggregate functions(COUNT,AVG,MIN,MAX,SUM),Group by,Orderby. Employee(E_id, E_name, Age, Salary) 1. Create Employee table containing all Records E_id, E_name, Age, Salary. 2. Count number of employee names from employeetable 3. Find the Maximum age from employee table. 4. Find the Minimum age from employeetable. 5. Find salaries of employee in Ascending Order. 6. Find grouped salaries of employees.
3	Create a table called Employee & execute the following. Employee(EMPNO,ENAME,JOB, MANAGER_NO, SAL, COMMISSION) 1. Create a user and grant all permissions to the user. 2. Insert the any three records in the employee table contains attributes EMPNO, ENAME JOB, MANAGER_NO, SAL, COMMISSION and use rollback. Check the result. 3. Add primary key constraint and not null constraint to the employee table. 4. Insert null values to the employee table and verify the result.
4	Consider the schema for College Database: STUDENT(USN, SName, Address, Phone, Gender) SEMSEC(SSID, Sem, Sec)

	CLASS(USN, SSID) COURSE(Subcode, Title, Sem, Credits) IAMARKS(USN, Subcode, SSID, Test1, Test2, Test3, FinalIA) Write SQL queries to 1. List all the student details studying in fourth semester 'C' section. 2. Compute the total number of male and female students in each semester and in each section. 3. Create a view of Test1 marks of student USN '1BI15CS101' in all Courses. 4. Calculate the FinalIA (average of best two test marks) and update the corresponding table for all students. (USE PL/SQL concept) 5. Categorize students based on the following criterion: If FinalIA = 17 to 20 then CAT = 'Outstanding' If FinalIA = 12 to 16 then CAT = 'Average' If FinalIA< 12 then CAT = 'Weak' Give these details only for 8th semester A, B, and C section students
5	Install an Open Source NoSQL Data base MangoDB & perform basic CRUD(Create, Read, Update & Delete) operations. Execute MangoDB basic Queries using CRUD operations.

IV. COURSE OUTCOMES

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

CO1	Inculcate basic concepts, application and architecture of database systems
CO2	Apply design principles and representing the description of the database using E-R diagram, and Gain Knowledge on relational database theory
CO3	Construct queries using SQL on commercial relational database system(oracle)
CO4	Illustrate to tune the database design using normalization Techniques
CO5	Understand the concepts of NoSQL databases.

V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3
CO1	3	2										1	2		2
CO2		2			2								2	2	
CO3	2												1		
CO4	2	2				2						2	2		1
CO5			2	1								1	1		2

VI. Assessment Details (CIE & SEE)				
General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023 Dated on 10-02-2025.				
Continuous Internal Evaluation (CIE): Refer Annexure section 2				
Semester End Examination (SEE): Refer Annexure section 2				
VII. Learning Resources				
VII(a): Textbooks:				
Sl. No.	**Title of the Book**	**Name of the author**	**Edition and Year**	**Name of the publisher**
1	Fundamentals of Database Systems	Ramez Elmasri and Shamkant B. Navathe	7th Edition	Pearson
2	Database management systems	Ramakrishnan, and Gehrke, ,	l3rd Edition,	McGraw Hil, 2014
VII(b): Reference Books:				
1	Database System Concepts	Silberschatz Korth and Sudharshan	6th Edition	McGrawHill, 2013
2	Database Principles Fundamentals of Design, Implementation and Management	Coronel, Morris, and Rob,	3rd edition	Cengage Learning 2012
VII(c): Web links and Video Lectures (e-Resources):				
https://onlinecourses.nptel.ac.in/noc25_cs18/preview https://nptel.ac.in/courses/106105175				
VIII: Activity Based Learning / Practical Based Learning/Experiential learning:				
Activity Based Learning (Suggested Activities in Class)/ Practical Based learning 1. Quizzes 2. Assignments 3. Mini Project				

Semester:	V	**Course Type:**	PCCL		
Course Title: Computer Networks Laboratory					
Course Code:	**23CSL504**			**Credits:**	1
Teaching Hours/Week (L:T:P:O)			0:0:2:0	**Total Hours:**	12 Lab Slots
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Practical			**Exam Hours:**	3

I. Course Objectives:

This laboratory course enables students to get practical experience in design, develop, implement, analyze

and evaluation of

- To understand the working principle of various communication protocols.
- To analyze the various routing algorithms.
- To know the concept of data transfer between nodes

Descriptions :

- For experiments 1 to 3, modify the topology and parameter settings, conduct multiple rounds of readings, and analyze the results from the log files. Plot the necessary graphs and provide a conclusion. Use NS2 or NS3 for the implementation.
- Experiments 4 to 9 should be implemented in Java

II. Teaching-Learning Process

- Chalk and Talk with Black Board
- ICT based Teaching
- Demonstration based Teaching

III. COURSE CONTENT

Prerequisite: Basics of C and Java Programming

Self-Learning: Array operations programs

Sl. No.	Experiments
1.	Implement three nodes point – to – point network with duplex links between them. Set the queue size, vary the bandwidth, and find the number of packets dropped.
2.	Implement transmission of ping messages/trace route over a network topology consisting of 6 nodes and find the number of packets dropped due to congestion.
3.	Implement an Ethernet LAN using n nodes and set multiple traffic nodes and plot congestion window for different source / destination.
4.	Develop a program for error detecting code using CRC-CCITT (16- bits).
5.	Develop a program to find the shortest path between vertices using the Bellman-Ford routing algorithm.
6.	Using TCP/IP sockets, write a client – server program to make the client send the file name and to make the server send back the contents of the requested file if present.
7.	Develop a program on a datagram socket for client/server to display the messages on client side, typed at the server side.
8.	Develop a program for a simple RSA algorithm to encrypt and decrypt the data.
9.	Develop a program for congestion control using a leaky bucket algorithm.

IV. COURSE OUTCOMES

CO1	Implement and simulate communication protocols and network algorithms to enhance data transmission efficiency and reliability.
CO2	Analyze and Compare various networking protocols
CO3	Demonstrate the working of different concepts of networking

V. CO-PO-PSO MAPPING(mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3
CO1			2		2										2
CO2		2	2											2	
CO3		2	2											2	

VI. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023 Dated on 10-02-2025.

Continuous Internal Evaluation (CIE): Refer Annexure section 4

Semester End Examination (SEE): Refer Annexure section 4

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
01	Data Communications and Networking	Behrouz A. Forouzan	5th Edition, 2013	Tata McGraw Hill
02	Computer Networking, A Top-Down Approach	James F Kurose and Keith W Ross	Sixth edition, 2017	Pearson

VII(b): Reference Books:

01	Computer Networks – A Systems Approach	Larry L. Peterson and Bruce S. Davie	4th Edition, 2019	Elsevier
02	Computer and Communication Networks	Nader F. Mir	2nd Edition, 2015	Pearson Education
03	Data and Computer Communication	William Stallings	10th Edition, 2014	Pearson Education

VII(c): Web links and Video Lectures (e-Resources):

https://www.isi.edu/websites/nsnam/ns/

- https://www.tutorialsweb.com/ns2/NS2-1.htm/
- https://ns2simulator.com/ns2-download/
- https://ns2projects.org/ns2-simulator-free-download/
- https://www.geeksforgeeks.org/java-programming-basics/
- https://www.tpointtech.com/java-basics
- https://www.w3schools.com/java/

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

- Programming Assignment
- MOOC Assignment

Semester:	V	**Course Type:**	PEC		
Course Title: Unix System Programming					
Course Code:	**23CSP511**			**Credits:**	03
Teaching Hours/Week (L:T:P:O)			3:0:0:0	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3 Hours

I. Course Objectives:

- Understand UNIX Architecture and command usage.
- Explore UNIX File System and APIs.
- Analyze Process Control Mechanisms.
- Implement Signals and Daemon Processes.
- Develop Interprocess Communication Skills.

II. Teaching-Learning Process (General Instructions):

Teachers can use following strategies to accelerate the attainment of the various course outcomes.

1. Chalk and Talk with Black Board
2. ICT based Teaching
3. Demonstration based Teaching

III. COURSE CONTENT

Module-1: Introduction	8 Hrs

Introduction: The Operating System, The Unix Operating System, Knowing your Machine, A brief Session, The UNIX Architecture and command usage: The UNIX Architecture, Features of Unix. Posix and Single Unix specification. Locating commands. Internal and external commands. Command structure, flexibility of command usage, Man Browsing the Manual pages On-line, Understanding the man documentation. General Purpose utilities: cal, date, echo, printf, bc, script,

Email basics, mailx, passwd, who, uname, tty, stty. The file system: The file, what's in a file name,The parent-child relationship, The HOME variable, pwd, sd, mkdir, rmdir, Absolute and relative pathnames, ls.

Textbook 1: Chapter 1,2,3,4,5,6

Self-Learning: Handling ordinary files: cat, cp, rm, mv.

Pre-requisites

Fundamentals of Operating Systems

Basic concepts like processes, memory management, and file systems.

Difference between system software and application software.

RBT Levels: L1 – Remembering, L2 – Understanding

Module-2: UNIX Files and APIs	8 Hrs

UNIX Files and APIs: File Types, The UNIX and POSIX File System, The UNIX and POSIX File Attributes, Inodes in UNIX System V, Application Program Interface to Files, UNIX Kernel Support for Files, Relationship of C Stream Pointers and File Descriptors, Directory Files, Hard and Symbolic Links. UNIX File APIs: General File APIs, File and Record Locking, Directory File APIs, Device File APIs, FIFO File APIs.

Textbook 2: Chapter 6,7

Self-Learning: Symbolic Link File APIs.

Pre-requisites

Basic UNIX/Linux Knowledge

- Understanding the UNIX/Linux file system structure (/home, /etc, /var, etc.).
- Familiarity with basic UNIX shell commands (ls, cd, pwd, rm, cp, mv, find).
- Understanding file permissions (chmod, chown, chgrp).

RBT Levels: L1 – Remembering, L2 – Understanding

Module-3: UNIX Processes and Process Control	8 Hrs

UNIX Processes and Process Control: The Environment of a UNIX Process: Introduction, main function, Process Termination, Command-Line Arguments, Environment List, Memory Layout of a C Program, Shared Libraries, Memory Allocation, Environment Variables, setjmp and longjmp Functions, getrlimit, setrlimit Functions. Process Control: Introduction, Process Identifiers, fork, vfork, exit, wait, waitpid, wait3, wait4 Functions, Race Conditions, exec Functions. Process Relationships: Introduction, Terminal Logins, Network Logins, Process Groups, Sessions.

Textbook 3: Chapter 7, 8, 9

Self-Learning: Controlling Terminal.

Pre-requisites

Basic UNIX/Linux Knowledge

- Understanding UNIX/Linux file system and shell commands.
- Familiarity with process management commands (ps, top, kill, jobs, fg, bg).
- Understanding of user and group permissions (id, whoami, su, sudo).

RBT Levels: L1 – Remembering, L2 – Understanding, L3 – Applying

Module-4: Signals and Daemon Processes	8 Hrs

Signals and Daemon Processes: Signals: The UNIX Kernel Support for Signals, signal, Signal Mask, sigaction, The SIGCHLD Signal and the waitpid Function, The sigsetjmp and siglongjmp Functions, Kill, Alarm, Interval Timers, POSIX.lb Timers. Daemon Processes: Introduction, Daemon Characteristics, Coding Rules, Error Logging.

Textbook 2: Chapter 9, Textbook 3: Chapter 13

Self-Learning: Client-Server Model.

Pre-requisites

C Programming Fundamentals

- Writing and compiling C programs (gcc, gdb).
- Error handling using errno, perror, strerror.
- Understanding function pointers and callbacks.

RBT Levels: L2 – Understanding, L3 – Applying

Module-5: Interprocess Communication	8 Hrs

Interprocess Communication : Overview of IPC Methods, Pipes, popen, pclose Functions, Coprocesses, FIFOs, XSI IPC, Message Queues, Semaphores. Shared Memory.

Textbook 3: Chapter 15

Self-Learning: Client-Server Properties.

Pre-requisites

Basic UNIX/Linux Knowledge

- Familiarity with UNIX shell commands (ps, kill, top, jobs).
- Understanding process management (fg, bg, nohup, disown).
- Basic file operations (open, read, write, close).

RBT Levels: L2 – Understanding, L3 – Applying

IV. COURSE OUTCOMES

Students will be able to

CO1	Understand the Fundamentals of UNIX and its architecture.
CO2	Implement File Handling and Directory Management.
CO3	Manage Process Creation and Control.
CO4	Handle Signals and Daemon Processes.
CO5	Utilize IPC Mechanisms for Communication.

V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3
CO1	3	2			1							1	2		
CO2	3	2			1							1	2		
CO3	3	2			1							1	2		
CO4	3	2			1							1	2		
CO5	3	2			1							1	2		

VI. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023 Dated on 10-02-2025.

Continuous Internal Evaluation (CIE): Refer Annexure section 1

Semester End Examination (SEE): Refer Annexure section 1

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
01	UNIX – Concepts and Applications	Sumitabha Das	4th Edition, 2006	Tata McGraw Hill
02	Unix System Programming Using C++	Terrence Chan	1999	PHI

03	Advanced Programming in the UNIX Environment	W.Richard Stevens, Stephen A. Rago	3rd Edition, Pearson Education 2005	PHI
VII(b): Reference Books:				
01	Advanced Unix Programming	S Marc J. Rochkind	2nd Edition,2005	Pearson Education
02	The Design of the UNIX Operating System	Maurice.J.Bach	1987	Pearson Education / PHI
03	Unix Internals	Uresh Vahalia	Pearson Education, 2001	Pearson Education
VII(c): Web links and Video Lectures (e-Resources):				
https://linuxcommand.org/tlcl.php https://www.gnu.org/software/libc/manual/ https://www.geeksforgeeks.org/unix-commands/ https://www.tutorialspoint.com/unix/index.htm				
VIII: Activity Based Learning / Practical Based Learning/Experiential learning:				
• Case Study-1 • Programming Assignment				

BE in Computer Science and Engineering

Semester:	V	**Course Type:**	PEC		
Course Title: Advanced JAVA					
Course Code:	**23CSP512**			**Credits:**	03
Teaching Hours/Week (L:T:P:O)			3:0:0:0	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3 Hours

I. Course Objectives:

- To introduce advanced Java concepts such as Enumerations, Autoboxing and Annotations
- Demonstrate the fundamental concepts of String operations
- Design and Develop Solutions to problems using Generic classes
- To discuss Switch Expressions, Records and other recent features
- Understanding the fundamentals of collection framework

II. Teaching-Learning Process (General Instructions):

Teaching-Learning Process (General Instructions)
These are sample Strategies; that teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) does not mean only the traditional lecture method, but different types of teaching methods may be adopted to achieve the outcomes.
2. Promote collaborative learning (Group Learning) in the class.
3. Pose at least three HOT (Higher Order Thinking) questions in the class to stimulate critical thinking.
4. Incorporate Problem-Based Learning (PBL) to foster students' analytical skills and develop their ability to evaluate, generalize, and analyze information rather than merely recalling it.
5. Introduce Topics in manifold representations.
6. Demonstrate ways to solve the same problem and encourage the students to come up with their own creative solutions.
7. Discuss application of every concept to solve the real world problems.

III. COURSE CONTENT

Module-1: Enumerations, Autoboxing, and Annotations.	8 Hrs

Type Wrappers, Autoboxing, Annotations, Type Annotations, Repeating Annotations, and Some Restrictions.
Text Book 1: Chapter: 1

Self-Learning: Enumerations	
Pre-requisites Basic knowledge of common programming concepts, including loops, arrays and functions. Basic knowledge of object oriented programming language Java.	
RBT Levels: L1 – Remembering, L2 – Understanding, L3 – Applying	
Module-2: String Handling.	8 Hrs
String Length, Special String Operations, Character Extraction, String Comparison, Searching Strings, Modifying a String, Data Conversion Using valueOf( ), Changing the Case of Characters Within a String, joining strings, Additional String Methods, StringBuffer , StringBuilder **Textbook 1:** Chapter:18	
Self-Learning: String Constructors	
Pre-requisites Basic knowledge of Strings.	
RBT Levels: L1 – Remembering, L2 – Understanding, L3 – Applying	
Module-3: Generics.	8 Hrs
What are Generics? A Simple Generic Example, A Generic Class with Two Type Parameters, The General Form of a Generic Class, Bounded Types, Using Wildcard Arguments, Creating a Generic Method, Generic Interfaces, Generic Class Hierarchies, Type Inference with Generics. **Textbook 1:** Chapter: 14.	
Self-Learning: Generic Restrictions.	
Pre-requisites Basic knowledge of Class, Methods, and Parameters.	
RBT Levels: L1 – Remembering, L2 – Understanding, L3 – Applying,	
Module-4: Lambda Expressions, Switch Expressions, Records	8 Hrs
Introducing Lambda Expressions, Block Lambda Expressions, Generic Functional Interfaces, Method References, Constructor References, Predefined Functional Interfaces. Enhancement to switch, Text Blocks, Records, Pattern Matching with instanceof, Sealed Classes. **Textbook1:** Chapter: 15 and 17.	
Self-Learning: Interfaces Future Directions.	
Pre-requisites **S**olid knowledge of Interfaces and Records.	
RBT Levels: L2 – Understanding, L3 – Applying	
Module-5: The collections and Framework.	8 Hrs
Collections Overview, The Collection Interfaces, The Collection Classes, accessing a collection Via an Iterator, Storing User Defined Classes in Collections, The Random Access Interface, Working with Maps, Comparators, The Collection Algorithms, Arrays, The legacy Classes and Interfaces. **Text Book 1**: Chapter: 20	
Self-Learning: Parting Thoughts on Collections.	
Pre-requisites: A good basic knowledge of data structures and algorithms.	
RBT Levels: L2 – Understanding, L3 – Applying	

IV. COURSE OUTCOMES

Students will be able to

CO1	Select appropriate Enumerations and Annotations to solve the real-world problems.
CO2	Solve specific problems using Strings.

CO3	Implement various applications using Generics.
CO4	Apply Lambda Expressions, Switch Expressions, and Records to model and solve real-world problems
CO5	Utilize collections to store and retrieve data efficiently.

V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PS O	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3
CO1	2	1	1										1		
CO2	2	2	2										1		
CO3	2	2	2										1		
CO4	2	2	2										1		
CO5	2	2	2										1		

VI. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023 Dated on 10-02-2025.

Continuous Internal Evaluation (CIE): Refer Annexure section 1

Semester End Examination (SEE): Refer Annexure section 1

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
01	JAVA the Complete Reference.	Herbert Schildt.	12th Edition.	Tata McGraw-Hill.

VII(b): Reference Books:

01	Introduction to JAVA Programming,	Y. Daniel Liang	7th Edition, 2007.	Pearson Education.
02	Advanced JAVA programming	Uttam K Roy.	1st Edison,2015.	Oxford University press.

VII(c): Web links and Video Lectures (e-Resources):

1. https://nptel.ac.in/courses/106/105/106105191/
2. https://nptel.ac.in/courses/106/105/106105225/
3. https://youtu.be/qGMxs-PbFPk

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

1. Case Study-1 2. Programming Assignment 3. Gate Based Aptitude Test 4. MOOC Assignment for selected Module

Semester:	V	**Course Type:**	PEC		
Course Title: Human Computer Interaction					
Course Code:	**23CSP513**			**Credits:**	03
Teaching Hours/Week (L:T:P:O)			3:0:0:0	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3 Hours

I. Course Objectives:

- To learn the foundations of Human Computer Interaction.
- To become familiar with the design technologies for individuals and persons with disabilities.
- To be aware of mobile HCI.
- To learn the guidelines for user interface.

II. Teaching-Learning Process (General Instructions):

Teachers can use following strategies to accelerate the attainment of the various course outcomes.
1. Chalk and Talk with Black Board
2. ICT based Teaching
3. Demonstration based Teaching

III. COURSE CONTENT

Module-1 : Foundations	8 Hrs

The Human: I/O channels – Memory – Reasoning and problem solving; The Computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity-

Text Book 1: Chapter1: 1.2, 1.3,1.4, Chapter 2: 2.9, Chapter 3: 3.2,3.3,3.4,3.5

Self-Learning: Memory processing

Pre-requires: Basics of computer

RBT Levels: L1 – Remembering, L2 – Understanding

Module-2 : Design & Software Process	8 Hrs

Interactive Design: Basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process: usability engineering – Prototyping in practice – design rationale. **Text Book 1:** Chapter:5, Chapter: 6	
Self-Learning: HCI in software process: Software life cycle	
RBT Levels: L1 – Remembering, L2 – Understanding	
Module-3: Models And Theories	8 Hrs
HCI Models: Cognitive models- Design focus, Linguistic models Socio-Organizational issues and stakeholder requirements – Communication and collaboration models **Text Book 1: Chapter 1:- 12.2,12.3, Chapter 13:13.2,13.3, Chapter 14: 14.2,14.3,14.4**	
Self-Learning: Communication	
RBT Levels: L1 – Remembering, L2 – Understanding	
Module-4 : Mobile HCI	8 Hrs
Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools. **Text Book 2:** Chapter 1, Chapter 6, Chapter7, Chapter 8	
RBT Levels: L2 – Understanding, L3 – Applying	
Module-5: Web Interface Design	8 Hrs
Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow - Case Studies **Text Book 3:** Chapter 4, Chapter 5, Chapter 6, Chapter 7, Chapter 8	
RBT Levels: L2 – Understanding, L3 – Applying	

IV. COURSE OUTCOMES

Students will be able to

CO1	Design effective dialog for HCI
CO2	Design effective HCI for individuals and persons with disabilities.
CO3	Assess the importance of user feedback.
CO4	Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites.
CO5	Develop meaningful user interface.

V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3
CO1	3	2										1	2		
CO2	2	2										1	2		
CO3	2	2										1	2		
CO4	2	1			1							1	2		
CO5	2	1			1							1	2		

VI. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023 Dated on 10-02-2025.

Continuous Internal Evaluation (CIE): Refer Annexure section 1

Semester End Examination (SEE): Refer Annexure section 1

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
01	Human Computer Interaction	Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale	3rd Edition	Pearson Education, 2004 (Module I, II & III)
02	Mobile Design and Development	Brian Fling	First Edition	O'Reilly Media Inc., 2009 (Module – IV)
03	Designing Web Interfaces	Bill Scott and Theresa Neil	First Edition	O'Reilly, 2009. (Module-V)

VII(b): Reference Books:

01	The Encyclopedia of Human-Computer Interaction,	Adnan Ahmad, Alan Blackwell Alan Dix,et.al.,	2nd Edition	International design Foundation

VII(c): Web links and Video Lectures (e-Resources):

http://elearning.vtu.ac.in/econtent/courses/video/CSE/06CS35.html

- https://onlinecourses.nptel.ac.in/noc25_cs38/preview
- https://nptel.ac.in/courses/106103115
- https://onlinecourses.nptel.ac.in/noc19_cs86/preview

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:
• Case Study-1 • Programming Assignment • Gate Based Aptitude Test • MOOC Assignment for selected Module

BE in Computer Science and Engineering

Semester:	V	**Course Type:**	PEC		
Course Title: Advanced Computer Architecture					
Course Code:	**23CSP514**			**Credits:**	03
Teaching Hours/Week (L:T:P:O)			3:0:0:0	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3 Hours

I. Course Objectives:

- Explain the fundamentals of computer processor architecture.
- Measure the performance of architectures in terms of right parameters.
- Explain about parallelism, memory systems, and multiprocessors.
- Summarize parallel architecture and the software used for them

II. Teaching-Learning Process (General Instructions):

Teachers can use following strategies to accelerate the attainment of the various course outcomes.

1. Chalk and talk with black board.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. ICT based teaching.
7. Project based learning.

III. COURSE CONTENT

III(a).Theory PART

Module-1: Theory of Parallelism	8 Hrs

Theory of Parallelism: Parallel Computer Models, The State of Computing, Multiprocessors and Multicomputer, Multivector and SIMD Computers, Program and Network Properties, Conditions of

Parallelism, Program Partitioning and Scheduling, Program Flow Mechanisms, System Interconnect Architectures, Principles of Scalable Performance, Performance Metrics and Measures, Parallel Processing Applications, Speedup Performance Laws. For all Algorithm or mechanism any one example is sufficient. **Text Book 1:** Chapter 1: 1.1 to 1.3, Chapter 2: 2.1 to 2.4, Chapter 3: 3.1 to 3.3	
Self-Learning: Network Properties	
Pre-requisites: Basic concepts of logic design and Computer Organization	
RBT Levels: L1 – Remembering, L2 – Understanding, L3 – Applying	
Module-2: Hardware Technologies	8 Hrs
Hardware Technologies 1: Processors and Memory Hierarchy, Advanced Processor Technology, Superscalar and Vector Processors, Memory Hierarchy Technology, Virtual Memory Technology. For all Algorithms or mechanisms any one example is sufficient.	
Self-Learning: Algorithms or mechanisms examples	
Pre-requisites: Basic concepts of logic design and Computer Organization	
RBT Levels: L1 – Remembering, L2 – Understanding, L3 – Applying	
Module-3: Hardware Technologies	8 Hrs
Hardware Technologies 2: Bus Systems, Shared Memory Organizations, Sequential and Weak Consistency Models, Pipelining and Superscalar Techniques, Linear Pipeline Processors, Nonlinear Pipeline Processors. For all Algorithms or mechanisms any one example is sufficient. **Textbook 1:** Chapter 5: 5.1, 5.3, 5.4, Chapter 6: 6.1 to 6.2	
Self-Learning: Algorithms or mechanisms examples	
Pre-requisites: Basic concepts of Computer Organization	
RBT Levels: L1 – Remembering, L2 – Understanding, L3 – Applying	
Module-4: Parallel and Scalable Architectures	8 Hrs
Parallel and Scalable Architectures: Multiprocessors and Multicomputers, Multiprocessor System Interconnects, Cache Coherence and Synchronization Mechanisms, Message-Passing Mechanisms, Multivector and SIMD Computers, Vector Processing Principles, Multivector Multiprocessors, Scalable, Multithreaded, and Dataflow Architectures, Latency-Hiding Techniques, Principles of Multithreading, Fine- Grain Multicomputer. For all Algorithms or mechanisms any one example is sufficient. **Textbook1:** Chapter 7: 7.1,7.2 and 7.4, Chapter 8: 8.1, 8.2, Chapter 9: 9.1 to 9.3	
Self-Learning: Algorithms or mechanisms examples	
Pre-requisites: Basic concepts of Computer Organization	
RBT Levels: L1 – Remembering, L2 – Understanding, L3 – Applying	

Module-5: Hashing and Search Structures	8 Hrs

Software for parallel programming: Parallel Models, Languages, and Compilers, Parallel Programming Models, Parallel Languages and Compilers, Dependence Analysis of Data Arrays. Instruction and System Level Parallelism, Instruction Level Parallelism, Computer Architecture, Contents, Basic Design Issues, Problem Definition, Model of a Typical Processor, Compiler-detected Instruction Level Parallelism, Operand Forwarding, Reorder Buffer, Register Renaming, Tomasulo's Algorithm. For all Algorithms or mechanisms any one example is sufficient.

Textbook1: Chapter 10: 10.1 to 10.3, Chapter 12: 12.1 to 12.9

Self-Learning: Algorithms or mechanisms examples

Pre-requisites: Basic concepts of Computer Organization

RBT Levels: L1 – Remembering, L2 – Understanding, L3 – Applying

IV. COURSE OUTCOMES

Students will be able to

CO1	Explain the fundamental concepts of computer architectures.
CO2	Explain the concepts of parallel computing.
CO3	Explain the concepts of hardware technologies.
CO4	Compare and contrast the parallel architectures.
CO5	Illustrate parallel programming concepts

V. CO-PO-PSO MAPPING(mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3
CO1	2	1	1										2		1
CO2	2	1											2		
CO3	2	1											2		
CO4	2	1											2		
CO5	2	1											2		

VI. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023 Dated on 10-02-2025.

Continuous Internal Evaluation (CIE): Refer Annexure section 1

Semester End Examination (SEE): Refer Annexure section 1

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
01	Advanced Computer Architecture (SIE): Parallelism, Scalability, Programmability	Kai Hwang and Naresh Jotwani	3rd edition, 2015.	McGraw Hill Education

VII(b): Reference Books:

01	Computer Architecture: A quantitative approach	John L. Hennessy and David A. Patterson	5th edition, 2013	Morgan Kaufmann Elseveir,

VII(c): Web links and Video Lectures (e-Resources):

- https://onlinecourses.nptel.ac.in/noc24_cs06/preview?utm_source=chatgpt.com.
- https://www.coursera.org/learn/comparch?utm_source=chatgpt.com.
- https://github.com/Developer-Y/cs-video-courses?utm_source=chatgpt.com
- https://www.doc.ic.ac.uk/~phjk/AdvancedCompArchitecture/aca20/?utm_source=chatgpt.com
- https://www.youtube.com/watch?v=H9ecWI_O3L8&utm_source=chatgpt.com.

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

- Case Study-1 2. Gate Based Aptitude Test 3. MOOC Assignment for selected Module

Semester:	V	**Course Type:**	ETC		
Course Title: Digital Image Processing					
Course Code:	23CSE531			**Credits:**	3
Teaching Hours/Week (L:T:P:O)			3:0:0:@	**Total Hours:**	3
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3

I. Course Objectives:

1. To understand the fundamentals of digital image processing
2. To introduce the processes involved image enhancement
3. To facilitate the students to gain understanding color image processing and morphology
4. To impart the knowledge of image segmentation and object recognition techniques.
5. To introduce the redundancy in images and the concept of image compression

II. Teaching-Learning Process (General Instructions):

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.

2. Use of Video/Animation to explain functioning of various concepts.

3. Encourage collaborative (Group Learning) Learning in the class.

4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.

5. Adopt Problem Based Learning (PBL), which fosters student's Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.

6. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.

7. Discuss how every concept can be applied to the real world and when that's possible, it helps to improve the student's understanding.
III. COURSE CONTENT
Module-1: Introduction — 8 Hrs
What is Digital Image Processing, Examples of Fields that Use Digital Image Processing, Fundamental Steps in Digital Image Processing, Components of an Image Processing System, Image Sampling and Quantization, Some Basic Relationships between Pixels **Text Book 1:** Chapter 1: 1.1, 1.3, 1.4, 1.5, Chapter 2: 2.4, 2.5
Self-Learning: More Examples of filed that use Digital Image Processing
Pre-requires: Adjacency Matrix
RBT Levels: L1 – Remembering, L2
Module-2: Image Enhancement in the Spatial Domain — 8 Hrs
The Basics of Intensity Transformations and Spatial Filtering, Basic Intensity Transformations, Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Combining Spatial Enhancement Methods.
Self-Learning: Case Study
Pre-requires: Linear Algebra
RBT Levels: L1 – Remembering, L2 – Understanding, L3 – Applying
Module-3: Color Models and Morphological Image Processing — 8 Hrs
Color Models: Color Fundamentals, Color Models **Morphological Image Processing:** Preliminaries, Erosion and Dilation, Opening and Closing, Hit-or-Miss Transformation, Some Basic Morphological Algorithms: Boundary Extraction, Hole Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening, Skeletons, Pruning **Text Book 1:** Chapter 6: 6.1, 6.2, Chapter 9: 9.1 to 9.5
Self-Learning: Case Study
Pre-requires: Set Theory
RBT Levels: L1 – Remembering, L2 – Understanding, L3 – Applying
Module-4: Image Segmentation, Representation and Descriptors — 8 Hrs
Image Segmentation: Fundamentals, Point, Detection of isolated points, line detection, Edge
Self-Learning: Case Study
Pre-requires: Foundations of Mathematics

RBT Levels: L1 – Remembering, L2 – Understanding, L3 – Applying	
Module-5: Image Compression	8 Hrs
Fundamentals: Coding Redundancy, Spatial and Temporal Redundancy, Irrelevant Information, Measuring Image Information, Fidelity Criteria, Image Compression Models Compression Methods: Huffman Coding, Golomb Coding, Arithmetic Coding, LZW Coding, Run-Length Coding, Bit-Plane Coding **Text Book 1:** Chapter 8: 8.1.1 to 8.1.6, 8.2.1 to 8.2.5, 8.2.7	
Self-Learning: Case Study	
Pre-requires: Foundations of Mathematics	
RBT Levels: L1 – Remembering, L2 – Understanding, L3 – Applying	

IV. Practical / Project Based Learning

Students can demonstrate a mini project and some of the projects are listed and not limited to

1. Fake Currency Detection
2. Number Plate Recognition
3. Read an image and extract low-level features such as edges, blur and smoothing an image filtering technique.
4. Write a program to blur and smoothing an image
5. Edge Detection for Fast Image Segmentation
6. Drowsy Driver Detection
7. Kidney Stone Detection
8. Pedestrian Detection
9. Curve and Lane Detection
10. Automated Attendance System
11. Handwriting Recognition System
12. Verification of Signature
13. Skin Cancer Detection
14. Detection of Liver Tumour
15. IRIS Segmentation
16. Emotion Recognition
17. Barcode Detection System
18. Colour Image Compression

V. COURSE OUTCOMES

CO1	Explain the fundamentals of image processing and its applications
CO2	Apply the image enhancement techniques for smoothing and sharpening of images
CO3	Explain color models and apply morphological operations for image segmentation
CO4	Compares different image segmentation techniques and the representation of segmented image

CO5	Compares different image compression techniques

VI. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3
CO1	3	2										1	1	1	
CO2	3	2	2	2	2							1	1	2	
CO3	2	2	2	2	2							1	1	2	
CO4	2	2	2	2	2							1	1	2	
CO5	2	2	1											1	

VII. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023 Dated on 10-02-2025.

Continuous Internal Evaluation (CIE): Refer Annexure section 1

Semester End Examination (SEE): Refer Annexure section 1

VIII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Digital Image Processing	Rafael C. Gonzalez Richard E. Woods	Third Edition, 2009	Pearson

VII(b): Reference Books:

1	Image Processing, analysis and Machine Vision	Milan Sonka	Fourth Edition,	Thomson Press India Ltd
2	Digital Image Processing	S. Sridhar	2nd Edition, 2016	Oxford University Press
3	Hands-On Image Processing with Python	Sandipan Dey	First Edition, 2018	Packt

VII(c): Web links and Video Lectures (e-Resources):

https://www.imageprocessingplace.com/DIP-3E/dip3e_classroom_presentations_downloads.htm
https://onlinecourses.nptel.ac.in/noc21_ee78/preview
https://www.youtube.com/playlist?list=PLuv3GM6-gsE08DuaC6pFUvFaDZ7EnWGX8

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

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

Programming Assignment-1: Implementation of important concepts of Image enhancement (point & filters) with C++/Java/Python

Programming Assignment-2: Implementation of segmentation, Morphological and color image processing techniques with C++/Java/Python

Semester:	V	**Course Type:**	ETC		
Course Title: Data Visualization Techniques					
Course Code:	**23CSE532**			**Credits:**	3
Teaching Hours/Week (L:T:P:O)			3:0:0:@	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3

I. Course Objectives:

This course will enable students to:

1. **Understand** the principles of data visualization, including its history, processes, and basic design principles, to create clear and effective visual representations.
2. **Learn** fundamental data preprocessing techniques such as handling missing values and normalization to ensure data is ready for visualization.
3. **Apply** visualization techniques for spatial, multivariate, and hierarchical data using appropriate tools and methods.
4. **Develop** interactive visualizations and dashboards to explore, analyze, and present data effectively.
5. **Communicate** insights using structured visual storytelling, ensuring clarity and effectiveness in decision-making contexts.

II. Teaching-Learning Process (General Instructions):

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.

2. Use of Video/Animation to explain functioning of various concepts.

3. Encourage collaborative (Group Learning) Learning in the class.

4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.

5. Adopt Problem Based Learning (PBL), which fosters student's Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.

6. Introduce Topics in manifold representations.

7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.

8. Discuss how every concept can be applied to the real world and when that's possible, it helps to improve the student's understanding.

III. COURSE CONTENT

Module-1: Introduction	Hrs 8

Introduction:

What Is Visualization?, History of Visualization, Relationship between Visualization and Other Fields, The Visualization Process.

Data Foundation:

Types of Data, Structure within and between Records - Scalars, Vectors, and Tensors, Data Preprocessing

Textbook 1: Chapter 1 and 2

Hands-on Exercise:

1. Getting Started with Tableau
   - Install Tableau Desktop and explore the interface.
   - Connect to different data sources (Excel, CSV, SQL, web data).
   - Understand Tableau's workspace (Data pane, Sheets, Dashboard).
2. Data Preparation & Cleaning
   - Import and clean datasets.
   - Perform pivoting, sorting, and filtering.
   - Understand joins and relationships in Tableau.

Self-Learning: Visualization pioneers & landmark projects (e.g., Edward Tufte, Florence Nightingale).

RBT Levels: L1 – Remembering, L2 – Understanding

Module-2: Visualization Foundations and Techniques	Hrs 8

Visualization Foundations:

The Visualization Process in Detail, Semiology of Graphical Symbols, The Eight Visual Variables, Taxonomies - Taxonomy of Visualization Goals, Data Type by Task Taxonomy, Keim Taxonomy

Visualization Techniques for Spatial Data:

One-Dimensional Data, Two-Dimensional Data, Three-Dimensional Data

Textbook 1: Chapter 4 and 5

Hands-on Exercise:

3. Basic Visualizations

    - Create bar charts, line graphs, and tree maps.
    - Explore the "Show Me" panel for quick visualizations.
    - Implement basic filtering and sorting in views.

4. Aggregations & Calculations

    - Use built-in aggregate functions (SUM, AVG, COUNT).
    - Create calculated fields (e.g., profit margin, growth rate).
    - Understand granularity and aggregation impacts.

Self-Learning: Study advanced taxonomy frameworks for visualization beyond Keim's model (e.g., Munzner's Nested Model).

RBT Levels: L1 – Remembering, L2 – Understanding

Module-3: Visualization Techniques for Spatial Data and Multivariate Data	Hrs 8

Visualization Techniques for Spatial Data:

Visualizing Spatial Data, Visualization of Point Data, Visualization of Line Data, Visualization of Area Data, Other Issues in Geospatial Data Visualization

Visualization Techniques for Multivariate Data:

Point-Based Techniques, Line-Based Techniques - Line Graphs, Parallel Coordinates, Region-Based Techniques - Bar Charts/Histograms, Tabular Displays, Combinations of Techniques - Glyphs and Icons

Textbook 1: Chapter 6 and 7

Hands-on Exercise:

5. Advanced Visualizations

    - Work with histograms, scatter plots, and Gantt charts.

- Use multiple datasets in a single visualization.
- Apply custom formatting to enhance clarity.

6. Use Tableau's map features to create geospatial visualizations.

    - Plot a dataset with geographical dimensions
    - Customize the map: Change the color palette and add filters for specific regions

Self-Learning: Advanced spatial analysis methods (e.g., spatial autocorrelation, hotspot detection)

RBT Levels: L1 – Remembering, L2 – Understanding

Module-4: Visualization Techniques for Trees, Graphs, Networks, Text and Documents	Hrs 8

Visualization Techniques for Trees, Graphs, and Networks:

Displaying Hierarchical Structures, Displaying Arbitrary Graphs/Networks

Text and Document Visualization:

Introduction, Levels of Text Representations, The Vector Space Model, Single Document Visualizations, Document Collection Visualizations, Extended Text Visualizations

Textbook 1: Chapter 8 and 9

Hands-on Exercise:

7. Creating Hierarchical Tree Structures

    - Use a dataset with hierarchical data (e.g., company organizational structure, product categories).
    - Create a tree map to represent hierarchical relationships.
    - Apply color encoding and size variations to enhance visualization.

8. Displaying Arbitrary Graphs and Networks

    - Use a dataset with relationships (e.g., social networks, citations, transportation routes).
    - Create a network graph using Tableau's Path and Dual-Axis Line Chart techniques.
    - Implement node-link representations to show connections.
    - Use parameters and filters for interactive exploration of network data.

Self-Learning: Explore graph theory fundamentals and algorithms relevant to network visualization (e.g., shortest path, centrality).

RBT Levels: L1 – Remembering, L2 – Understanding

Module-5: Designing, Comparing and Evaluating Visualizations	**Hrs 8**

Designing Effective Visualizations:

Steps in Designing Visualizations, Problems in Designing Effective Visualizations

Comparing and Evaluating Visualization Techniques:

User Tasks, User Characteristics, Data Characteristics, Visualization Characteristics, Structures for Evaluating Visualizations, Benchmarking Procedures, An Example of Visualization Benchmarking

Textbook 1: Chapter 12 and 13

Hands-on Exercise:

9. Building Dashboards

    - Combine multiple visualizations into an interactive dashboard.
    - Apply filters, highlight actions, and URL actions.
    - Optimize layouts for readability and interaction.

Self-Learning: Cognitive load theory and its implications for visualization design.

RBT Levels: L1 – Remembering, L2 – Understanding

Mini Project: Data Visualization using Tableau

- Select a real-world dataset and connect it to Tableau.
- Clean, preprocess, and prepare the data for analysis.
- Create at least three advanced visualizations (e.g., scatter plot, heat map, dual-axis charts).
- Build an interactive dashboard with filters and drill-down actions.
- Use calculated fields to derive insights.
- Submit a short report summarizing the dataset, key findings, and dashboard design.

- Present the dashboard in a 5-7 minute demonstration.

IV. COURSE OUTCOMES

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

CO1	Explain the fundamentals of data visualization, including the history, pipeline, and various types of data structures.
CO2	Describe data preprocessing techniques, including metadata handling, missing values, and normalization, for effective visualization.
CO3	Identify and explain appropriate visualization techniques for spatial, multivariate, and hierarchical data using taxonomies and design principles.
CO4	Summarize principles of designing effective visualizations and their impact on user understanding.
CO5	Describe advanced visualization techniques for trees, graphs, and networks to solve real-world problems.

V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3
CO1			2		2								1		
CO2	1	1	2		2								1		
CO3	2	3	3		2				2				2		
CO4		2	3		2				2	1			2		
CO5		2	3		2				2	1			2		

VI. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023 Dated on 10-02-2025.

Continuous Internal Evaluation (CIE): Refer Annexure section 1

Semester End Examination (SEE): Refer Annexure section 1

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher

1	**Interactive Data Visualization - Foundations, Techniques, and Applications**	**Matthew Ward Georges Grinstein Daniel Keim**		**CRC Press Taylor & Francis Group**
VII(b): Reference Books:				
1.	**Tableau Data Visualization Cookbook**	**Ashutosh Nandeshwar**	**2013**	**Packt Publishing**
2.	**Practical Time Series Analysis - Master Time Series Data Processing, Visualization, and Modeling using Python**	**Dr. Avishek Pal Dr. PKS Prakash**	**2017**	**Packt Publishing**

VII(c): Web links and Video Lectures (e-Resources):

WebLinks:

1. **https://pandas.pydata.org/docs/**
2. **https://seaborn.pydata.org/**
3. **https://www.idvbook.com/index.html/**

Video Lectures:

1. https://www.youtube.com/watch?v=i7HARZlJv7Y
2. https://www.youtube.com/watch?v=K3pXnbniUcM
3. https://www.youtube.com/watch?v=EjiMVQibki0&list=PLZ2ps__7DhBZ12NClTmMLsnU0mF9ZUSG_
4. https://www.youtube.com/watch?v=6xv1KvCMF1Q&list=PLUaB-1hjhk8GwbqoVmo_5zuhOa0Tcl3xC

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

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

1. Quizzes 2. Hands-on Tableau Assignments 3. Mini project

Semester:	V	**Course Type:**	ETC		
Course Title: Web Application and Database Security					
Course Code:	23CSE533			**Credits:**	03
Teaching Hours/Week (L:T:P:O)			3:0:0:@	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3 Hours

I. Course Objectives:

1. Understanding Web Security Threats
2. Secure Web Development Practices
3. Database Security

II. Teaching-Learning Process (General Instructions):

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) needs not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.

2. Use of Video/Animation to explain functioning of various concepts. 3. Encourage collaborative (Group Learning) Learning in the class.

4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.

5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.

6. Introduce Topics in manifold representations.

7. Show the different ways to solve the same problem with different circuits/logic and encourage the students to come up with their own creative ways to solve them.

8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding

9. Use any of these methods: Chalk and board, Active Learning, Case Studies

III. COURSE CONTENT

Module-1: Web Application Basics	8 Hrs

Introduction, HTTP Protocol, Web Functionality, Encoding Schemes, Enumerating Content and Functionality.

Textbook 1: Chapter 3, 4

Self-Learning: Analyzing the Application

Pre-requisites
Fundamentals of Web Technology & Database Management Systems

RBT Levels: L1 – Remembering, L2 – Understanding, L3 – Applying

Module-2: Authentication Security	8 Hrs

Authentication Techniques, Design Flaws in Authentication, Implementation Flaws in Authentication, Securing Authentication.
Textbook 1: Chapter 6

Self-Learning: Path Traversal Attacks

RBT Levels: L1 – Remembering, L2 – Understanding, L3 – Applying

Module-3: Injection Attacks:	8 Hrs

Injecting into Interpreted Contexts, SQL Injection, NoSQL Injection, XPath Injection, LDAP Injection, XML Injection, Http Injection.

Hands on:

Experiments / Programs / Problems

Use OpenSSL to implement the following - Understanding SSL (Secure Sockets Layer)

- Cipher Modes
- Symmetric and Asymmetric Keys

Textbook 1: Chapter 9

Self-Learning: Mail Service Injection

RBT Levels: L1 – Remembering, L2 – Understanding, L3 – Applying,

Module-4: Cross Site Scripting (XSS)	8 Hrs

Types of XSS, XSS in Real World, Finding and Exploiting XSS Vulnerabilities.

Hands on:

Experiments / Programs / Problems - Use OpenSSL to implement the following

- Encryption and Decryption
- Hashing

Textbook 1: Chapter 12

Self-Learning: Preventing XSS Attacks

RBT Levels: L1 – Remembering, L2 – Understanding, L3 – Applying

Module-5: User Attacks	8 Hrs

Inducing User Actions, Capturing Cross-Domain Data, Client-Side Injection Attacks, Local Privacy Attacks, ActiveX Control attacks.

Hands on:

Experiments / Programs / Problems - Use OpenSSL to implement the following

- Creating private and public keys
- Understanding Digital Signatures
- Creating certificates and locating them in a browser

Textbook 1: Chapter 12

Self-Learning: Browser Attacks

Pre-requisites
Fundamentals of Web Technology & Database Management Systems

RBT Levels: L1 – Remembering, L2 – Understanding, L3 – Applying

IV. COURSE OUTCOMES

Students will be able to

CO1	Understand the structure and working of web applications and analyze their behavior in real-world contexts. L1, L2
CO2	Identify and evaluate common authentication mechanisms, recognize flaws, and apply techniques to secure web authentication.L2, L3
CO3	Detect and prevent various injection attacks (SQL, NoSQL, LDAP, XPath, XML, HTTP, Email) in web applications. L2, L3
CO4	Analyze and mitigate Cross-Site Scripting (XSS) vulnerabilities by implementing appropriate defences. L2, L3
CO5	Examine and defend against advanced user-based attacks including client-side injection, privacy attacks, and browser exploits. L2, L3

V. CO-PO-PSO MAPPING(mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3
CO1	3	2	1	1								1	1		
CO2	2	2	2	2	1	1		1				1	1	1	
CO3	2	2	2	2	1	1		1				1	1	1	1
CO4	2	2	2	2	1	1		1				1	1	1	1
CO5	2	2	2	2	1	1		1				1	1	1	1

VI. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023 Dated on 10-02-2025.

Continuous Internal Evaluation (CIE): Refer Annexure section 1

Semester End Examination (SEE): Refer Annexure section 1

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher

1	"The Web Application Hacker's Handbook",	Dafydd Stuttard,	2008	Wiley India Pvt. Ltd
VII(b): Reference Books:				
1	" Database Security "	Alfred Basta, Melissa Zgola,	2012	Cengage Publication
2	"Database Security"	S.Castano, M. Fugini, G. Martella,P. Samarati,	2007	Addision-Wesley

VII(c): Web links and Video Lectures (e-Resources):

- https://youtu.be/QF-NGSeLwHY?si=D-8IDP8_d0rnseiF
- https://youtu.be/4eJbbNRXFnY?si=LtdfyydcFDXvJWbO
- https://youtu.be/Abby7vJyHTo?si=40wfsSeaSs0kBVUz
- https://youtu.be/WkDQTivDoW0?si=G8VKrUaDA92gKpVm
- https://youtu.be/iblaclWrpRA?si=9BbWw_L3Zom3_-Fu

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

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

- Quizzes
- Assignments - PPT/Article: give an assignment for write article about importance about Database and web application security
- Website Design - Create your own web application and database security

Semester:	V	**Course Type:**	ETC		
Course Title: React JS					
Course Code:	**23CSE534**			**Credits:**	3
Teaching Hours/Week (L:T:P:O)			3:0:0:@	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3

I. Course Objectives:

This course will enable students to:

1. Understand the fundamentals of React, including JSX, components, state and props.
2. Develop proficiency in functional and class-based React components.
3. Learn to manage component lifecycles and optimize performance
4. Implement interactive UI features.
5. Build a complete React-based application with modular components.

II. Teaching-Learning Process (General Instructions):

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.

2. Use of Video/Animation to explain functioning of various concepts.

3. Encourage collaborative (Group Learning) Learning in the class.

4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.

5. Adopt Project Based Learning (PBL), which fosters student's Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.

6.Topics will be introduced in a multiple representation.

III. COURSE CONTENT

III(a). Theory PART	
Module-1: Life of a Component	8Hrs
Hello World: Setup, Hello React World, What Just Happened, React.createElement, JSX, Next: Custom Components. **The Life of a Component:** A Custom Function Component, A JSX Version, A Custom Class Component Properties, State, A textarea Component, Make It Stateful , A Note on DOM Events, Props Versus State, Props in Initial State: an Antipattern, Accessing the Component from the Outside, Lifecycle Methods, Lifecycle Example: Log It All, Performance Win: Prevent Component Updates, Whatever Happened to Function Components. **Textbook 1:** Chapter 1 and 2 **Hands on:** 1. Write a React program that displays "Hello, World!" using both React.createElement and JSX. 2. Create a **functional React component** named WelcomeMessage that accepts a **prop called** name and displays a personalized greetings.	
Self-Learning: Lifecycle Example: Using a Child Component	
RBT Levels: L1 – Remembering, L2 – Understanding, L3 - Apply	
Module-2: Excel	8Hrs
Excel: A Fancy Table Component: Data First, Table Headers Loop, Table Headers Loop, a Terse Version, Debugging the Console Warning, Adding <td> Content, Sorting, Sorting UI Cues, Editing Data, Search, Instant Replay , Download the Table Data, Fetching Data . **Functional Excel:** A Quick Refresher: Function versus Class Components, Rendering the Data, The State Hook, Sorting the Table. **Textbook 1:** Chapter 3 and 4 **Hands on:** 1. Create a functional Excel-like table component in React that displays tabular data using props. 2. Implementing Search, Edit and Download Functionality in a React Table.	
Self-Learning: Editing Data,Searching.	
RBT Levels: L1 – Remembering, L2 – Understanding, L3 - Apply	
Module-3: Excel & JSX	8Hrs
Functional Excel: Lifecycles in a World of Hooks, A Custom Hook, Wrapping up the Replay, use Reducer, Excel Component with a Reducer. **JSX:** A Couple Tools, Whitespace in JSX, Comments in JSX, HTML Entities, Spread Attributes, Returning Multiple Nodes in JSX, Differences Between JSX and HTML, Namespaced	

Components, JSX and Forms, onChange Handler, value Versus defaultValue,<textarea> value,<select>Value.

Textbook 1: Chapter 4 and 5

Hands on:
1. Develop a **functional Excel-like table component** in React using a **custom hook** and the useReducer hook.
2. Create a React form component using JSX that includes <textarea>, <select> and <input> field.

Self-Learning: Controlled and Uncontrolled Components.

RBT Levels: L1 – Remembering, L2 – Understanding, L3 - Apply

Module-4: Application Components 1	8Hrs

Setting Up for App Development: Create React App, package.json and node_modules, Poking Around the Code, Moving On

Building the App's Components: Setup, Start Coding, Refactoring the Excel Component, Version 0.0.1 of the New App, CSS, Local Storage.

Textbook 1: Chapters 6 and 7

Hands on:

1. Set up a new React application using create-react-app. Explore the generated folder structure and identify the roles of key files like package.json, node_modules, and src/index.js. Then, modify the default app to display a custom logo and a heading titled **"My First React App"**.

Self-Learning: The Components, Logo and a Body.

RBT Levels: L1 – Remembering, L2 – Understanding, L3 - Apply

Module-5: Application Components 2	8Hrs

Building the App's Components: <Button>Component, Forms,<Actions>, Dialogs, Header, App Config, <Excel>:New and Improved.

The Finished App: Updated App.js, DataFlow Component, Job Done, Context ,Next Steps, Providing Context.

Textbook 1: Chapter 7 and 8

Hands on:

1**.** Build a **modular React app** using reusable components such as <Button>, <Header>, <Dialog>, and a form-based <Actions> component. Integrate these components into a main <Excel> component that mimics a spreadsheet interface.

Self-Learning: Consuming Context , Updating Discovery .

RBT Levels: L1 – Remembering, L2 – Understanding, L3 - Apply

IV. COURSE OUTCOMES

CO1	Explain React's core concepts.
CO2	Develop interactive UI elements using React's component state props, and event handling.
CO3	Apply React Hooks and custom hooks to manage application state efficiently.
CO4	Optimize React applications by implementing performance improvements.
CO5	Design and develop a complete, modular React application using components and context API.

V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3
CO1	2	2	2										2		
CO2	2	2	2										2		
CO3	2	2	2										2		
CO4	2	2	2		1								2		
CO5	2	2	2		1								2		

VI. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023 Dated on 10-02-2025.

Continuous Internal Evaluation (CIE): Refer Annexure section 1

Semester End Examination (SEE): Refer Annexure section 1

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher

1	React Up & Running	Stoyan Stefanov	Second Edition, 2021	O'Reilly Media
VII(b): Reference Books:				
1	The Road to react	Robin Wieruch	2024	Lean Publishing
2	Learning React	Alex Banks & Eve Porcello	First Edition,2017	O'Reilly Media
VII(c): Web links and Video Lectures (e-Resources):				

WebLinks:

1. https://www.youtube.com/watch?v=Y6aYx_KKM7A&t=509s
2. https://www.youtube.com/watch?v=DPdc5Z-Tf4U
3. https://www.youtube.com/watch?v=yZVQJkKY_p0
4. https://react.dev/reference/react

VIII: Activity Based Learning / Practical Based Learning/Project Based learning:

1. Assignments
2. Mini projects

Semester:	V	**Course Type:**	AEC		
Course Title: Mobile Application Development					
Course Code:	**23CSAE51**			**Credits:**	1
Teaching Hours/Week (L:T:P:O)			0:0:2:0	**Total Hours:**	12 Lab Slots
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Practical			**Exam Hours:**	3

I. COURSE OBJECTIVES:

This course will enable students to:

- Learn and acquire the art of Android Programming.
- Configure Android studio to run the applications.
- Understand and implement Android's User interface functions.
- Create, modify and query on SQlite database.

II. Teaching-Learning Process (General Instructions):

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

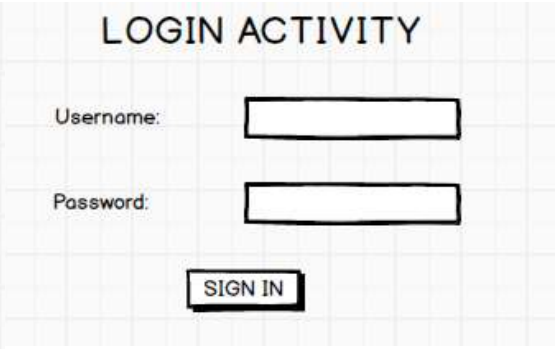
- A Power Point Presentation – For Course Overview and Lectures
- Live Execution of Concepts and Make the students Replicate the same(Not copying).
- Explain the Concepts step by step with continuous replication for larger concepts
- Each Session should be combined with hands-on exercises

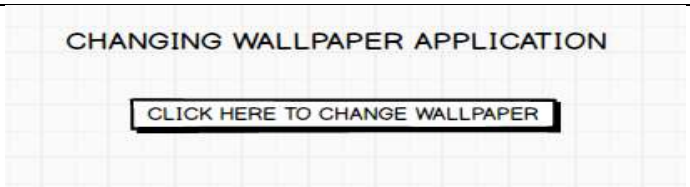
III. COURSE CONTENT

Descriptions:

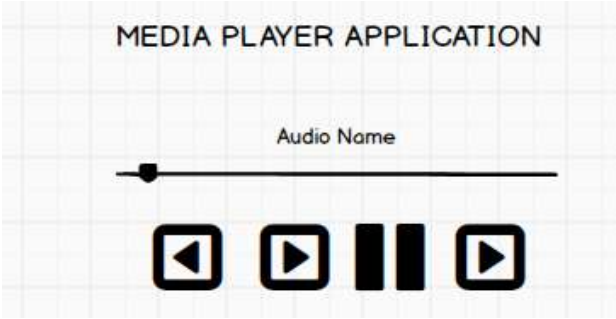
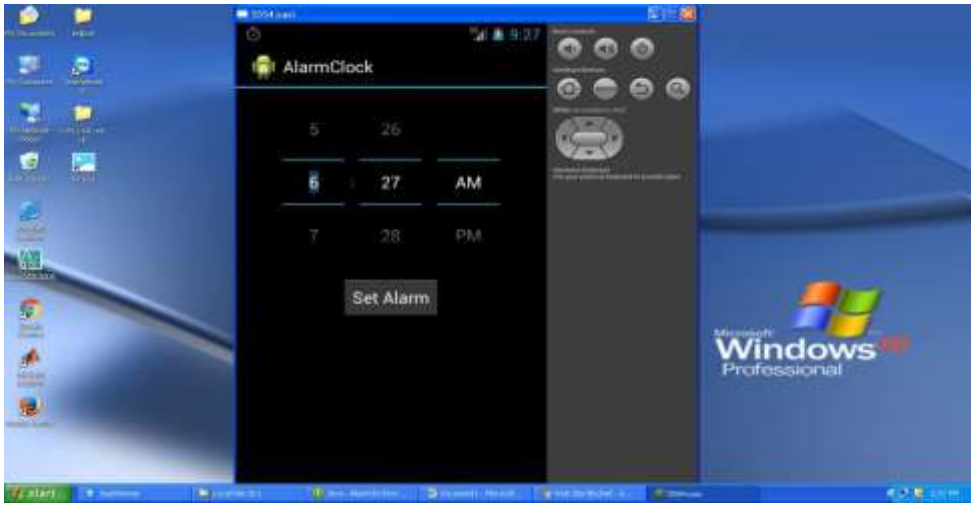
1. The installation procedure of the Android Studio/Java software must be demonstrated and carried out in groups.
2. Students should use the latest version of Android Studio/Java/ Kotlin to execute these programs. Diagrams given are for representational purposes only, students are expected to improvise on them.
3. **Part B programs should be developed as an application and are to be demonstrated as a mini project in a group by adding extra features or the students can also develop their application and demonstrate it as a mini-project. (Projects/programs are not limited to the list given in Part B).**

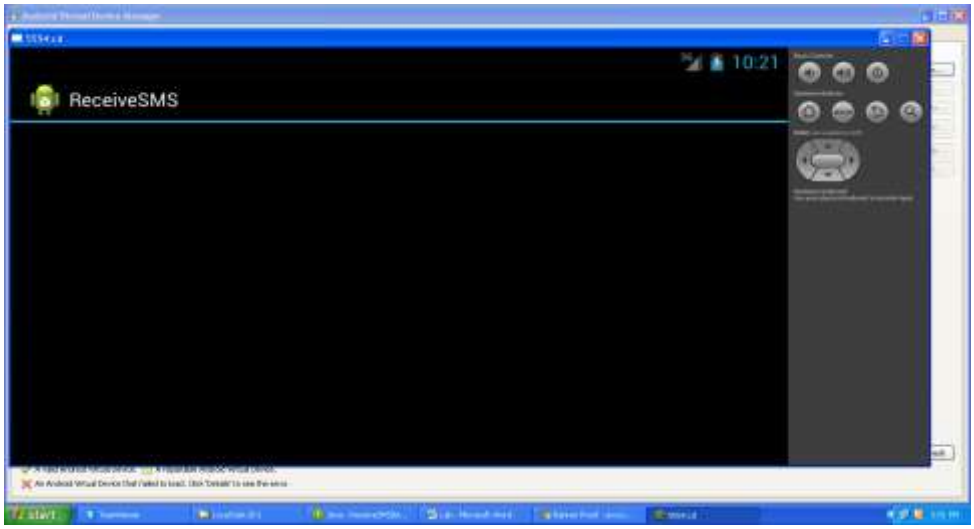
Sl. No.	PART-A

1	Create an application to design aVisiting Card. The Visiting card should have a company logo at the top right corner. The company name should be displayed in Capital letters, aligned to the center. Information like the name of the employee, job title, phone number, address, email, fax and the website address is to be displayed. Insert a horizontal line between the job title and the phone number. 
2	Create a SIGN Up activity with Username and Password. Validation of password should happen based on the following rules: • Password should contain uppercase and lowercase letters. • Password should contain letters and numbers. • Password should contain special characters. • Minimum length of the password (the default value is 8). On successful **SIGN UP** proceed to the next Login activity. Here the user should **SIGN IN** using the Username and Password created during signup activity. If the Username and Password are matched then navigate to the next activity which displays a message saying "Successful Login" or else display a toast message saying "Login Failed". The user is given only two attempts and after that display a toast message saying "Failed Login Attempts" and disable the SIGN IN button. Use Bundle to transfer information from one activity to another.  
3	Develop an application to set an image as wallpaper. On click of a button, the wallpaper image should start to change randomly every 30 seconds.

	
4	Write a program to create an activity with two buttons START and STOP. On pressing of the START button, the activity must start the counter by displaying the numbers from One and the counter must keep on counting until the STOP button is pressed. Display the counter value in a Text View control. 
5	Develop a simple application with one Edit Text so that the user can write some text in it. Create a button called "Convert Text to Speech" that converts the user input text into voice. 
6	Develop a native application that uses GPS location information. 

PART – B	MINI PROJECT
1	Write a program to enter Medicine Name, Date and Time of the Day as input from the user and store it in the SQLite database. Input for Time of the Day should be either Morning or Afternoon or Evening or Night. Trigger an alarm based on the Date and Time of the Day and display the Medicine Name. 
2	Develop a content provider application with an activity called "Meeting Schedule" which takes Date, Time and Meeting Agenda as input from the user and store this information into the SQLite database. Create another application with an activity called "Meeting Info" having DatePicker control, which on the selection of a date should display the Meeting Agenda information for that particular date, else it should display a toast message saying "No Meeting on this Date".  
3	Create an application to receive an incoming SMS which is notified to the user. On clicking this SMS notification, the message content and the number should be displayed

	on the screen. Use appropriate emulator control to send the SMS message to your application. 
4	Create an application to demonstrate a basic media player that allows the user to Forward, Backward, Play and Pause an audio. Also, make use of the indicator in the seek bar to move the audio forward or backward as required. 
5	Write a mobile application that creates alarm clock. 

6	Implement an application that creates an alert upon receiving a message. 

IV. COURSE OUTCOMES

CO1	Create, test and debug Android application by setting up Android development environment.
CO2	Implement adaptive, responsive user interfaces that work across a wide range of devices.
CO3	Infer long running tasks and background work in Android applications.

V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3
CO1	2	2	2										1	1	
CO2	2	2	2		1								1	1	
CO3	2	2	2		1								1	1	

VI. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023 Dated on 10-02-2025.

Continuous Internal Evaluation (CIE): Refer Annexure section 4

Semester End Examination (SEE): Refer Annexure section 4

VII. Learning Resources

VII(a): Text Book & Reference Book:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Android Developer Fundamentals Course – Concept Reference.	Google Developer Training	2017.	Google Developer Training Team.
2	Android Programming – Pushing the Limits.	Erik Hellman.	1st Edition, 2014.	Wiley India Pvt Ltd,.

VII(b): Web links and Video Lectures (e-Resources):

WebLinks:

https://www.gitbook.com/book/google-developer-training/android-developer-fundamentals-course-concepts/details

(Download pdf file from the above link)

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

3. Miniproject

Semester:	V	**Course Type:**	AEC		
Course Title: Cloud Computing					
Course Code:	**23CSAE52**			**Credits:**	1
Teaching Hours/Week (L:T:P:O)			0:0:2:0	**Total Hours:**	12 Lab Slots
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Practical			**Exam Hours:**	3

I. COURSE OBJECTIVES:

This course will enable students to:

1. Understand various models, types and challenges of cloud computing
2. Understand the design of cloud native applications, the necessary tools and the design tradeoffs.
3. Realize the importance of Cloud Virtualization, Abstraction`s, Enabling Technologies and cloud security

I. Teaching-Learning Process (General Instructions):

Teachers can use following strategies to accelerate the attainment of the various course outcomes.

1. Chalk and Talk with Black Board

2. ICT based Teaching

3. Demonstration based Teaching

	III. COURSE CONTENT
Sl. No.	**Experiments**
1	Creating a Virtual Machine: Configure and deploy a virtual machine with specific CPU and memory requirements in Google Cloud. OR Exploring AWS CloudShell and the AWS Cloud9 IDE

2	Getting Started with Cloud Shell and gcloud: Discover the use of gcloud commands to manage Google Cloud resources from Cloud Shell. OR Working with Amazon S3Orchestrating Serverless Functions with AWS Step Functions
3	Cloud Functions: Create and deploy a Cloud Function to automate a specific task based on a Cloud Storage event. OR Working with Amazon DynamoDB
4	App Engine: Deploy a web application on App Engine with automatic scaling enabled. OR Developing REST APIs with Amazon API Gateway
5	Cloud Storage: Qwikstart: Google Cloud Storage provides scalable and secure object storage for managing data, accessible via the Cloud Console or gsutil CLI. OR Creating Lambda Functions Using the AWS SDK for Python
6	Cloud SQL for MySQL: Discover how Google Cloud SQL for MySQL provide automated management and high availability for MySQL databases? OR Migrating a Web Application to Docker Containers
7	Cloud Pub/Sub: Experiment how Google Cloud Pub/Sub facilitate real-time messaging and communication between distributed applications. OR Caching Application Data with ElastiCache, Caching with Amazon CloudFronT, Caching Strategies
8	Multiple VPC Networks: Explore benefits of using multiple VPC networks in Google Cloud for organizing and isolating resources. OR Implementing CloudFront for Caching and Application Security
9	Cloud Monitoring: Discover how Cloud Monitoring help in tracking and analyzing the performance and health of cloud resources?

	OR Orchestrating Serverless Functions with AWS Step Functions
10	Kubernetes Engine: Qwik Start: Deploy a containerized application to a Kubernetes Engine cluster. OR Automating Application Deployment Using a CI/CD Pipeline

IV.COURSE OUTCOMES

CO1	Demonstrate cloud applications in various fields using suitable cloud platforms.
CO2	Design and apply security aspects in cloud computing.
CO3	Implement the architecture, delivery models and industrial platforms for cloud computing based applications.

V.CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3
CO1	2	1											1		
CO2	1	2			1								2	1	
CO3	2	1	1		1								2		

VI. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023 Dated on 10-02-2025.

Continuous Internal Evaluation (CIE): Refer Annexure section 4

Semester End Examination (SEE): Refer Annexure section 4

VII. Learning Resources

VII(a): Text Books:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Distributed and Cloud Computing	Kai Hwang, Geoffrey C Fox, and Jack J Dongarra,	2012	Elsevier

VII(b): Reference Books:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Cloud Computing Theory and Practice	Dan C. Marinescu	2nd Edition,	Elsevier 2018

VII(c): Web links and Video Lectures (e-Resources):

WebLinks:

- https://freevideolectures.com/course/4639/nptel-cloud-computing/
- https://www.youtube.com/playlist?list=PLShJJCRzJWxhz7SfG4hpaBD5bKOloWx9J
- https://www.youtube.com/watch?v=EN4fEbcFZ_E
- https://www.youtube.com/watch?v=RWgW-CgdIk0
- https://www.geeksforgeeks.org/virtualization-cloud-computing-types
- Google Cloud Teaching Resources- LMS
- AWS Cloud Developing - AWS Academy Courses

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

4. Installation of virtualization software (Virtual box, Xen etc..) and run applications with different OS.

Semester:	V	**Course Type:**	AEC		
Course Title: DevOps					
Course Code:	**23CSAE53**			**Credits:**	1
Teaching Hours/Week (L:T:P:O)			0:0:2:0	**Total Hours:**	12 Lab Slots
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Practicals			**Exam Hours:**	3

I. Course Objectives:

- To introduce DevOps terminology, definition & concepts
- To understand the different Version control tools like Git, Mercurial
- To understand the concepts of Continuous Integration/ Continuous Testing/ Continuous Deployment)
- To understand Configuration management using Ansible
- llustrate the benefits and drive the adoption of cloud-based Devops tools to solve real world problems

II. Teaching-Learning Process (General Instructions):

These are sample Strategies, which teachers can use to accelerate the attainment of the various

III.COURSE CONTENT

Sl. No.	Experiments
1	Introduction to Maven and Gradle: Overview of Build Automation Tools, Key Difference Between Maven and Gradle, Installation and Setup
2	Working with Maven: Creating a Maven Project, Understanding the POM File, Dependency Management and Plugins
3	Working with Gradle: Setting Up a Gradle Project, Understanding Build Scripts (Groovy and Kotlin DSL), Dependency Management and Task Automation
4	Practical Exercise: Build and Run a Java Application with Maven, Migrate the Same Application to Gradle

5	Introduction to Jenkins: What is Jenkins?, Installing Jenkins on Local or Cloud Environment, Configuring Jenkins for First Use
6	Continuous Integration with Jenkins: Setting Up a CI Pipeline, Integrating Jenkins with Maven/Gradle, Running Automated Builds and Tests
7	Configuration Management with Ansible: Basics of Ansible: Inventory, Playbooks, and Modules, Automating Server Configurations with Playbooks, Hands-On: Writing and Running a Basic Playbook
8	Practical Exercise: Set Up a Jenkins CI Pipeline for a Maven Project, Use Ansible to Deploy Artifacts Generated by Jenkins, Installing Ansible , Jenkins and Tomcat and SSH Connections among 3 machines
9	Introduction to Azure DevOps: Overview of Azure DevOps Services, Creating Application and building Maven project - in Azure Devops
10	Creating Build Pipelines: Building a Maven/Gradle Project with Azure Pipelines, Integrating Code Repositories (e.g., GitHub, Azure Repos), Running Unit Tests and Generating Reports

IV.COURSE OUTCOMES

CO1	Demonstrate different actions performed through Version control tools like Git.
CO2	Perform Continuous Integration and Continuous Testing and Continuous Deployment using Jenkins by building and automating test cases using Maven & Gradle.
CO3	Experiment with configuration management using Ansible, and using Azure DevOps.

V.CO-PO-PSO MAPPING(mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3
CO1	2	2			2								2	2	
CO2	2	2	2		2								2	2	
CO3	2	2	2		2								2	2	

VI Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023 Dated on 10-02-2025.

Continuous Internal Evaluation (CIE): Refer Annexure section 4

Semester End Examination (SEE): Refer Annexure section 4

VII. Learning Resources

VII(a): Text Books

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
01	The DevOps Handbook	Gene Kim, Jez Humble, Patrick Debois, John Willis, Nicole Forsgren	2nd Edition. 2021	IT Revolution press
02	Learning DevOps: Continuously Deliver Better Software	Mikael Krief	2nd Edition. 2022	Packt Publishing

VII(b):Reference Books:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
01	Accelerate: The Science of Lean Software and DevOps	Nicole Forsgren, Jez Humble, Gene Kim	1st Edition. 2018	IT Revolution press

VII(c): Web links and Video Lectures (e-Resources):

- https://www.geeksforgeeks.org/devops-tutorial/
- https://www.javatpoint.com/devops
- https://www.youtube.com/watch?v=2N-59wUIPVI
- https://www.youtube.com/watch?v=87ZqwoFeO88

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:
Mini Project

Semester:	V	**Course Type:**	AEC		
Course Title: JavaScript					
Course Code:	**23CSAE54**			**Credits:**	1
Teaching Hours/Week (L:T:P:O)			0:0:2:0	**Total Hours:**	12 Lab Slots
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Practical			**Exam Hours:**	3

I. COURSE OBJECTIVES:

This course will enable students to:

1. Understanding JavaScript fundamentals, including functions, loops and conditional statements.
2. Developing web-based applications to solve real-world problems.
3. Enhancing problem-solving skills by breaking down complex problems into modular components.

II. Teaching-Learning Process (General Instructions):

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

- A Power Point Presentation – For Course Overview and Lectures
- Live Execution of Concepts and Make the students Replicate the same(Not copying).
- Explain the Concepts step by step with continuous replication for larger concepts

Each Session should be combined with hands-on exercises

III. COURSE CONTENT

Sl. No.	Experiments
1	Create a form for Employee information. Write JavaScript code to find DA, HRA, PF, TAX, Gross pay, Deduction and Net pay.
2	Write a JavaScript to check if a number is prime or not.

3	Write a JavaScript code to find the sum of N natural Numbers
4	Write a JavaScript to design a simple calculator to perform the following operations: sum, product, difference and quotient.
5	Write a JavaScript program to convert decimal to binary
6	Write a JavaScript to validate an email address.
7	Write a JavaScript that calculates the squares and cubes of the numbers from 0 to 10 and outputs HTML text that displays the resulting values in an HTML table format.
8	Develop and demonstrate, using Javascript script, a HTML document that contains three short paragraphs of text, stacked on top of each other, with only enough of each showing so that the mouse cursor can be placed over some part of them. When the cursor is placed over the exposed part of any paragraph, it should rise to the top to become completely visible
9	Write a JavaScript code that displays text "TEXT-GROWING" with increasing font size in the interval of 100ms in RED COLOR, when the font size reaches 50pt it displays "TEXTSHRINKING" in BLUE color. Then the font size decreases to 5pt.
10	Develop and demonstrate a HTML file that includes JavaScript script that uses functions for the following problems: a) Parameter: A string b) Output: The position in the string of the left-most vowel c) Parameter: A number d) Output: The number with its digits in the reverse order

IV.COURSE OUTCOMES

CO1	**Apply JavaScript Concepts Effectively.**
CO2	Develop Functional Web-Based Applications.
CO3	Implement Modular Problem-Solving Approaches.

V.CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3
CO1	2	2	2										1	1	
CO2	2	2	2		1								1	1	

CO3	2	2	2		1								1	1	

VI. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023 Dated on 10-02-2025.

Continuous Internal Evaluation (CIE): Refer Annexure section 4

Semester End Examination (SEE): Refer Annexure section 4

VII. Learning Resources

VII(a): Reference Books:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Javascript: The Definitive Guide	David Flanagan	Seventh Edition	O'Reilly Media
2	JavaScript Absolute Beginner's Guide	Kirupa Chinnathambi	3rd Edition	Pearson

VII(b): Web links and Video Lectures (e-Resources):

WebLinks:

5. https://youtu.be/W6NZfCO5SIk?si=GXiTfFEE-f5wX_Bt
6. https://youtu.be/PlbupGCBV6w?si=k3DoznyK72puY4l6
7. https://developer.mozilla.org/en-US/docs/Web/JavaScript
8. https://www.tpointtech.com/javascript-tutorial

VIII: Activity Based Learning / Practical Based Learning/Project Based Learning:

5. Mini projects.

6th Semester Syllabus

Semester:	VI	**Course Type:**	PCC		
Course Title: Artificial Intelligence and Machine Learning					
Course Code:	**23CST601**			**Credits:**	03
Teaching Hours/Week (L:T:P:O)			3:0:0:0	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3 Hours

I. Course Objectives:

- Gain a historical perspective of AI and its foundations.
- Become familiar with basic principles of AI toward problem solving.
- To familiarize the basics of machine learning and its algorithms such as decision trees.
- Understand the working of Artificial Neural Networks models and basic concepts of Classification Algorithms.
- To explore advanced concept like Bayesian models, clustering, Deep Learning and provide practical insight into its applications.

II. Teaching-Learning Process (General Instructions):

Teachers can use following strategies to accelerate the attainment of the various course outcomes.

1. Chalk and Talk with Black Board
2. ICT based Teaching
3. Demonstration based Teaching

III. COURSE CONTENT

Module 1 : Introduction to AI	8 Hrs

Artificial intelligence, Problems, problem spaces and search, Heuristic search techniques
Textbook 1: Chapter 1, 2 and 3

Self-Learning: Application of AI

RBT Levels: L1 – Remembering, L2 – Understanding

Module 2 : Machine Learning and Understanding Data	8 Hrs
Introduction: Need for Machine Learning, Machine Learning Explained, Types of Machine Learning, Challenges of Machine Learning, Machine Learning Process. **Understanding Data:** Introduction, Big Data Analysis Framework, Descriptive Statistics, Univariate Data Analysis and Visualization, Bivariate Data and Multivariate Data, Feature Engineering and Dimensionality Reduction Techniques. **Textbook 2:** Chapter 1:1.1,1.2, 1.4-1.6; Chapter 2:2.1-2.6, 2.10	
Self-Learning: Data Science Process	
RBT Levels:L1 – Remembering, L2 – Understanding, L3 – Applying	
Module 3: Supervised Learning 1	8 Hrs
Basic Learning Theory: Design of Learning System, Introduction to Concept of Learning, Modelling in Machine Learning. **Similarity-based Learning:** Nearest-Neighbor Learning, Weighted K-Nearest-Neighbor Algorithm, Nearest Centroid Classifier, Locally Weighted Regression (LWR). **Textbook 2:** Chapter 3:3.3, 3.4, 3.6; Chapter 4: 4.2-4.5	
Self-Learning: Case Study	
RBT Levels:L1 – Remembering, L2 – Understanding, L3 – Applying,	
Module-4: Supervised Learning 2	8 Hrs
Decision Tree Learning: Introduction to Decision Tree Learning Model, Decision Tree Induction Algorithms. **Bayesian Learning:** Introduction to Probability-based Learning, Fundamentals of Bayes Theorem, Classification Using Bayes Model. **Textbook 2:** Chapter 6: 6.1, 6.2; Chapter 8: 8.1-8.3	
Self-Learning: Case Study	
RBT Levels:L1 – Remembering, L2 – Understanding, L3 – Applying	
Module-5: Unsupervised Learning and Neural Networks	8 Hrs

Clustering Algorithms: Introduction to Clustering Approaches, Proximity Measures, Hierarchical Clustering Algorithms.

Artificial Neural Networks: Introduction, Biological Neurons, Artificial Neurons, Perceptron and Learning Theory, Types of Artificial Neural Networks, Popular Applications of Artificial Neural Networks, Advantages and Disadvantages of ANN, Challenges of ANN.

Deep Learning: Introduction to Deep Neural Networks, Loss function and optimizations, Regularization Methods, Convolution Neural Networks, Transfer Learning, Recurrent Neural Networks, LSTM and GRU.

Textbook 2: Chapter 10: 10.1-10.5, 10.9-10.11;Chapter 13: 13.1-13.3 Chapter 16: 16.1-16.5, 16.7,16.8

Self-Learning: Case Study

RBT Levels:L1 – Remembering, L2 – Understanding, L3 – Applying

IV. COURSE OUTCOMES

Students will be able to

CO1	Understand the fundamental concepts of Artificial Intelligence (AI), including problem-solving strategies and heuristic search techniques.
CO2	Explain the importance of Machine Learning, its types, challenges, and data preprocessing techniques such as feature engineering and dimensionality reduction.
CO3	Apply learning theories and similarity-based learning models like k-Nearest Neighbors and locally weighted regression for classification and prediction tasks.
CO4	Implement decision tree learning and artificial neural networks using perceptrons and multilayer Architectures.
CO5	Analyze probabilistic learning models, clustering approaches, and deep learning techniques such as CNNs, RNNs, LSTMs, and GRUs for classification and model optimization.

V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3
CO1	3	2	1									1	2	2	
CO2	3	2	2										2	2	

CO3	3	2	2										2	2	2
CO4	3	2	2										3	2	2
CO5	3	2	2										2	2	2

VI. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023 Dated on 10-02-2025.

Continuous Internal Evaluation (CIE): Refer Annexure section 1

Semester End Examination (SEE): Refer Annexure section 1

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
01	Artificial Intelligence	Elaine Rich, Kevin K and S B Nair	3rd Edition, 2017	McGraw Hill
02	Machine Learning	S Sridhar, M Vijayalakshmi,	1st Edition, 2017	McGraw Hill

VII(b): Reference Books:

01	Machine Learning	Tom M Mitchell	2021, First Edition	OXFORD University Press
02	Machine Learning: Theory and Practice	Murty, M. N., and V. S. Ananthanarayana	2024.	Universities Press

VII(c): Web links and Video Lectures (e-Resources):

- http://elearning.vtu.ac.in/econtent/courses/video/CSE/06CS35.html
- https://www.kdnuggets.com/2019/11/10-free-must-read-books-ai.html
- https://www.udacity.com/course/knowledge-based-ai-cognitive-systems--ud409
- https://nptel.ac.in/courses/106/105/106105077/
- **https://www.universitiespress.com/resources?id=9789393330697**
- https://www.drssridhar.com/?page_id=1053
- Machine Learning Tutorials: https://www.geeksforgeeks.org/machine-learning/
- Machine Learning Tutorials: https://www.tutorialspoint.com/machine_learning/index.htm
- Python for Machine Learning: https://www.w3schools.com/python/python_ml_getting_started.asp
- Introduction to Machine Learning: https://onlinecourses.nptel.ac.in/noc22_cs29/preview

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

- AI Chatbot Development.
- Hands-on Projects with Kaggle Competitions.

Semester:	VI	**Course Type:**	IPCC		
Course Title: Theory of Computation					
Course Code:	**23CSI602**			**Credits:**	4
Teaching Hours/Week (L:T:P:O)			3:0:2:@	**Total Hours:**	40 + (10-12 lab slots)
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3

I. Course Objectives:

This course will enable students to:

1. Introduce core concepts in Automata and Theory of Computation.
2. Introduce core concepts in Automata and Theory of Computation.
3. Learn concepts of Grammars and Recognizers for different formal languages
4. Prove or disprove theorems in automata theory using their properties

II. Teaching-Learning Process (General Instructions):

These are sample Strategies which teachers can use to accelerate the attainment of the various course outcomes.
1. Lecturer method (L) needs not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyse information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem with different approaches and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding

III. COURSE CONTENT

III(a). Theory PART

Module-1: Introduction	Hrs 8

Introduction to Finite Automata, Structural Representations, Automata and Complexity. The Central Concepts of Automata Theory. Deterministic Finite Automata, Nondeterministic Finite Automata, An Application: Text Search, Finite Automata with Epsilon-Transitions.
Text Book 1: Chapter 1: 1.1, 1.5; Chapter 2: 2.2,2.3,2.4,2.5

Self-Learning: Applications of Automata	
Module-2: Regular Expressions	Hrs 8
Regular Expressions, Finite Automata and Regular Expressions, Proving Languages not to be Regular. Closure Properties of Regular Languages, Equivalence and Minimization of Automata, Applications of Regular Expressions **Text Book 1:** Chapter 3: 3.1, 3.2 (Except 3.2.1), 3.3; Chapter 4: 4.1, 4.2, 4.4	
Self-Learning: Closure Properties of Regular Languages: homomorphism and inverse homomorphism	
Module-3: Context-Free Grammars	Hrs 8
Context-Free Grammars, Parse Trees, Ambiguity in Grammars and Languages, Normal Forms for Context-Free Grammars. **Text Book 1:** Chapter 5: 5.1, 5.2, 5.4; Chapter 6: 6.1,6.2,6.3.1,6.4	
Self-Learning: Pumping Lemma for Context-Free Languages	
Module-4: Context-Free Language and Pushdown Automata	Hrs 8
Closure Properties of Context-Free Languages, Definition of the Pushdown Automaton, The Languages of a PDA, Equivalence of PDA's and CFG's, Deterministic Pushdown Automata **Text Book 1:** Chapter 7: 7.1, 7.2, 7.3	
Self-Learning: Chomsky Normal Form (CNF) and Greibach Normal Form (GNF)	
Module-5: Turing Machines	Hrs 8
Introduction to Turing Machines: Problems That Computers Cannot Solve, The Turing Machine, Programming Techniques for Turing Machines, Extensions to the Basic Turing Machine. **TEXT BOOK:** Sections 8.1,8.2, 8.3,8.4, 9.1, 9.2	
Self-Learning: Case Study	

III(b). PRACTICAL PART

Execute the following Program using the tool JFLAP and C/C++

Sl. No.	Experiments / Programs / Problems
1	Design a FSM that accepts all strings over input symbols {0,1} having 3 consecutive 1's as a substring.
2	Design a Finite State Machine (FSM) that accepts all strings over input symbols {0, 1} which are divisible by 3.

3	Design a Finite State Machine (FSM) that accepts all decimal string which are divisible by 3.
4	Design a Push Down Automata (PDA) that accepts all string having equal number of 0's and 1's over input symbol {0, 1} for a language 0^n1^n where n >= 1.
5	Design a Program to create PDA machine that accept the well-formed parenthesis.
6	Design a PDA to accept WCW^R where w is any binary string and W^R is reverse of that string and C is a special symbol.
7	Design a Turing Machine that calculate 2's complement of given binary string.
8	Design a Turing Machine that's accepts the following language $a^nb^nc^n$ where n>0.

IV. COURSE OUTCOMES

After going through this course, the student will be able to

CO1	Apply the fundamentals of automata theory to write DFA, NFA, Epsilon-NFA and conversion between them.
CO2	Prove the properties of regular languages using regular expressions.
CO3	Design context-free grammars (CFGs) for Grammers.
CO4	Design Pushdown automata (PDAs) for formal languages.
C05	Design Turing machines to solve the computational problems.

V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3
CO1	1	2	2		1							1	1	1	
CO2	2	2	2		1								1		
CO3	3	2	3		1								1	1	
CO4	3	2	3		1								1	1	
CO5	3	3	2		1								1		

VI. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023 Dated on 10-02-2025.

Continuous Internal Evaluation (CIE): Refer Annexure section 2				
Semester End Examination (SEE): Refer Annexure section 2				
VII. Learning Resources				
VII(a): Text Book				
Sl. No.	**Title of the Book**	**Name of the author**	**Publication**	**Edition**
1	Introduction to Automata Theory, Languages and Computation",	John E Hopcroft,	Pearson	3rd Edition
VII(b): Reference Books				
1	Automata,Computability and complexity	Elain Rich	Pearson Education,2018	1st Edition,
2	Theory of Computer Science	K.L.P Mishra, N Chandrashekaran	PHI,2012	3rd Edition
3	An introduction to Formal Languages and Automata	Peter Linz	Narosa Publishers,1998.	3rd Edition
VII(c): Web links and Video Lectures (e-Resources):				
WebLinks: https://archive.nptel.ac.in/courses/106/105/106105196/ https://archive.nptel.ac.in/courses/106/106/106106049/ https://nptelvideos.com/course.php?id=717				
VIII: Activity Based Learning / Practical Based Learning/Experiential learning:				
Activity Based Learning (Suggested Activities in Class)/ Practical Based learning Quizzes 2. Assignments 3. Mini Project				

Semester:	VI	**Course Type:**	PCCL		
Course Title: Artificial Intelligence and Machine Learning Lab					
Course Code:	23CSL603			**Credits:**	1
Teaching Hours/Week (L:T:P:O)			0:0:2:0	**Total Hours:**	12 Lab Slots
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Practical			**Exam Hours:**	3

I. Course Objectives:

- Implement and evaluate AI and ML algorithms in and Python programming language.
- To understand various machine learning algorithms such as similarity-based learning, regression, decision trees, and clustering.
- To familiarize with learning theories, probability-based models and developing the skills required for decision-making in dynamic environments.

Descriptions:

- For program 1,2 and 4 implement without using API

II. Teaching-Learning Process (General Instructions):

- Chalk and Talk with Black Board
- ICT based Teaching
- Demonstration based Teaching

III. COURSE CONTENT

Prerequisite: Basics of Python Programming
Self-Learning: Linear Algebra (vectors, matrices, eigenvalues, SVD)

Sl. No.	Programs
1.	Implement A* Search algorithm.
2.	Implement AO* Search algorithm.
3.	Develop a program to implement Principal Component Analysis (PCA) for reducing the dimensionality of the Iris dataset from 4 features to 2.

4.	For a given set of training data examples stored in a .CSV file, implement and demonstrate the Find-S algorithm to output a description of the set of all hypotheses consistent with the training examples.
5.	Develop a program to implement k-Nearest Neighbour algorithm to classify the randomly generated 100 values of x in the range of [0,1]. Perform the following based on dataset generated. a) Label the first 50 points {x1,……,x50} as follows: if (xi ≤ 0.5), then xi ∈ Class1, else xi ∈ Class1 b) Classify the remaining points, x51,……,x100 using KNN. Perform this for k=1,2,3,4,5,20,30
6.	Develop a program to demonstrate the working of the decision tree algorithm. Use Breast Cancer Data set for building the decision tree and apply this knowledge to classify a new sample.
7.	Develop a program to implement the Naive Bayesian classifier considering Olivetti Face Data set for training. Compute the accuracy of the classifier, considering a few test data sets.
8.	Develop a program to implement k-means clustering using Wisconsin Breast Cancer data set and visualize the clustering result.
9.	Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.
10.	Design and implement a CNN model (with 2 layers of convolutions) to classify multi category image datasets. Record the accuracy corresponding to the number of epochs. Use the appropriate dataset.

Additional Practice Programs:

1. Develop a program to create histograms for all numerical features and analyze the distribution of each feature. Generate box plots for all numerical features and identify any outliers. Use California Housing dataset.
2. Develop a program to Compute the correlation matrix to understand the relationships between pairs of features. Visualize the correlation matrix using a heatmap to know which variables have strong positive/negative correlations. Create a pair plot to visualize pair wise relationships between features. Use California Housing dataset.
3. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
4. Design and implement a neural based network for generating word embedding for words in a document corpus.
5. Design and implement a deep learning network for classification of textual documents.

IV. COURSE OUTCOMES

CO1	Implement and Apply AI/ML Algorithms for Search and Optimization, Dimensionality Reduction problems.
CO2	Demonstrate similarity-based learning methods and perform regression analysis.
CO3	Implement the clustering algorithms and deep learning techniques for classifications.

V. CO-PO-PSO MAPPING(mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3
CO1	3	2	2		2								2		
CO2	3	3	2		1								2		
CO3	2	2	2		2								2		

VI. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023.

Continuous Internal Evaluation (CIE): Refer Annexure section 4

Semester End Examination (SEE): Refer Annexure section 4

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
01	Artificial Intelligence	E. Rich , K. Knight & S. B. Nair	3rd Edition, 2017	McGraw Hill.
02	Machine Learning	S Sridhar and M Vijayalakshmi	2021.	Oxford press
03	Machine Learning: Theory and Practice	M N Murty and Ananthanarayana V S	**2024**	Oxford press

VII(b): Reference Books:

01	Machine Learning	Tom M Mitchell	1st Edition,2017	McGraw Hill
02	Artificial Intelligence and Machine Learning	An Introduction to Data Structures with Applications	2nd Ed, 2013	Cengage

VII(c): Web links and Video Lectures (e-Resources):

http://elearning.vtu.ac.in/econtent/courses/video/CSE/06CS35.html
- https://www.drssridhar.com/?page_id=1053
- https://www.universitiespress.com/resources?id=9789393330697
- https://onlinecourses.nptel.ac.in/noc23_cs18/preview

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

- Programming Assignment
- MOOC Assignment

BE in Computer Science and Engineering

Semester:	VI	**Course Type:**	PEC		
Course Title: C# and .NET					
Course Code:	**23CSP621**			**Credits:**	03
Teaching Hours/Week (L:T:P:O)			3:0:0:0	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3 Hours

I. Course Objectives:

- Inspect Visual Studio programming environment and toolset designed to build applications for Microsoft Windows.
- Understand Object Oriented Programming concepts in C# programming language.
- Interpret Interfaces and define custom interfaces for application.
- Build custom collections and generics in C#
- Construct events and query data using query expressions

II. Teaching-Learning Process (General Instructions):

Teaching-Learning Process (General Instructions)
These are sample Strategies; that teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) does not mean only the traditional lecture method, but different types of teaching methods may be adopted to achieve the outcomes.
2. Promote collaborative learning (Group Learning) in the class.
3. Pose at least three HOT (Higher Order Thinking) questions in the class to stimulate critical thinking.
4. Incorporate Problem-Based Learning (PBL) to foster students' analytical skills and develop their ability to evaluate, generalize, and analyze information rather than merely recalling it.
5. Introduce Topics in manifold representations.
6. Demonstrate ways to solve the same problem and encourage the students to come up with their own creative solutions.
7. Discuss application of every concept to solve the real world problems.

III. COURSE CONTENT

Module-1: Introducing Microsoft Visual C# and Microsoft Visual Studio.	8 Hrs
Welcome to C#, Working with variables, operators and expressions, Writing methods and applying scope, Using decision statements, Using compound assignment and iteration statements, Managing errors and exceptions	

Text Book 1: Chapter 1,2,3,4,5,6	
Self-Learning: Managing errors and exceptions	
Pre-requisites: Basic knowledge of common programming concepts, including loops, arrays and functions.	
RBT Levels: L1 – Remembering, L2 – Understanding.	
Module-2: Understanding the C# Object Model.	8 Hrs
Creating and Managing classes and objects, Understanding values and references, Creating value types with enumerations and structures. **Textbook 1:** Chapter 7,8,9,10	
Self-Learning: Creating value types Using array.	
Pre-requisites: Basic knowledge of Object oriented programming.	
RBT Levels: L1 – Remembering, L2 – Understanding.	
Module-3: Arrays, Inheritance, and Interfaces.	8 Hrs
Understanding parameter arrays, Working with inheritance, Creating interfaces and defining abstract classes, Using garbage collection and resource management **Textbook 1:** Chapter 11,12,13,14	
Self-Learning: Garbage resource management	
Pre-requisites: Basic knowledge of Arrays, Inheritance, and Interfaces.	
RBT Levels: L1 – Remembering, L2 – Understanding, L3 – Applying	
Module-4: Defining Extensible Types with C#.	8 Hrs
Defining Extensible Types with C#: Implementing properties to access fields, Using indexers, Introducing generics, Using collections. **Textbook 1:** Chapter 15,16,17,18	
Self-Learning: Collections	
Pre-requisites **S**olid knowledge of Generics and Collections.	
RBT Levels: L2 – Understanding, L3 – Applying	
Module-5: Event handling, Queries, and operator overloading	8 Hrs
Enumerating Collections, Decoupling application logic and handling events, Querying in- memory data by using query expressions, Operator overloading. **Textbook 1:** Chapter 19,20,21,22	
Self-Learning: Operator overloading	
Pre-requisites: A good basic knowledge of DBMS.	
RBT Levels: L2 – Understanding, L3 – Applying	

IV. COURSE OUTCOMES

Students will be able to

CO1	Build applications on Visual Studio .NET platform by understanding the syntax and semantics of C#
CO2	Demonstrate Object Oriented Programming concepts in C# programming language
CO3	Implement inheritance, interface and resource management

CO4	Design custom interfaces for applications and leverage the available built-in interfaces in building complex applications.
CO5	Compose queries to query in-memory data and define own operator behavior

V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3
CO1	2	1	1										1		
CO2	2	2	2										1		
CO3	2	2	2										1		
CO4	2	2	2										1		
CO5	2	2	2										1		

VI. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023 Dated on 10-02-2025.

Continuous Internal Evaluation (CIE): Refer Annexure section 1

Semester End Examination (SEE): Refer Annexure section 1

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
01	Microsoft Visual C# Step by Step.	John Sharp.	8th Edition. 2016.	PHI Learning Pvt. Ltd

VII(b): Reference Books:

01	C# 6 and .NET Core 1.0.	Christian Nagel.	1st Edition, 2016.	Wiley India Pvt Ltd.
02	Prof C# 5.0 and the .NET 4.5 Framework.	Andrew Troelsen.	6th Edition, 2012.	Apress and Dreamtech Press.

VII(c): Web links and Video Lectures (e-Resources):

- https://dotnet.microsoft.com
- https://learn.microsoft.com

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

1. Programming Assignment 2. Gate Based Aptitude Test 3. MOOC Assignment for selected Module

Semester:	VI	**Course Type:**	PEC		
Course Title: Storage Area Networks					
Course Code:	**23CSP622**			**Credits:**	03
Teaching Hours/Week (L:T:P:O)			3:0:0:0	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3 Hours

I. Course Objectives:

- Evaluate storage architectures,
- Definebackup,recovery,disasterrecovery,businesscontinuity,andreplication
- Examine emerging technologies including IP-SAN
- Understand logical and physical components of a storage infrastructure
- Identify components of managing and monitoring the data center
- Define information security and identify different storage virtualization technologies

II. Teaching-Learning Process (General Instructions):

Teachers can use following strategies to accelerate the attainment of the various course outcomes.
1. Chalk and Talk with Black Board
2. ICT based Teaching
3. Demonstration based Teaching

III. COURSE CONTENT

Module-1: Introduction to Information storage	8 Hrs

Storage System: Introduction to Information Storage: Information Storage, Evolution of Storage Architecture, Data Center Infrastructure, Virtualization and Cloud Computing. **Data Center Environment:** Application Database Management System (DBMS), Host(Compute), Connectivity, Storage, Disk Drive Components, Disk Drive Performance, Host Access to Data, Direct-Attached Storage, Storage Design Based on Application
Textbook1: Chapter 1: 1.1to1.4 ;Chapter 2: 2.1to2.10

Self-Learning: Storage Design Based on Application

Pre-requisites: knowledge of database

RBT Levels: L1 – Remembering, L2 – Understanding

Module-2: Data Protection	8 Hrs

Data Protection-RAID: RAID Implementation Methods, RAID Array Components, RAID Techniques, RAID Levels, RAID Impact on Disk Performance, RAID Comparison. **Intelligent Storage Systems:** Components of an Intelligent Storage System, Types of Intelligent Storage Systems. **Fibre Channel Storage Area Networks - Fibre Channel:** Overview, The SAN and Its Evolution, Components of FC SAN. **Textbook1:**Chapter 3: 3.1to3.6; Chapter 4:4.1,4.3: Chapter 6: 6.1to6.3	
Self-Learning: Components of FC SAN.	
Pre-requisites: Basic Memory storage	
RBT Levels: L1 – Remembering, L2 – Understanding	
Module-3: Storage Connectivity	8 Hrs
Direct-Attached Storage, SCSI, and Storage Area Networks: Types of DAS, DAS Benefits and Limitations, Disk Drive Interfaces.**IP SAN and FCoE:** iSCSI, FCIP, **Network-Attached Storage:** General-Purpose Servers versus NAS Devices,Benefi ts of NAS, File Systems and Network File Sharing, Components of NAS, NAS I/O Operation, NAS Implementations, NAS File-Sharing Protocols, Factors Affecting NAS Performance **Textbook1:**Chapter 5:.5.1,5.2,5.3; Chapter 8: 8.1,8.2; Chapter 7:7.1to7.8	
Self-Learning: Factors Affecting NAS Performance	
Pre-requisites: File systems and Protocols	
RBT Levels: L1 – Remembering, L2 – Understanding	
Module-4: Business Continuity	8 Hrs
Introduction to Business Continuity: Information Availability, BC Terminology, BC Planning Life Cycle, Failure Analysis, Business Impact Analysis, BC Technology Solutions, **Backup and Archive:** Backup Purpose, Backup Considerations, Backup Granularity, Recovery Considerations, Backup Methods, Backup Architecture, Backup and Restore Operations, Backup Topologies, Backup in NAS Environments **Textbook1:**Chapter 9: 9.1to9.6;Chapter 10: 10.1to10.9	
Self-Learning: Backup in NAS Environments	
Pre-requisites: Operating System	
RBT Levels: L1 – Remembering, L2 – Understanding	
Module-5: Replication and Security	8 Hrs
Local Replication: Replication Terminology, Uses of Local Replicas, Replica Consistency, Local Replication Technologies, Tracking Changes to Source and Replica, Restore and Restart Considerations, Creating Multiple Replicas .**Remote Replication:** Modes of Remote Replication, Remote Replication Technologies. **Securing the Storage Infrastructure:** Information Security Framework, Risk Triad, Storage Security Domains. Security Implementations in Storage Networking **Textbook1:Ch.11.1to11.7,Ch.12.1,12.2,Ch.14.1to14.4** **RBT: L1, L2**	
Self-Learning: Security Implementations in Storage Networking	
Pre-requisites: Network Topology	
RBT Levels: L1 – Remembering, L2 – Understanding	

IV. COURSE OUTCOMES

Students will be able to

CO1	Identify key challenges in managing information along with RAID implementations.
CO2	Describe different storage networking technologies and virtualization.
CO3	Explain components and the implementation of NAS.
CO4	Describe CAS architecture and types of archives and forms of virtualization.
CO5	Illustrate the storage infrastructure and management activities.

V. CO-PO-PSO MAPPING(mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3
CO1	3	2	2									1	2		
CO2	1	2	2									1	-		
CO3	2	2	2									1	2		2
CO4	2	2	2									1	1	1	2
CO5	1	2	2									2			2

VI. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023.

Continuous Internal Evaluation (CIE): Refer Annexure section 1

Semester End Examination (SEE): Refer Annexure section 1

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
01	Information Storage and Management	EMC Education Services	2009 ISBN: 978-0-470-29421-5	Wiley

VII(b): Reference Books:

01	Storage Networking Real World Skills for the Computer Storage Certification and Beyond	Nigel Poulton	2015:ISBN-13:978-8126557677	SYBEX a Wiley brand Wiley
02	Storage Networks Explained	Ulf Troppens, Wolfgang Muller-Freidt, Rainer Wolafka		Wiley

VII(c): Web links and Video Lectures (e-Resources):

What is Storage Area Network (SAN)? | VMware Glossary
Virtualization in Cloud Computing - javatpoint
What is Storage ? SAN ,NAS, DAS, iSCSI Storage Implementations? - YouTube
Understanding Concept of Striping, Mirroring & Parity (storagetutorials.com)

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

- Case Study-1 2. Assignment

Semester:	VI	**Course Type:**	PEC		
Course Title: Process Automation					
Course Code:	**23CSP623**			**Credits:**	3
Teaching Hours/Week (L:T:P:O)			3:0:0:0	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3

I. Course Objectives:

This course will enable students to:

- To understand basic concepts of RPA
- To Describe IIPA, where it can be applied and how it implemented
- To Describe the different types of variables, Control Flow and data manipulation techniques
- To Understand Image, Text and data Tables Automation
- To describe various types of Exceptions and strategies to handle

II. Teaching-Learning Process (General Instructions):

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) needs not to be only traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.

5. Adopt Problem Based Learning (PBL),which fosters student's Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world and when that's possible, it helps to improve the student's understanding.
9. Demonstration of sample code for various components using UiPath for automation.

III. COURSE CONTENT

Module-1: RPA Foundations	08 Hrs

RPA Foundations- What is RPA - Flavors of RPA- History of RPA- The Benefits of RPA- The downsides of RPA- RPA Compared to BPO, BPM and BPA- Consumer Willingness for Automation- The Workforce of the Future- RPA, Skills-On-Premise Vs. the Cloud- Web Technology- Programming Languages and Low Code- OCR-Databases-APls- Al-Cognitive Automation-Agile, Scrum, Kanban and Waterfall Devops- Flowcharts.
Textbook 1: Chapter 1, 2

Self-Learning: Kanban and Waterfall Devops- Flowcharts.

Pre-requisites: Software Engineering

RBT Levels: L1 – Remembering, L2 – Understanding

Module-2: RPA Platforms	08 Hrs

RPA Platforms- Components of IIPA-IIPA Platforms-About Ui Path- About UiPath - The future of automation - Record and Play - Downloading and installing UiPath Studio -Learning Ui Path Studio- Task recorder - Step-by step examples using the recorder.
Textbook 2: Chapter 1, 2

Self-Learning: Recorder.

RBT Levels: L1 – Remembering, L2 – Understanding,

Module-3: Sequence, Flowchart, and Control Flow	08 Hrs

Sequence, Flowchart, and Control Flow-sequencing the workflow- Activities-Control flow, various types of loops, and decision making-Step-by step example using Sequence and Flowchart-Step-by-step example using Sequence and Control flow-Data Manipulation-Variables and Scope-Collections-Arguments - Purpose and use-Data table usage with examples-Clipboard management-File operation with step-by-step example-CSV/Excel to data table and vice versa [with a step-by-step example).
Textbook 2: Chapter 3, 4

Self-Learning: CSV/Excel

RBT Levels: L1 – Remembering, L2 – Understanding,	
Module-4: Taking Control of the Controls	08Hrs
Taking Control of the Controls- Finding and attaching windows- Finding the control- Techniques for waiting for a control- Act on controls - mouse and keyboard activities- Working with Ui Explorer- Handling events- Revisit recorder- Screen Scraping- When to use OCR- Types of 0CR available- How to use OCR- Avoiding typical failure points. **Textbook 2:** Chapter 5	
Self-Learning: OCR	
RBT Levels: L1 – Remembering, L2 – Understanding	
Module-5: Exception Handling, Debugging, and Logging	08 Hrs
Exception Handling, Debugging, and Logging- Exception handling- Common exceptions and ways to handle them- Logging and taking screenshots-Debugging techniques- Collecting crash dumps- Error reporting- Future of RPA **Text book 1:** Chapter 13 **Text book 2:** Chapter 8	
Self-Learning: RPA	
RBT Levels: L1 – Remembering, L2 – Understanding	

IV. COURSE OUTCOMES

CO1	To Understand the basic concepts of RPA
CO2	To Describe various components and platforms of RPA
CO3	To Describe the different types of variables, control flow and data manipulation techniques
CO4	To Understand various control techniques and OCR in RPA
CO5	To Describe various types and strategies to handle exceptions

V. CO-PO-PSO MAPPING(mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3
CO1	1	2	2												
CO2	2	2	1										2		
CO3	2	3	1										3		2

CO4	1	2	1										2	2	
CO5	2	2	1												2

VI. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023 Dated on 10-02-2025.

Continuous Internal Evaluation (CIE): Refer Annexure section 1

Semester End Examination (SEE): Refer Annexure section 1

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems	Tom Taulli	2020, ISBN-13 (electronic):978-7-4842-5729-6	A press
2	Learning Robotic Process Automation	Alok Mani Tripathi	March 2018 ISBN: 9787788470940	Packt Publishing Release

VII(b): Reference Books:

1	"introduction to Robotic Process Automation: a Primer",	Frank Casale, Rebecca Dilla, Hieidi Jaynes, Lauren Livingston,	1st Edition 2015.	Institute of Robotic Process Automation,
2	Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant	Richard Murdoch	1st Edition 2018.	Independently Published
3	”Robotic Process Automation Tools, Process Automation and their benefits: Understanding RPA and Intelligent Automation	Srikanth Merianda	1st Edition 2018	, Consulting Opportunity Holdings LLC
4	Robotic Process Automation with Blue Prism Quick Start Guide: Create software	Lim Mei Ying	1st Edition 2018	Packt Publishing

	robots and automate business processes			

VII(c): Web links and Video Lectures (e-Resources):

1. https://www.uipath.com/rpa/robotic-process-automation
2. http://www.academy.uipath.com/

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

- Case Study-1
- Assignment
- MOOC Assignment for selected Module

Semester:	VI	**Course Type:**	PEC		
Course Title: Mobile Computing					
Course Code:	**23CSP624**			**Credits:**	03
Teaching Hours/Week (L:T:P:O)			3:0:0	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3

I. Course Objectives:

This course will enable students to:

- Define concepts of wireless communication.
- Compare and contrast propagation methods, Channel models, capacity calculations multiple antennas and multiple user techniques used in the mobile communication.
- Explain CDMA, GSM. Mobile IP, WImax and Different Mobile OS.
- Illustrate various Markup Languages CDC, CLDC, MIDP; Programming for CLDC, MIDlet model and security concerns.

II. Teaching-Learning Process (General Instructions):

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) needs not to be only traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.

5. Adopt Problem Based Learning (PBL),which fosters student's Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.

6. Introduce Topics in manifold representations.

7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.

8. Discuss how every concept can be applied to the real world and when that's possible, it helps to improve the student's understanding.

9. Demonstration of sample code for various components using UiPath for automation.

III. COURSE CONTENT

Module-1: Architecture	8 Hrs

Mobile Computing Architecture: Architecture for Mobile Computing, 3-tier Architecture, Design Considerations for Mobile Computing. Emerging Technologies: Wireless broadband (WiMAX), Mobile IP: Introduction, Registration, Tunneling, Cellular IP, Mobile IP with IPv6. Wireless Networks :GSM,SMS

Textbook 1 : Chapter 2: 2.4 - 2.6; Chapter 4: 4.4 - 4.6, Chapter 5, Chapter 6.

Self-Learning: CDMA

RBT Levels: L1 – Remembering, L2 – Understanding

Module-2: GPRS and GPRS Network Architecture	8 Hrs

GPRS and Packet Data Network, GPRS Network Architecture, GPRS Network Operations, Data Services in GPRS, Applications for GPRS, Billing and Charging in GPRS. Spread Spectrum technology, IS-95, CDMA versus GSM, Wireless Data, Third Generation Networks, Applications on 3G, Mobile phones and their features.

Textbook 1 : Chapter 7; Chapter 9: 9.2 - 9.7; Chapter 12: 12.2 - 12.6

Self-Learning: Mobile phones and their features.

RBT Levels: L1 – Remembering, L2 – Understanding

Module-3: Mobile OS and Computing Environment	8 Hrs

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, Proprietary OS Client Development: The development process, Need analysis phase, Design phase, Implementation and Testing phase, Deployment phase.

Textbook 2 : Chapter 7, 8.

Self-Learning: Deployment phase.

RBT Levels: L1 – Remembering, L2 – Understanding

Module-4: Building Wireless Internet Applications	8 Hrs
Building Wireless Internet Applications: Thin client overview: Architecture, The client, Middleware, Messaging Servers, Processing a Wireless request, Wireless Applications, Protocol (WAP) Overview, Wireless Languages. **Textbook 2:** Chapter 11, 12, 13	
Self-Learning: Wireless Languages.	
RBT Levels: L1 – Remembering, L2 – Understanding	
Module-5: J2ME	8 Hrs
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. **Textbook 1:** Chapter 15: 15.1 - 15.10	
Self-Learning: Security Issues	
RBT Levels: L1 – Remembering, L2 – Understanding	

IV. COURSE OUTCOMES

CO1	Explain state of art techniques in wireless communication.
CO2	Discover CDMA, GSM. Mobile IP, WImax
CO3	Demonstrate program for CLDC, MIDP let model and security concerns
CO4	Analyze the architecture and components involved in building wireless internet applications.
CO5	Develop and deploy mobile applications using J2ME, MIDlet life-cycle, and GUI components

V. CO-PO-PSO MAPPING(mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3
CO1	3	3	2	2	2	1							3		
CO2	3	3	2	2	2								3		
CO3	2	2	3	2	2				1	2			3	2	
CO4	2	2	2	3	2				2	2			2	2	

CO5	2	2	3	3	3				3	2			3	3		

VI. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023 Dated on 10-02-2025.

Continuous Internal Evaluation (CIE): Refer Annexure section 1

Semester End Examination (SEE): Refer Annexure section 1

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
01	Mobile Computing, Technology, Applications and Service Creation,	Ashok Talukder, Roopa Yavagal, Hasan Ahmed	2nd Edition, 2010.	Tata McGraw Hill
02	Mobile and Wireless Design Essentials	Martyn Mallik	2003	Wiley India

VII(b): Reference Books:

01	Mobile Computing	Raj kamal	2007	Oxford University Press
02	Wireless Communications and Networks, 3G and Beyond	Iti Saha Misra	2009	Tata McGraw Hill

VII(c): Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/courses/106106147
- http://www.digimat.in/nptel/courses/video/106106147/L01.html

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

- Assignment
- MOOC Assignment for selected Module

Semester:	VI	**Course Type:**	OEC		
Course Title: Introduction to Data Structures					
Course Code:	**23CSO611**			**Credits:**	03
Teaching Hours/Week (L:T:P:O)			3:0:0:0	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3 Hours

I. Course Objectives:

- Learn and identify various non-primitive data types
- Learn and identify different data structures in C programming language.
- Assess the use of suitable data structures in problem-solving.
- Assess the use of graph data structure.
- Develop solutions for practical problems.

II. Teaching-Learning Process (General Instructions):

Teachers can use following strategies to accelerate the attainment of the various course outcomes.

1. Chalk and Talk with Black Board
2. ICT based Teaching
3. Demonstration based Teaching

III. COURSE CONTENT

Module-1: Review of Non-Primitive Data Types:	8 Hrs

Arrays: Introduction to Arrays, different types of arrays, declaration and initialization of 1-dimentions and 2-dimentioal arrays, programming examples, Dynamic Memory Allocation.

Pointers: Pointer's basics, accessing pointer variables, Array of pointers, Programming examples on pointer applications.

Structures & Unions: Introduction to Structures and Unions, declaration and initialization, array of structures, self-referential structures, structure functions, and programming examples.

Textbook 1: Chapter 3: 3.1-3.5;Chapter 5: 5.1-5.6, 5.10-5.13; Chapter 7:7.1-7.5

Self-Learning: More programming examples.	
RBT Levels: L1 – Remembering, L2 – Understanding, L3 – Applying	
Module-2: Introduction to Data Structures:	8 Hrs
Definition and Operations on Data Structures, Classification of Data structures. Stack data structures and its operations, array implementation of stacks, applications of stack and programming examples. Introduction to Queues and its operations, Limitations of Simple queue over Circular queue, applications of queues and programming examples. Recursion and its type, programming examples on Factorial, Fibonacci and GCD-LCM. **Textbook 1:** Chapter 2:2.8-2.11;Chapter 4:4.1-4.2; Chapter 9: 9.1-9.4, 9.7-9.15	
Self-Learning: GCD-LCM.	
RBT Levels: L1 – Remembering, L2 – Understanding, L3 – Applying	
Module-3: Linked Lists and its types:	8 Hrs
Definition, Representation of linked lists in memory, Singly Linked List, Linked list operations: Traversing, Searching, Insertion, and Deletion. Doubly Linked list and its operations, Circular linked lists, applications of linked list and programming examples. **Textbook 1:** Chapter 8: 8.1-8.7	
Self-Learning: More programming examples.	
RBT Levels:L1 – Remembering, L2 – Understanding, L3 – Applying,	
Module-4: Introduction to Non-Linear Data Structures:	8 Hrs
Basic concepts and terminologies of Tree Data Structure, Types of Trees, Creating a Binary Tree, Binary Tree Traversal Techniques - In-order, Post-order and Preorder, programming examples. **Textbook 1:** Chapter 10:10.1-10.4	
Self-Learning: More programming examples.	
RBT Levels: L2 – Understanding, L3 – Applying	
Module-5: Binary Search Trees & Graphs:	8 Hrs
Basic concepts of BST, Create, Insert, and Search operations on BST, Programming Examples. **Graphs:** Introduction, Terminologies of Graph Data Structure, Directed graphs, Adjacency Matrix and Adjacency List Representation of Graphs and programming examples. **Textbook 1:** Chapter 11:11.1- 11.3; Chapter 13: 13.1-13.4	
Self-Learning: More programming examples.	
RBT Levels: L2 – Understanding, L3 – Applying	
IV. COURSE OUTCOMES **Students will be able to**	
CO1	Understand the concepts of Pointers, Structures and Unions.

CO2	Implement data structures using C Programming language.
CO3	Apply various data structures in problem-solving using C language.
CO4	Design and develop solutions using Data Structures for practical problems.

V. CO-PO-PSO MAPPING(mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3
CO1	2	1	1						1						
CO2		2	2									1			
CO3	1	2	2												
CO4	1	1	2												

VI. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023 Dated on 10-02-2025.

Continuous Internal Evaluation (CIE): Refer Annexure section 1

Semester End Examination (SEE): Refer Annexure section 1

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
01	Data structures using C	Reema Thareja	5th Edition, 2012	Oxford University Press.

VII(b): Reference Books:

01	Fundamentals of Data Structures in C	Ellis Horowitz and Sartaj Sahni,	2nd Edition, 2014.	Universities Press
02	Data Structures Schaum's Outlines,	Seymour Lipschutz	Revised 1st Ed, 2014	McGraw Hill

VII(c): Web links and Video Lectures (e-Resources):

- https://www.geeksforgeeks.org/data-structures/
- https://www.w3schools.com/dsa/dsa_intro.php
- https://www.coursera.org/learn/data-structures

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

- Case Study-1
- Programming Assignment
- MOOC Assignment for selected Module

Semester:	VI	**Course Type:**	OEC		
Course Title: Object-Oriented Programming with JAVA					
Course Code:	**23CSO612**			**Credits:**	03
Teaching Hours/Week (L:T:P:O)			3:0:0:0	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3 Hours

I. Course Objectives:

- Learn fundamental features of object oriented language and JAVA
- Set up Java JDK environment to create, debug and run simple Java programs.
- Create multi-threaded programs and event handling mechanisms.
- Introduce event driven Graphical User Interface (GUI) programming using applets and swings.

II. Teaching-Learning Process (General Instructions):

Teachers can use following strategies to accelerate the attainment of the various course outcomes.

1. Chalk and Talk with Black Board
2. ICT based Teaching
3. Demonstration based Teaching

III. COURSE CONTENT

Module-1: Introduction to Object Oriented Concepts	8 Hrs

A Review of structures, Procedure–Oriented Programming, Object Oriented Programming, Comparison of Object-Oriented Language with C, Console I/O, variables and reference variables, Function Prototyping.
Operators: Arithmetic Operators, The Bitwise Operators, Relational Operators, Boolean Logical Operators, The Assignment Operator, The Operator, Operator Precedence, Using Parentheses. Control Statements: Java's Selection Statements, Iteration Statements, Jump Statements.,
Textbook 1: Chapter 4,5
Textbook 2: Chapter 1

Self-Learning: Some Programming Examples.

Pre-requisites Basic knowledge of C programming language Basic knowledge of common programming concepts, including loops, arrays and recursion	
RBT Levels: L1 – Remembering, L2 – Understanding	
Module-2: Class and Objects	8 Hrs
Classes: Classes fundamentals; Declaring objects; Constructors, this keyword, garbage collection. Objects and arrays, Namespaces, Nested classes, Constructors, Destructors. Introduction to Java: Java's magic: the Byte code; Java Development Kit (JDK); the Java Buzzwords, Object-oriented programming; Simple Java programs. **Textbook 2:** Chapter 2	
Self-Learning: Some Programming Examples.	
Pre-requisites Basic knowledge of C programming	
RBT Levels: L1 – Remembering, L2 – Understanding	
Module-3: Inheritance	8 Hrs
Inheritance: Inheritance Basics, Types of Inheritance, Using super, Creating a Multilevel Hierarchy, When Constructors Are Executed, Method Overriding, Using Abstract Classes, Using final with Inheritance, Local Variable Type Inference and Inheritance, The Object Class. **Textbook 1:**Chapter 8	
Self-Learning: Some Programming Examples.	
Pre-requisites Basic knowledge of C programming	
RBT Levels: L1 – Remembering, L2 – Understanding, L3 - Analysis	
Module-4: Packages and Interfaces	8 Hrs
Interfaces: Interfaces, Default Interface Methods, Use static Methods in an Interface, Private Interface Methods. Packages: Packages, Packages and Member Access, Importing Packages. **Textbook 1:** Chapter 9	
Self-Learning: Some Programming Examples.	
Pre-requisites Basic knowledge of C programming	
RBT Levels: L1 – Remembering, L2 – Understanding, L3 - Analysis	

Module-5: Exception Handling	8 Hrs

Exceptions: Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch Clauses, Nested try Statements, throw, throws, finally, Java's Built-in Exceptions, Creating Your Own Exception Subclasses, Chained Exceptions.

Textbook 1: Chapter 10

Self-Learning: Some Programming Examples.

Pre-requisites:

Basic knowledge of C programming

RBT Levels: L1 – Remembering, L2 – Understanding, L3 - Analysis

IV. COURSE OUTCOMES

Students will be able to

CO1	Understand the object oriented concepts
CO2	Demonstrate the fundamentals of java and working of java development kit
CO3	Apply the concepts of inheritance and interfaces in solving real world problems.
CO4	Utilize the concept of packages and Interfaces
CO5	Understanding the concepts of Exception Handling

V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3
CO1	2		1												
CO2	1		2		2										
CO3	2	2	2												
CO4			2												
CO5			3		2										

VI. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023 Dated on 10-02-2025.

Continuous Internal Evaluation (CIE): Refer Annexure section 1

Semester End Examination (SEE): Refer Annexure section 1

VII. Learning Resources

VII(a): Textbooks:				
Sl. No.	**Title of the Book**	**Name of the author**	**Edition and Year**	**Name of the publisher**
01	Java The Complete Reference	Herbert Schildt,	12th Edition, 2021	Tata McGraw Hill
02	Object Oriented Programming with C++	Sourav Sahay	2nd edition, 2006.	Oxford University Press.
VII(b): Reference Books:				
01	Mahesh Bhave and Sunil Patekar,	Programming with Java	First Edition, 2008	Pearson Education

VII(c): Web links and Video Lectures (e-Resources):

1 https://onlinecourses.nptel.ac.in/noc21_cs03/preview
2 https://www.coursera.org/specializations/object-oriented-programming
3 https://www.geeksforgeeks.org/category/java-programs/
4 https://www.coursera.org/specializations/java-programming
5 https://www.codecademy.com/learn/learn-java

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

- Case Study-1
- Programming Assignment
- Gate Based Aptitude Test
- MOOC Assignment for selected Module

Semester:	VI	**Course Type:**	OEC		
Course Title: Software Testing					
Course Code:	**23CSO613**			**Credits:**	03
Teaching Hours/Week (L:T:P:O)			3:0:0:0	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3 Hours

I. Course Objectives:

- To introduce software testing principles, processes, and life cycles.
- To equip students with functional and structural testing techniques.
- To teach verification methods for software requirements and design.
- To enable creation of test cases from requirements and use cases.
- To familiarize students with debugging and testing tools.

II. Teaching-Learning Process (General Instructions):

Teachers can use following strategies to accelerate the attainment of the various course outcomes.

1. Chalk and Talk with Black Board
2. ICT based Teaching
3. Demonstration based Teaching

III. COURSE CONTENT

Module-1: Introduction To Software Testing	8 Hrs

Some Software Failures, Testing Process, Some Terminologies, Program and Software, Verification and Validation, Fault, Error, Bug and Failure, Test, Test Case and Test Suite, Deliverables and Milestones, Alpha, Beta and Acceptance Testing, Quality and Reliability Testing, Quality Assurance

and Quality Control,Static and Dynamic Testing, Testing and Debugging, Limitations of Testing, The V Shaped Software Life Cycle Model, **Text Book:** Chapter 1	
Self-Learning: Water fall model	
RBT Levels: L1 – Remembering, L2 – Understanding	
Module-2: Functional Testing	8 Hrs
Boundary Value Analysis, Robustness Testing, Worst-Case Testing, Robust Worst-Case Testing, Applicability, Equivalence Class Testing, Creation of Equivalence Classes, Applicability, Decision Table Based Testing, Cause-Effect Graphing Technique. **Textbook:** Chapter 2	
Self-Learning: Cause-Effect Graphing Technique.	
RBT Levels: L1 – Remembering, L2 – Understanding, L3 – Applying	
Module-3: Structural Testing	8 Hrs
Control Flow Testing, Statement Coverage, Branch Coverage, Condition Coverage, Path Coverage, Data Flow Testing, Define/Reference Anomalies, Definitions, Identification of du and dc Paths, Testing Strategies Using du-Paths, Generation of Test Cases, Slice Based Testing, Guidelines for Slicing, Creation of Program Slices, Generation of Test Cases, Mutation Testing, Mutation and Mutants, Mutation Operators, Mutation Score. **Textbook:** Chapter 4	
Self-Learning: Mutation Score.	
RBT Levels: L1 – Remembering, L2 – Understanding, L3 – Applying	
Module-4: Software Verification	8 Hrs
Verification Methods, Peer Reviews, Software Requirements Specification (SRS) Document Verification, Software Design Description (SDD) Document Verification, Source Code Reviews, User Documentation Verification, Review Process Issues, User Documentation Checklist, Software Project Audit, Relevance Scale, Project Audit and Review Checklist **Textbook:** Chapter 5	
Self-Learning: Project Audit Tools	
Pre-requisites **S**olid knowledge of Recursion, Stack, and Queue data structures	

RBT Levels: L2 – Understanding, L3 – Applying

Module-5: Creating Test Cases from Requirements and Use Cases	8 Hrs

Generation of Test Cases from Use Cases, Guidelines for generating validity checks, Strategies for Data Validity. **Software Testing Activities:** Levels of Testing, Debugging, Software Testing Tools, Static Software Testing Tools, Dynamic Software Testing Tools, Process Management Tools, Software Test Plan

Textbook1: Chapter 6, Chapter 8

Self-Learning: More Process Management

RBT Levels: L2 – Understanding, L3 – Applying

IV. COURSE OUTCOMES

Students will be able to

CO1	Articulate the importance of software testing processes and key concepts.
CO2	Apply functional testing techniques like boundary value and equivalence class testing.
CO3	Perform structural testing, including control flow and mutation testing.
CO4	Verify software artifacts through effective reviews and audits.
CO5	Design test cases and debugging strategies using industry tools.

V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3
CO1	3	3										2			
CO2	2	2	2												
CO3	2	2	2												
CO4				2		2	2	2							
CO5	2				1										

VI. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023 Dated on 10-02-2025.

Continuous Internal Evaluation (CIE): Refer Annexure section 1

Semester End Examination (SEE): Refer Annexure section 1

VII. Learning Resources				
VII(a): Textbooks:				
Sl. No.	**Title of the Book**	**Name of the author**	**Edition and Year**	**Name of the publisher**
01	Software Testing	Yogesh Singh	2012	Cambridge University Pres
VII(b): Reference Books:				
01	Software Testing: A Craftsman's Approach,	Paul C. Jorgensen,	4th Edition	CRC Press ,Taylor & Francis Group
02	Foundations of Software Testing	Dorothy Graham, Erik van Veenendaal, Isabel Evans, and Rex Black	4th Edition	Cengage Learning
VII(c): Web links and Video Lectures (e-Resources):				
Web Links: • https://www.istqb.org/ • https://www.softwaretestinghelp.com/				
VIII: Activity Based Learning / Practical Based Learning/Experiential learning:				
• Case Study-1 • MOOC Assignment for selected Module				

Semester:	VI	**Course Type:**	OEC		
Course Title: Data Visualization using Python					
Course Code:	**23CSO614**			**Credits:**	03
Teaching Hours/Week (L:T:P:O)			3:0:0:0	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3 Hours

I. Course Objectives:

- To provide a foundation in data science terminologies
- Understand and use various plot types with Python
- Explore and work with different plotting libraries
- Create effective visualizations

II. Teaching-Learning Process (General Instructions):

Teachers can use following strategies to accelerate the attainment of the various course outcomes.

1. Chalk and Talk with Black Board
2. ICT based Teaching
3. Demonstration based Teaching

III. COURSE CONTENT

Module-1 : Introduction to Data Science	8 Hrs

PREPARING AND GATHERING DATA AND KNOWLEDGE
Philosophies of data science - Data science in a big data world - Benefits and uses of data science and big data - facts of data: Structured data, Unstructured data, Natural Language, Machine generated data, Audio, Image and video streaming data.
THE DATA SCIENCE PROCESS-Overview of the data science process- defining research goals and creating project charter, retrieving data, cleansing, integrating and

transforming data, exploratory data analysis, Build the models, presenting findings and building application on top of them.
Textbook 1: Chapter 1: 1.1 to 1.2; Chapter 2

Self-Learning: Data Preprocessing

RBT Levels:L1 – Remembering, L2 – Understanding,

Module-2 : Introduction to Visualization	8 Hrs

Introduction: Data Visualization, Importance of Data Visualization, Data Wrangling, Tools and Libraries for Visualization.

Overview of Statistics: Measures of Central Tendency, Measures of Dispersion, Correlation, Summary Statistics

Textbook 2: Chapter 1

Self-Learning: Types of Data

RBT Levels:L1 – Remembering, L2 – Understanding

Module-3: Introduction to Numpy and Pandas	8 Hrs

Numpy: Numpy Operations - Indexing, Slicing, Splitting, Iterating, Filtering, Sorting, Combining, and Reshaping.

Pandas: Advantages of pandas over numpy, Disadvantages of pandas, Pandas operation - Indexing, Slicing, Iterating, Filtering, Sorting and Reshaping using Pandas.

Textbook2: Chapter 1

Self-Learning: Pandas.

RBT Levels:L1 – Remembering, L2 – Understanding,

Module-4 : Matplotlib	8 Hrs

A Deep Dive into Matplotlib

Introduction, Overview of Plots in Matplotlib, **Pyplot Basics:** Creating Figures, Closing Figures, Format Strings, Plotting, Plotting Using pandas DataFrames, Displaying Figures**,** Saving Figures;

Basic Text and Legend Functions: Labels, Titles, Text, Annotations, Legends**; Basic Plots:** Bar Chart, Stacked Bar Chart, Histogram, Box Plot, Scatter Plot ; **Layouts:** Subplots, Tight Layout ; **Images:** Basic Image Operations, Writing Mathematical Expressions.

Textbook2: Chapter 3

Self-Learning: Pie Chart

RBT Levels:L1 – Remembering, L2 – Understanding,

Module-5 : Visualizations using Seaborn	8 Hrs

Introduction, Advantages of Seaborn **Controlling Figure Aesthetics:** Seaborn Figure Styles, Removing Axes Spines, Contexts; **Color Palettes:** Categorical Color Palettes, Sequential Color Palettes, Diverging Color Palettes; **Interesting Plots in Seaborn:** Bar Plots, Kernel Density Estimation, Plotting Bivariate Distributions, Visualizing Pairwise Relationships, Violin Plots.

Textbook2: Chapter 4

Self-Learning: Seaborn Applications

RBT Levels:L1 – Remembering, L2 – Understanding,

IV. COURSE OUTCOMES

Students will be able to

CO1	Understanding Data Science Fundamentals.
CO2	Demonstrate the data visualization techniques.
CO3	Create and manipulate NumPy and Pandas operations.
CO4	Analyze data represented in the form of graphs & charts.
CO5	Experiment with different visualization tools.

V. CO-PO-PSO MAPPING(mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3
CO1	2	1													
CO2		2													
CO3	2	2		2	3										
CO4		3	2		3										
CO5		2	2		3										

VI. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023 Dated on 10-02-2025.

Continuous Internal Evaluation (CIE): Refer Annexure section 1

Semester End Examination (SEE): Refer Annexure section 1

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
01	Introducing Data Science	Davy Cielen, Arno D. B. Meysman and Mohamed Ali	2016	Manning Publications
02	Data Visualization workshop	Tim Grobmann and Mario Dobler	ISBN 9781800568112	Packt Publishing

VII(b): Reference Books:

01	Doing Data Science	Cathy O'Neil, Rachel Schutt	1st edition, 2013	O' Reilly
02	"Data Visualization": A Successful Design Process,	Kirk, Andy	2012	Packt Publishing Ltd
03	Think Python: How to Think Like a Computer Scientist	Allen B. Downey,	2nd Edition, 2015	Green Tea Press,
04	Visualizing Data: Exploring and Explaining Data with The Processing Environment	Fry, Ben,	Inc., 2007	O'Reilly Media

VII(c): Web links and Video Lectures (e-Resources):

1. https://nptel.ac.in/courses/106/105/106105077/
2. https://www.oreilly.com/library/view/doing-data-science/9781449363871/toc01.html
3. https://www.youtube.com/watch?v=eFByJkA3ti4
4. https://www.youtube.com/watch?v=JhK2qVi5dC4
5. https://matplotlib.org/
6. https://docs.python.org/3/tutorial/
7. http://book.visualisingdata.com/

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:
• Case Study-1 • Assignment • MOOC Assignment for selected Module

Semester:	VI	**Course Type:**	ETC		
Course Title: Computer Vision					
Course Code:	**23CSE641**			**Credits:**	03
Teaching Hours/Week (L:T:P:O)			3:0:0:@	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3 Hours

I. Course Objectives:

This course will enable students to:

- To understand the fundamentals of computer vision and digital image processing
- To introduce the processes involved image enhancement and restoration.
- To facilitate the students to gain understanding color image processing and morphology.
- To impart the knowledge of image segmentation and object recognition techniques.

II. Teaching-Learning Process (General Instructions):

Teachers can use following strategies to accelerate the attainment of the various course outcomes.

1. Chalk and Talk with Black Board
2. ICT based Teaching
3. Demonstration based Teaching

III. COURSE CONTENT

III(a). Theory PART

Module-1: Introduction	8 Hrs

What is computer vision?. Image Formation: Photometric image formation, The digital camera. Image processing: Point operators, Linear filtering.

Textbook-1: Chapter1: 1.1, 1.2 ; Chapter 2:2.2, 2.3; Chapter 3: 3.1, 3.2

Self-Learning: A Brief history of Computer Vision	
Pre-Requites: Basics of Computer Graphics	
RBT Levels: L1 – Remembering, L2 – Understanding	
Module-2: Image Processing	8 Hrs
More neighborhood operators, Fourier transforms, Pyramids and wavelets, and Geometric transformations. Textbook-1: Chapter 3: 3.3 - 3.6	
Self-Learning: Wavelets Applications	
Pre-Requites: Digital Image Processing	
RBT Levels: L1 – Remembering, L2 – Understanding	
Module-3: Image Restoration and Reconstruction	8 Hrs
A model of Image degradation/restoration process, restoration in the presence of noise only, periodic noise reduction by frequency domain filtering. **Textbook-2:** Chapter 5: 5.1-5.4; Chapter 10: 10.1-10.3.2, 10.4	
Self-Learning: Types of noise	
Pre-Requites: Digital Image Processing	
RBT Levels: L1 – Remembering, L2 – Understanding, L3 – Applying	
Module-4: Color Image Processing	8 Hrs
Color fundamentals, color models, Pseudocolor image processing, full color image processing, color transformations, color image smoothing and sharpening, Using color in image segmentation. **Textbook-2:** Chapter 6: 6.1-6.8	
Self-Learning: Noise in color images.	
Pre-Requites: Digital Image Processing	
RBT Levels: L1 – Remembering, L2 – Understanding, L3 – Applying	
Module-5: Feature Extraction and Classification	8 Hrs
Background, Boundary preprocessing (Boundary following & Chain codes only). **Image pattern Classification:** Background, Patterns and classes, Pattern classification by prototype matching (Minimum distance classifier only). **Textbook-2:** Chapter 9: 9.1-9.5; Chapter 11:11.1-11.2.2; Chapter 12:12.1-12.3.1	
Self-Learning: Pattern classifiers	

Pre-Requites: Digital Image Processing

RBT Levels: L1 – Remembering, L2 – Understanding, L3 – Applying

IV. COURSE OUTCOMES

Students will be able to

CO1	Explain the fundamentals of computer vision and its applications.
CO2	Compare the different image restoration and segmentation techniques.
CO3	Demonstrate the smoothing and sharpening techniques for color images.
CO4	Explain feature extraction for object recognition.
CO5	Explain pattern classification techniques for object recognition.

V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3
CO1	3	2											1	1	
CO2	3	2	2										1	1	
CO3	2	2	2		1								1	2	
CO4	2	2	2		1								1	2	
CO5	2	2	2		1								1	2	

VI. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023 Dated on 10-02-2025.

Continuous Internal Evaluation (CIE): Refer Annexure section 1

Semester End Examination (SEE): Refer Annexure section 1

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Computer Vision: Algorithms and Applications (Texts in Computer Science)	**Richard Szeliski**	2nd Edition, 2022	Springer

2	Digital Image Processing	Rafael C G., Woods R E. and Eddins S L	4th edition, 2019	Pearson
VII(b): Reference Books:				
1	Computer Vision: A Modern Approach	David Forsyth and Jean Ponce	2nd Edition, 2015	Pearson
2	Computer Vision - An Introduction into Theory and Algorithms	Reinhard Klette, Concise	2014	Springer

VII(c): Web links and Video Lectures (e-Resources):

- **Virtual Labs: https://cse19-iiith.vlabs.ac.in/**
- **https://onlinecourses.nptel.ac.in/noc21_ee78/preview ●**
- **Introduction to Machine Vision: https://www.youtube.com/watch?v=tY2gczObpfU**
- **https://coral.ise.lehigh.edu/optml/files/2019/10/OptML_CV_tutorial_1_compressed.pdf**

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

- Case Study-1
- Programming Assignment
- Gate Based Aptitude Test
- MOOC Assignment for selected Module

Semester:	VI	**Course Type:**	ETC		
Course Title: Big Data Analytics					
Course Code:	**23CSE642**			**Credits:**	03
Teaching Hours/Week (L:T:P:O)			3:0:0:@	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3 Hours

I. Course Objectives:

This course will enable students to:

- Understand fundamentals and applications of Big Data analytics.
- Explore the Hadoop framework and Hadoop Distributed File system and essential Hadoop Tools.
- Illustrate the concepts of NoSQL using MongoDB and Cassandra for Big Data.
- Employ MapReduce programming model to process the big data.
- Understand various machine learning algorithms for Big Data Analytics, Web Mining and Social Network Analysis.

II. Teaching-Learning Process (General Instructions):

Teachers can use following strategies to accelerate the attainment of the various course outcomes.

1. Chalk and Talk with Black Board
2. ICT based Teaching
3. Demonstration based Teaching

III. COURSE CONTENT

Module-1: Introduction to Big Data Analytics	8 Hrs

Introduction to Big Data Analytics: Big Data, Scalability and Parallel Processing, Designing Data Architecture, Data Sources, Quality, Pre-Processing and Storing, Data Storage and Analysis, Big Data Analytics Applications.

Textbook 1: Chapter 1: 1.2 -1.7
Self-Learning: Case Studies.
RBT Levels: L1 – Remembering, L2 – Understanding

Module-2: Introduction to Hadoop	8 Hrs

Introduction to Hadoop (T1): Introduction, Hadoop and its Ecosystem, Hadoop Distributed File System, MapReduce Framework and Programming Model.Hadoop Yarn, Hadoop Ecosystem Tools.

Hadoop Distributed File System Basics (T2): HDFS Design Features, Components, HDFS User Commands.

Essential Hadoop Tools (T2): Using Apache Pig, Hive, Sqoop, Flume, Oozie.

Textbook 1: Chapter 2 :2.1-2.6
Textbook 2: Chapter 3

Self-Learning: HBase.
RBT Levels: L1 – Remembering, L2 – Understanding, L3 – Applying

Module-3: NoSQL Big Data Management, MongoDB and Cassandra	8 Hrs

NoSQL Big Data Management, MongoDB Cassandra : Introduction, NoSQL Data Store, NoSQL Data Architecture Patterns, NoSQL to Manage Big Data, Shared-Nothing Architecture for Big Data Tasks,MongoDB, Databases, Cassandra Databases.

Textbook 1: Chapter 3: 3.1-3.7

Self-Learning: Case Study
RBT Levels: L2 – Understanding, L3 – Applying

Module-4: Map Reduce, Hive, Pig	8 Hrs

MapReduce, Hive and Pig: Introduction, MapReduce Map Tasks, Reduce Tasks and MapReduce Execution, Composing MapReduce for Calculations and Algorithms, Hive, HiveQL, Pig.

Textbook 1: Chapter 4: 4.1-4.6

Self-Learning: Case Study
RBT Levels: L2 – Understanding, L3 – Applying

Module-5: Machine Learning Algorithms for Big Data Analytics	8 Hrs

Machine Learning Algorithms for Big Data Analytics: Introduction, Estimating the relationships, Outliers, Variances, Probability Distributions, and Correlations, Regression analysis, Finding Similar Items, Similarity of Sets and Collaborative Filtering, Frequent Itemset and Association Rule Mining.

Text, Web Content, Link, and Social Network Analytics: Introduction, Text mining, Web Mining, Web Content and Web Usage Analytics, Page Rank, Structure of Web and analyzing a Web Graph, Social Network as Graphs and Social Network Analytics:

Textbook 1: Chapter 6: 6.1 to 6.5

Textbook 1: Chapter 9: 9.1 to 9.5

Self-Learning: Case Study

RBT Levels: L2 – Understanding, L3 – Applying

IV. COURSE OUTCOMES

Students will be able to

CO1	Understand fundamentals and applications of Big Data analytics.
CO2	Investigate Hadoop framework, Hadoop Distributed File system and essential Hadoop tools.
CO3	Illustrate the concepts of NoSQL using MongoDB and Cassandra for Big Data.
CO4	Demonstrate the MapReduce programming model to process the big data along with Hadoop tools.
CO5	Apply Machine Learning algorithms for real world big data, web contents and Social Networks to provide analytics with relevant visualization tools.

V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3
CO1	2	2			1										
CO2	2			2	1								1		
CO3	2	2	1		1								1		
CO4	2		2		2										
CO5	2	2		2									1		

VI. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023 Dated on 10-02-2025.

Continuous Internal Evaluation (CIE): Refer Annexure section 1

Semester End Examination (SEE): Refer Annexure section 1

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Big Data Analytics Introduction to Hadoop, Spark, and MachineLearning	Raj Kamal and Preeti Saxena	1st Edition,2018	McGraw Hill Education.
2	Hadoop 2 Quick-Start Guide: Learn the Essentials of Big Data Computing in the Apache Hadoop 2 Ecosystem	Douglas Eadline	1 stEdition,2016	Pearson Education,

VII(b): Reference Books:

1	Hadoop: The Definitive Guide	Tom White	4th Edition,2015	O'Reilly Media
2	Professional Hadoop Solutions	Boris Lublinsky, Kevin T Smith, Alexey Yakubovich	1 stEdition,2014	Wrox Press
3	Hadoop Operations: A Guide for Developers and Administrators	Eric Sammer	1 stEdition,2012	O'Reilly Media
4	Big Data Analytics: A Hands-On Approach	ArshdeepBahga, Vijay Madisetti	1st Edition,2018	VPT Publications

VII(c): Web links and Video Lectures (e-Resources):

1. https://www.youtube.com/watch?v=n_Krer6YWY4
2. https://onlinecourses.nptel.ac.in/noc20_cs92/preview
3. https://www.digimat.in/nptel/courses/video/106104189/L01.html
4. https://web2.qatar.cmu.edu/~mhhammou/15440-f19/recitations/Project4_Handout.pdf

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

- Case Study-1
- Programming Assignment
- Gate Based Aptitude Test
- MOOC Assignment for selected Module

Semester:	VI	**Course Type:**	ETC		
Course Title: Cryptography & Network Security					
Course Code:	**23CSE643**			**Credits:**	03
Teaching Hours/Week (L:T:P:O)			3:0:0:@	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3 Hours

I. Course Objectives:

1. Understand the basics of Cryptography concepts, Security and its principle
2. To analyse different Cryptographic Algorithms
3. To illustrate public and private key cryptography
4. To understand the key distribution scenario and certification
5. To understand approaches and techniques to build protection mechanism in order to secure computer networks
6. To get Practical exposure to the various Symmetric and asymmetric Cipher algorithm

II. Teaching-Learning Process (General Instructions):

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) needs not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.

2. Use of Video/Animation to explain functioning of various concepts. 3. Encourage collaborative (Group Learning) Learning in the class.

4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.

5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.

6. Introduce Topics in manifold representations.

7. Show the different ways to solve the same problem with different circuits/logic and encourage the students to come up with their own creative ways to solve them.

8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding

9. Use any of these methods: Chalk and board, Active Learning, Case Studies

III. COURSE CONTENT

Module-1: Classical Encryption Techniques	8 Hrs

Classical Encryption Techniques: Symmetric Cipher Model, Cryptography, Cryptanalysis and Brute-Force Attack, Substitution Techniques, Caesar Cipher, Monoalphabetic Cipher, Playfair Cipher, Hill Cipher, Polyalphabetic Cipher,. Block Ciphers and the Data Encryption Standard: Traditional block Cipher structure, Stream Ciphers and Block Ciphers, Motivation for the Feistel Cipher structure, the Feistel Cipher, **Limitations of Classical Cryptographic Techniques** The data encryption standard, DES encryption, DES decryption, A DES example, the avalanche effect, the strength of DES, Block cipher design principles

Textbook 1: Chapter 2: 2.1 – 2.3; Chapter 3: 3.1-3.5

Self-Learning: Advanced Encryption Standard (AES)

Self study: Modern Symmetric Algorithms (ChaCha20) Overview (brief comparison with DES)

Pre-requisites

Basics of Cyber security and Networks, Matrix multiplication and inversion – especially relevant for Hill Cipher.

RBT Levels:L1 – Remembering, L2 – Understanding, L3 – Applying

Module-2: Public-Key Cryptography and RSA	8 Hrs

Public-Key Cryptography and RSA: Principles of public-key cryptosystems. Public-key cryptosystems. Applications for public-key cryptosystems, requirements for public-key cryptosystems. public-key cryptanalysis. The RSA algorithm, description of the algorithm, computational aspects, the security of RSA. Other Public-Key Cryptosystems: Diffie-Hellman key exchange, The algorithm, key exchange protocols, man in the middle attack,

Textbook 1: Chapter 9; Chapter 10: 10.1

Self-Learning: Elliptic Curve Cryptography (ECC)

Pre-requisites

Basic knowledge of mathematics, Elliptic Curve Mathematics (Basic)

RBT Levels:L1 – Remembering, L2 – Understanding, L3 – Applying

Module-3: Key Management and Distribution	8 Hrs
Key Management and Distribution: Symmetric key distribution using Symmetric encryption, A key distribution scenario, Hierarchical key control, session key lifetime, a transparent key control scheme, Decentralized key control, controlling key usage, Symmetric key distribution using asymmetric encryption, simple secret key distribution, secret key distribution with confidentiality and authentication, **Textbook 1:** Chapter 14: 14.1 – 14.2	
Self-Learning: A hybrid scheme	
RBT Levels:L1 – Remembering, L2 – Understanding, L3 – Applying,	
Pre-requisites Computer Networks, Mathematics / Algorithms	
Module-4: Certificates, Public key infrastructure and User Authentication	8 Hrs
X-509 certificates. Certificates, X-509 version 3 Public key infrastructure. User Authentication: Remote user Authentication principles, Kerberos, Motivation, Kerberos version 4, Kerberos version 5, Remote user Authentication using Asymmetric encryption, Mutual Authentication. **Textbook 1:** Chapter 14: 14.4; Chapter 15: 15.1,15.3,15.4	
Self-Learning: one-way Authentication.	
Pre-requisites Network Security Concepts, , Operating System Basics	
RBT Levels: L1 – Remembering, L2 – Understanding, L3 – Applying	
Module-5: Electronic Mail Security	8 Hrs
Electronic Mail Security: Pretty good privacy, S/MIME, IP Security: IP Security overview, IP Security policy, Encapsulating Security payload, **Secure Email Gateways & Anti-Phishing Measures**., **DNS Security (DNSSEC, SPF, DKIM, DMARC)** for securing email authenticity. **Textbook 1:** Chapter 19: 19.1, 19.2; Chapter 20: 20.1 – 20.3.	
Self-Learning: IPv6 Security Considerations**.**	
Pre-requisites: Network Security Concepts, Cybersecurity Awareness, IPv6 Fundamentals	
RBT Levels: L1 – Remembering, L2 – Understanding, L3 – Applying	
IV. COURSE OUTCOMES	

Students will be able to	
CO1	To Understand Cryptography, Network Security theories, algorithms and systems
CO2	To Apply different Cryptography and Network Security operations on different applications
CO3	To Analyze different methods for authentication and access control
CO4	To Evaluate Public and Private key, Key management, distribution and certification
CO5	To Design necessary techniques to build protection mechanisms to secure computer networks

V. CO-PO-PSO MAPPING(mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3
CO1	2	1	1										1	1	1
CO2	2	1	1										1	1	1
CO3	2	1	1										1	1	1
CO4	2	1	1										1	1	1
CO5	2	1	1										1	1	1

VI. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023 Dated on 10-02-2025.

Continuous Internal Evaluation (CIE): Refer Annexure section 1

Semester End Examination (SEE): Refer Annexure section 1

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	"Cryptography and Network Security",	William stallings,	6th edition	Pearson Publication,

VII(b): Reference Books:

1	Cryptography and Network Security	BehrouzA.Foruzan	2007	Tata McGraw Hill
2	"Cryptography and Network Security"	V.K Pachghare,	2nd Edition.	PHI,

VII(c): Web links and Video Lectures (e-Resources):

- https://www.bugcrowd.com/glossary/symmetric-encryption-algorithms
- https://www.ibm.com/think/topics/symmetric-encryption
- https://www.wikihow.com/Create-Substitution-Ciphers

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

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

- Quizzes
- Assignments
  1. **Key Exchange Mechanisms in Real-World Applications (SSL/TLS Handshake)**.
  2. **Practical Implementations of Certificates (SSL/TLS, Digital Signatures)**.
  3. **Certificate Pinning & Certificate Transparency** (defenses against MITM attacks).

Semester:	VI	**Course Type:**	ETC		
Course Title: Full Stack Development					
Course Code:	**23CSE644**			**Credits:**	3
Teaching Hours/Week (L:T:P:O)			3:0:0:@	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3

I. Course Objectives:

This course will enable students to:

1. Explain the use of learning full stack web development.
2. Make use of rapid application development in the design of responsive web pages.
3. Illustrate Models, Views and Templates with their connectivity in Django for full stack web development.
4. Demonstrate the use of state management and admin interfaces automation in Django.
5. Design and implement Django apps containing dynamic pages with SQL databases.

II. Teaching-Learning Process (General Instructions):

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.

2. Use of Video/Animation to explain functioning of various concepts.

3. Encourage collaborative (Group Learning) Learning in the class.

4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.

5. Adopt Problem Based Learning (PBL), which fosters student's Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.

6. Topics will be introduced in a multiple representation.

III. COURSE CONTENT

Module-1: MVC based Web Designing	8Hrs

Web framework, MVC Design Pattern, Django Evolution, Views, Mapping URL to Views, Working of Django URL Confs and Loose Coupling, Errors in Django.

Hands on:

1. Develop a Django app that displays current date and time in server.
2. Develop a Django app that displays date and time four hours ahead and four hours before as an offset of current date and time in server

Textbook 1: Chapter 1 and Chapter 3

Self-Learning: Wild Card patterns in URLS.

RBT Levels:L1 – Remembering, L2 – Understanding, L3 – Applying

Module-2: Django Templates and Models	8Hrs

Template System Basics, Using Django Template System, Basic Template Tags and Filters, MVT Development Pattern, Template Loading, Template Inheritance, MVT Development Pattern. Configuring Databases, Defining and Implementing Models, Basic Data Access, Adding Model String Representations, Inserting/Updating data, Selecting and deleting objects,

Hands on:

1.Develop a simple Django app that displays an unordered list of fruits and ordered list of selected students for an event.

2. Develop a layout.html with a suitable header (containing navigation menu) and footer with copyright and developer information. Inherit this layout.html and create 3 additional pages: contact us, About Us and Home page of any website.

3. Develop a Django app that performs student registration to a course. It should also display list of students registered for any selected course. Create students and course as models with enrolment as ManyToMany field

Textbook 1: Chapter 4 and Chapter 5

Self-Learning: Schema Evolution

RBT Levels:L1 – Remembering, L2 – Understanding, L3 – Applying

Module-3: Django Admin Interfaces and Model Forms	8Hrs

Activating Admin Interfaces, Using Admin Interfaces, Customizing Admin Interfaces, Reasons to use Admin Interfaces. Form Processing, Creating Feedback forms, Form submissions, custom validation, creating Model Forms, URLConf Ticks.

Hands on:

1. For student and course models created for Module2, register admin interfaces, perform migrations and illustrate data entry through admin forms.

2. Develop a Model form for student that contains his topic chosen for project, languages used and duration with a model called project.

Textbook 1: Chapters 6, 7 and 8

Self-Learning: Other URLConfs.

RBT Levels:L1 – Remembering, L2 – Understanding, L3 – Applying

Module-4: Generic Views and Django State Persistence	8Hrs

Using Generic Views, Generic Views of Objects, Extending Generic Views of objects, Extending Generic Views.

MIME Types, Generating Non-HTML contents like CSV and PDF, Syndication Feed Framework.

Hands on:

1. For students enrolment developed in Module 2, create a generic class view which displays list of students and detailview that displays student details for any selected student in the list.

2. Develop example Django app that performs CSV and PDF generation for any models created in previous laboratory component.

Textbook 1: Chapters 9, 11 and 12

Self-Learning: Sitemap framework.

RBT Levels:L1 – Remembering, L2 – Understanding, L3 – Applying

Module-5: jQuery and AJAX Integration in Django	8Hrs

Ajax Solution, Java Script, XHTMLHttpRequest and Response, HTML, CSS, JSON, iFrames, Settings of Java Script in Django, jQuery and Basic AJAX,

Hands on:

1.Develop a registration page for student enrolment as done in Module 2 but without page refresh using AJAX.

2. Develop a search application in Django using AJAX that displays courses enrolled by a student being searched.

Textbook 2: Chapters 1, 2 and 7

Self-Learning: JQuery AJAX Facilities

RBT Levels:L1 – Remembering, L2 – Understanding, L3 – Applying

IV. COURSE OUTCOMES

CO1	Understand the working of MVT based full stack web development with Django.
CO2	Designing of Models and Forms for rapid development of web pages.
CO3	Analyze the role of Template Inheritance and Generic views for developing full stack web applications.
CO4	Apply the Django framework libraries to render nonHTML contents like CSV and PDF.
CO5	Perform jQuery based AJAX integration to Django Apps to build responsive full stack web applications.

V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3
CO1	2	2	2		2								2		
CO2	2	2	2		2								2		
CO3	2	2	2		2								2		
CO4	2	2	2		2								2		
CO5	2	2	2		2								2		

VI. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023 Dated on 10-02-2025.

Continuous Internal Evaluation (CIE): Refer Annexure section 1

Semester End Examination (SEE): Refer Annexure section 1

VII. Learning Resources

VII(a): Textbooks: (Insert or delete rows as per requirement)

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	The Definitive Guide to Django: Web	Adrian Holovaty, Jacob Kaplan Moss	Second Edition, 2009	Springer-Verlag Berlin and Heidelberg

	Development Done Right			GmbH & Co. KG Publishers
2	Django Java Script Integration: AJAX and jQuery	Jonathan Hayward	First Edition: 2011	Pack Publishing
VII(b): Reference Books:				
1	Django 3 Web Development Cookbook	Aidas Bendroraitis, Jake Kronika	Fourth Edition,2020	Packt Publishing
2	Django for Beginners: Build websites with Python and Django	William Vincent	First Edition:2018	Amazon Digital Services
3	Django3 by Example	Antonio Mele	3rd Edition,2020	Pack Publishers
4	Django Design Patterns and Best Practices	Arun Ravindran	2nd Edition,2020	Pack Publishers

VII(c): Web links and Video Lectures (e-Resources):

WebLinks:

1. MVT architecture with Django: https://freevideolectures.com/course/3700/django-tutorials
2. Using Python in Django: https://www.youtube.com/watch?v=2BqoLiMT3Ao
3. Model Forms with Django: https://www.youtube.com/watch?v=gMM1rtTwKxE
4. Real time Interactions in Django: https://www.youtube.com/watch?v=3gHmfoeZ45k
5. AJAX with Django for beginners: https://www.youtube.com/watch?v=3VaKNyjlxAU

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

1. Real world problem solving - applying the Django framework concepts and its integration with AJAX to develop any shopping website with admin and user dashboards.

Semester:	VI	**Course Type:**	AEC		
Course Title: Research Methodology & IPR					
Course Code:	**23RMAE61**		**Credits:**		03
Teaching Hours/Week (L:T:P:O)			3:0:0:@	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	03

I. Course Objectives:

- To Understand the knowledge on basics of research and its types.
- To Learn the concept of Literature Review, Technical Reading, Attributions and Citations.
- To learn Ethics in Engineering Research.
- To Discuss the concepts of Intellectual Property Rights in engineering.

II. Teaching-Learning Process :

- Chalk and talk method
- Power point presentation / keynotes
- Videos

III. COURSE CONTENT

III(a). Theory PART

Module-1: Introduction	08Hrs

Introduction: Meaning of Research, Objectives of Engineering Research, and Motivation in Engineering Research, Types of Engineering Research, Finding and Solving a Worthwhile Problem.

Ethics in Engineering Research, Ethics in Engineering Research Practice, Types of Research Misconduct, Ethical Issues Related to Authorship.

Textbook 1 : Chapter1 : sections: 1.1,1.2,1.3,1.4
Textbook 1 : Chapter5 : sections: 5.1,5.2,5.3

Self Learning : Case Studies

RBT Levels: L2

Module-2: Literature Review and Technical Reading	08Hrs

Literature Review and Technical Reading, New and Existing Knowledge, Analysis and Synthesis of Prior Art Bibliographic Databases, Web of Science, Google and Google Scholar, Effective Search: The Way Forward Introduction to Technical Reading Conceptualizing Research, Critical and Creative Reading, Taking Notes While Reading, Reading Mathematics and Algorithms, Reading a Datasheet.

Attributions and Citations: Giving Credit Wherever Due, Citations: Functions and Attributes, Impact of Title and Keywords on Citations, Knowledge Flow through Citation, Citing Datasets, Styles for Citations, Acknowledgments and Attributions, What Should Be Acknowledged, Acknowledgments in, Books Dissertations, Dedication or Acknowledgments.

Textbook1: Chapter2: sections: 2.1,2.2,2.3,2.4,2.5,2.6,2.7,2.8,2.9,2.10

Textbook1: Chapter3: sections: 3.1,3.2,3.3,3.4

Self Learning : Case Studies

RBT Levels: L2

Module-3: Introduction To Intellectual Property	08Hrs

Introduction To Intellectual Property: Role of IP in the Economic and Cultural Development of the Society, IP Governance, IP as a Global Indicator of Innovation, Origin of IP History of IP in India. Major Amendments in IP Laws and Acts in India.

Patents: Conditions for Obtaining a Patent Protection, To Patent or Not to Patent an Invention. Rights Associated with Patents. Enforcement of Patent Rights. Inventions Eligible for Patenting. Non-Patentable Matters. Patent Infringements. Avoid Public Disclosure of an Invention before Patenting.

Process of Patenting. Prior Art Search. Choice of Application to be Filed. Patent Application Forms. Jurisdiction of Filing Patent Application. Publication. Pre-grant Opposition. Examination. Grant of a Patent. Validity of Patent Protection. Post-grant Opposition.

Textbook2: Chapter1: sections:1.1,1.2,1.3,1.4,1.6
Textbook2: Chapter2: sections:2.1 (2.1.1 to 2.1.9)

Self Learning : Case Studies

RBT Levels: L2

Module-4: Copyrights and Related Rights	08 Hrs

Copyrights and Related Rights: Classes of Copyrights. Criteria for Copyright. Ownership of Copyright. Copyrights of the Author. Copyright Infringements. Copyright Infringement is a Criminal Offence. Copyright Infringement is a Cognizable Offence. Fair Use Doctrine. Copyrights and Internet. Non-Copyright Work. Copyright Registration. Judicial Powers of the Registrar of Copyrights. Fee Structure. Copyright Symbol. Validity of Copyright. Copyright Profile of India. Copyright and the word 'Publish'. Transfer of Copyrights to a Publisher. Copyrights and the Word 'Adaptation'. Copyrights and the Word 'Indian Work'. Joint Authorship. Copyright Society. Copyright Board. Copyright Enforcement Advisory Council (CEAC). International Copyright Agreements, Conventions and Treaties. Interesting Copyrights Cases.

Trademarks: Eligibility Criteria. Who Can Apply for a Trademark. Acts and Laws. Designation of

Trademark Symbols. Classification of Trademarks. Registration of a Trademark is Not Compulsory. Validity of Trademark. Types of Trademark Registered in India. Trademark Registry. Process for Trademarks Registration. Prior Art Search. Famous Case Law: Coca-Cola Company vs. Bisleri International Pvt. Ltd.

Textbook2: Chapter2: sections: 2.2 (except 2.2.6)
Textbook2: Chapter2: sections:2.3 (2.3.1 to 2.3.10, 2.3.14)

Learning : Case Studies

RBT Levels: L2

Module-5: Industrial Designs	08Hrs

Industrial Designs: Eligibility Criteria. Acts and Laws to Govern Industrial Designs. Design Rights. Enforcement of Design Rights. Non-Protectable Industrial Designs India. Protection Term. Procedure for Registration of Industrial Designs. Prior Art Search. Application for Registration. Duration of the Registration of a Design. Importance of Design Registration. Cancellation of the Registered Design. Application Forms. Classification of Industrial Designs. Designs Registration Trend in India. International Treaties. Famous Case Law: Apple Inc. vs. Samsung Electronics Co.

Geographical Indications: Acts, Laws and Rules Pertaining to GI. Ownership of GI. Rights Granted to the Holders. Registered GI in India. Identification of Registered GI. Classes of GI. Non-Registerable GI. Protection of GI. Collective or Certification Marks. Enforcement of GI Rights. Procedure for GI Registration Documents Required for GI Registration. GI Ecosystem in India.

Textbook2: Chapter2: Sections : 2.4, 2.5 (2.5.1 – 2.5.13)

Self Learning : Case Studies

RBT Levels:L2

IV. COURSE OUTCOMES

CO1	Understand the importance of engineering research and its ethics.
CO2	Interpret the fundaments of Literature Review and Technical Reading.
CO3	Outline the fundamentals of patens laws and drafting procedure.
CO4	Illustrate the copyright laws and basic principles of design rights.

V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3
CO1	2							2		1		2			
CO2	2							3		3		2			
CO3				2				3	2	2		3			

CO4								3	2	2		3			

VI. Assessment Details (CIE & SEE)

General Rules: Refer to – Academic regulations

Continuous Internal Evaluation (CIE):
Refer to Annexure, SL #5
Rubrics: Refer to Annexure, SL #5

Semester End Examination (SEE):
Refer to - Annexure, SL #5
Rubrics: Refer to - Annexure, SL #5

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Engineering Research Methodology	Dipankar Deb, Rajeeb Dey, Valentina E. Balas	ISSN 1868- 4394 ISSN 1868-4408 (electronic)	Intelligent Systems Reference Library, ISBN 978-981-13-2946-3 ISBN 978-981-13-2947-0 (eBook),
2	Intellectual Property A Primer for Academia	Prof. Rupinder Tewari Ms. Mamta Bhardwaj	2021	Publication Bureau, Panjab University Chandigarh-160014, India

VII(b): Reference Books:

1	Research Methods for Engineers	David V. Thiel	978-1-107-03488-4	Cambridge University Press
2	Intellectual Property Rights	N.K.Acharya	ISBN: 978-93-81849-30-9	Asia Law House 6th Edition

VII(c): Web links and Video Lectures (e-Resources):

https://www.youtube.com/watch?v=5fvpsqPWZac
http://kcl.digimat.in/nptel/courses/video/109106137/L68.html
http://kcl.digimat.in/nptel/courses/video/109106137/L72.html
http://acl.digimat.in/nptel/courses/video/109106137/L04.html

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

Quizzes, Assignments, Seminars

Semester:	VI	**Course Type:**	HSMC		
Course Title: Social Connect Responsibility					
Course Code:	**23SCRH08**	**Credits:**			01
Teaching Hours/Week (L: T: P: O)		1:0:0:0		**Total Hours:**	15
CIE Marks:	50			**Total Marks:**	50

I. Course Objectives:

- This course aims to familiarize students with the dynamics of society and importance of conscious participation in the formation of an ideal society
- The course enables students to critically analyze the social processes of globalization, modernization and social change, and its impact on the socio-cultural system.
- The course aims to develop socially responsible engineers by engaging them in real-world social issues, analyzing their impact, proposing innovative solutions, and effectively documenting their findings.
- The course enables students to create a responsible connection with the society.

II. Teaching-Learning Process (General Instructions):

This course is designed to provide students with hands-on learning experiences that foster social awareness, critical thinking, and problem-solving skills. Teachers play a crucial role in guiding students through real-world issues and encouraging innovative, ethical solutions.

1. Foster an Experiential Learning Approach
   - Encourage field visits, case studies, and real-world problem analysis rather than relying solely on theoretical lectures.
   - Use problem-based learning (PBL) where students actively engage with a community issue and work towards solving it.
2. Facilitate Active Student Engagement
   - Conduct brainstorming sessions to help students identify and understand societal problems.
   - Promote group discussions and debates on contemporary social issues.
3. Encourage Innovative & Feasible Solutions
   - Help students explore technology-driven solutions using engineering principles.
   - Promote a multi-disciplinary approach, integrating environmental, social, and economic aspects.
4. Promote Community Interaction & Implementation
   - Guide students to collaborate with NGOs, local communities, or government agencies.
   - Ensure that students test their solutions in real-world settings and collect feedback.
   - Emphasize the importance of ethical considerations in community engagement.
5. Train Students in Documentation & Reporting
   - Teach students how to prepare structured reports on their findings, solutions, and

implementation outcomes.

- Encourage presentations, digital storytelling, and video documentation for effective communication.
- Provide constructive feedback on student projects and ensure continuous improvement.

III. COURSE CONTENT

Module-1:Introduction to Social Connect Responsibility — 03Hrs

1. Identify the factors comprising the socio-cultural system and its impact on society
2. The concept of inter-relatedness of society and culture, socio-cultural dimensions, factors contributing to socio-cultural evolution.
3. Identifying problems in areas such as education, healthcare, environment, and infrastructure.

Module-2: Understanding Social Issues — 03 Hrs

1. Understanding societal challenges in local and global contexts.
2. Role of engineers in addressing these issues.
3. Conducting preliminary field surveys and interviews

Module-3: Analyzing the Social Problem — 03 Hrs

1. Understanding the economic, environmental, and societal impact of the problem
2. Ethical and moral considerations in problem-solving by Interaction with stakeholders (community members, NGOs, government bodies)
3. Root cause analysis using tools like SWOT, Fishbone Diagram, and Case Studies.

Module-4: Proposing Engineering Solutions — 03 Hrs

1. Application of engineering knowledge to develop feasible solutions.
2. Use of technology for social good (IoT, AI, Renewable Energy, Smart Systems, etc.).
3. Sustainable and cost-effective approaches.
4. Feasibility analysis and implementation strategies.

Module-5: Documentation & Reporting — 03 Hrs

1. Preparing a structured report with problem identification, analysis, proposed solutions, and implementation insights.
2. Creating presentations, videos, and other forms of project documentation.
3. Reflecting on personal learning and the social impact of the project.
4. Submission of a final report and group presentation.

IV.COURSE OUTCOMES

CO1	Students will be able to recognize and define real-world social issues, assessing their relevance and impact on communities.
CO2	Students will develop analytical skills to investigate the root causes of social problems and evaluate their economic, environmental, and ethical implications.
CO3	Students will apply engineering principles and innovative thinking to propose feasible, sustainable, and technology-driven solutions for identified social issues.
CO4	Students gain from stakeholder's interaction and develop presentation skills.

V.CO-PO-PSO MAPPING

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12
CO1			1			2	1	1	1			1
CO2			1			1	2	1	1			1

CO3			1			2	2	1	1			1
CO4			1			2	1	1	1			1

VI. Formative Assessment Details (CIE)

Continuous Internal Evaluation (CIE)& Rubrics: ***Refer to Annexure section -8***

VII. Learning Resources

VII (a). Reference Books :

1. C. N. Shankar Rao (2006) Sociology of Indian Society, 2nd, S. Chand publication
2. Nandan Nilekani, Imagining India: The Idea of a Renewed Nation, Penguin Books, 2009.
3. Gurcharan Das, India Unbound: From Independence to the Global Information Age, Anchor Books, 2002.
4. Raghuram G. Rajan, I Do What I Do, Harper Business, 2017.

VIII. Activity Based Learning

1. **Community Survey:** Students visit local communities (rural/urban) to identify real social issues (sanitation, education, healthcare, infrastructure)
2. **Collaboration with NGOs & CSR Units:** Partner with organizations working on social impact projects.
3. **Sustainability Planning:** Students draft plans for scaling up their solutions in a sustainable manner.
4. **Video Documentation:** Create short films showcasing their social project progress and community feedback.

Annexure

|| Jai Sri Gurudev ||
SRI ADICHUNCHANAGIRI SHIKSHANA TRUST (R)
SJB Institute of Technology
An Autonomous Institution under VTU
Approved by AICTE-New Delhi , Recognized by UGC with 2(f) &12(B)
Accredited by NAAC with 'A+' Grade
#67, BGS Health & Education City, Dr. Vishnuvardhan Road, Kengeri, Bengaluru – 560060.
☎ 080 - 28612445 / 6 080 - 2861 2651 www.sjbit.edu.in academicdean@sjbit.edu.in

ANNEXURE

CIE & SEE evaluation for Autonomous Scheme 2023 – UG

Note: Revised as per approvals of 4th Academic Council Meeting held on 05/02/2025

S. #	Course Type /Credits	Continuous Internal Evaluation (CIE)																					Semester End Examination (SEE)									Min. pass % (CIE + SEE)
		Total CIE marks	Min. Eligty.	I. Theory Component									II. Practical Component									Total CIE marks	Dur. In hrs.	Theory			Practical			Total SEE marks	
						A. Unit test			B. Formative Assessments			Tot. Theory marks (I)			C. Weekly Evaluation		D. Internal Test			E. Prj	Tot. marks (II)				Max. conducted marks	Max. considered marks	min. pass %	Max. conducted marks	Max. considered marks	min. pass %		
				Marks	Min. Eligty.	Nos.	Marks / Each	Tot.	Nos.	Marks / Each	Tot.		Marks	Min. Eligty.	Each week	Tot. marks	Nos.	Marks / Each	Total marks	Marks												
1	BSC/ESC/PCC/ETC /PEC/OEC (3 or 4 Credit courses)	50	40%	50	40%	2	50	50 (avg. of 2)	2	50	50 (avg. of 2)	50 (avg. of A & B)	--	--	--	--	--	--	--	--	--	50 (I)	03	100	50	35%	--	--	--	50	40%
2	IBSC/IESC/IPCC/ ETC (4 Credit courses)	50	40%	50	40%	2	50	50 (avg. of 2)	2	50	50 (avg. of 2)	50 (avg. of A & B)	50	40%	50	50 (Avg. of all)	1	50	50	50	50 (Avg. of C & [D or E])	50 (Avg. of I & II)	03	100	50	35%	--	--	--	50	40%
3	IESC - CAED (4 credit course)	50	40%	--	--	--	--		--	--		--	50	40%	50	50 (Avg. of all)	1	50	50	--	50 (Avg. of C & D)	50	03	--	--	--	100	50	35%	50	40%
4	PCCL (1 Credit courses)	50	40%	--	--	--	--		--	--		--	50	40%	50	50 (Avg. of all)	1	50	50	50	50 (Avg. of C & [D or E])	50 (II)	03	--	--	--	100	50	35%	50	40%
5	AEC- IDT, Skill Development courses (1 credit course)	50	40%	50	40%	1	50		1	50		50 (Avg. of 2)	--	--	--	--	--	--	--	--	--	50 (I)	02	50	50	35%	--	--	--	50	40%
6	HSMC- CIP, Env studies, SFH, UHV (1 credit course)	50	40%	50	40%	1	50		1	50		50 (Avg. of 2)	--	--	--	--	--	--	--	--	--	50 (I)	02	50	50	35%	--	--	--	50	40%
7	HSMC - English, Kannada (No credits)	50	40%	50	40%	1	50		1	50		50 (Avg. of 2)	--	--	--	--	--	--	--	--	--	50 (I)	--	--	--	--	--	--	--	--	40%
8	NCMC - Personality Development courses, PE, Yoga, NCC, NSS, IKS (No credits)	50	40%	50	40%	--	--		1	50		50	--	--	--	--	--	--	--	--	--	50 (I)	--	--	--	--	--	--	--	--	40%

 # Formative (Successive) Assessments: Assignments/quiz/ seminars/field survey and report presentation/course project/group discussions/etc. based on the faculty & dept. planning. **# Practical Conduction:** The conduction of each experiment/program per week should evaluate for 50 Marks and average of all shall be taken. **# In case of Integrated course,** minimum eligibility shall be attained as prescribed in both the theory and practical components.
 # Self Learning Courses (SLC) Courses, Internship, Mini project & Major Project: Rubrics & Methodology shall be defined seperately

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Academic Director 10/2/25

ANNEXURE

|| Jai Sri Gurudev ||
SRI ADICHUNCHANAGIRI SHIKSHANA TRUST (R)
SJB Institute of Technology
An Autonomous Institution under VTU
Approved by AICTE-New Delhi , Recognized by UGC with 2(f) &12(B)
Accredited by NAAC with 'A+' Grade
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CIE and SEE guidelines for Autonomous Scheme 2023 –ಆ೬

Note: Revised as per approvals of 4th Academic Council Meeting held on 05/02/2025

Continuous Internal Evaluation (CIE)	Semester End Examination (SEE)	Final Passing requirement
1. BSC/ESC/PCC/ ETC/PEC/OEC – Theory Course (03 & 04 Credit courses)		
The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.		
Continuous Internal Evaluation: The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). CIE will be conducted by the department and it will have only 01 component (I): **I. Theory component:** Theory Component will consist of A. Internal Assessment Test (IAT). B. Formative Assessments (FA). **A. Internal Assessment Test:** i) There are 02 tests each of 50 marks conducted during 8th week & 15th week, respectively. ii) The question paper will have four questions (max of 3 sub questions) from the notified syllabus. Each question is set for 25 marks. iii) The student must answer 2 full questions (one from 1st & 2nd questions and another from 3rd & 4th question).	**Semester-End Examination:** The minimum passing mark for SEE is 35% of the maximum marks (18 out of 50 marks). Duration of 03 hours and total marks of 100. i) The question paper will have ten questions. Each question is set for 20 marks. ii) 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. iii) The students have to answer 5 full questions, selecting one full question from each module. iv) Marks scored shall be proportionally reduced to 50 marks.	The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE and SEE taken together.

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iv) IAT QP shall be designed to attain the different levels of Bloom's taxonomy as per the outcomes defined for the course. **B. Formative assessments:** i) 02 formative assessments each of 50 marks shall be conducted by the course coordinator based on the dept. planning during random times. ii) One formative assessment shall be completed before 5th week and second shall be completed before 12th week. iii) The syllabus content for the formative assessment shall be defined by the course coordinator. iv) The formative assessments include Assignments/seminars/case study/field survey/ report presentation/course project/etc. v) The assignment QP or Quiz QP shall indicate marks of each question and the relevant COs & RBT levels. vi) The rubrics required for the other type of formal assessments shall be defined by the departments along with mapping of relevant COs & POs and get it approved from academic dean. **The final CIE marks will be 50:** CIE = Avg. {Avg. of two tests + Avg. of two FA} **The documents of all the assessments shall be maintained meticulously.**		
2. IBSC/IESC/IPCC– Integrated with Theory & Practical (04 credit courses), ETC (if offered as integrated course)		
The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.		
Continuous Internal Evaluation: The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). Minimum eligibility of 40% marks shall be attained separately in both the theory component and practical component. CIE will be conducted by the department and it will have 02 component: I. Theory Component. II. Practical Component. **I. Theory Component:** Theory component will consist of A. Internal Assessment Test (IAT). B. Formative assessments (FA).	The minimum passing mark for SEE is 35% of the maximum marks (18 out of 50 marks). **Semester-End Examination:** Only theory SEE for duration of 03 hours and total marks of 100. i) The question paper will have ten questions. Each question is set for 20 marks. ii) 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.	The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE and SEE taken together.

A. Internal Assessment Test: i) There are 02 tests each of 50 marks conducted during 8th week & 15th week, respectively. ii) The question paper will have four questions (max of 3 sub questions) from the notified syllabus. Each question is set for 25 marks. iii) It is suggested to include questions on laboratory content in the Internal Assessment test Question papers. iv) The student must answer 2 full questions (one from 1st & 2nd questions and another from 3rd & 4th question). v) IAT QP shall be designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course. **B. Formative assessments:** i) 02 formative assessments each of 50 marks shall be conducted by the course coordinator based on the dept. planning during random times. ii) One formative assessment shall be completed before 5th week and second shall be completed before 12th week. iii) The syllabus content for the formative assessment shall be defined by the course coordinator. iv) The formative assessments include Assignments/seminars/case study/field survey/ report presentation/course project/etc. v) The assignment QP or Quiz QP shall indicate marks of each question and the relevant COs & RBT levels. vi) The rubrics required for the other type of formal assessments shall be defined by the departments along with mapping of relevant COs & POs and get it approved from academic dean. **II. Practical Component:** **C.** Conduction of each experiment/program should be evaluated for 50 marks and average of all the experiments/programs shall be taken. (rubrics will be published by the concerned committee) **D.** One laboratory Internal Assessment test will be conducted during the 14th week for 50 marks. (rubrics will be published by the concerned committee) **E.** If the course project / mini project is involved in the laboratory component. **The evaluation shall be completed by 14th week of the semester.** The rubrics required for the evaluation of the project shall be defined by the departments along with mapping of relevant COs & POs and get it approved from academic dean.	iii) The laboratory content must be included in framing the theory question papers. iv) The students have to answer 5 full questions, selecting one full question from each module. v) Marks scored shall be proportionally reduced to 50 marks. **No Practical SEE for Integrated Course.** **Note:** CAED Course shall not be considered here. It shall be considered as in sl. No. 3 in the next row	

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Note:

i) If component 'E' is involved in the course, either component 'D' or 'E' along with component 'C' shall be considered for average of item II.

ii) Otherwise, components 'C' & 'D' shall be considered for average of item II.

The final CIE marks will be 50:

CIE= Avg. {**I** [Avg. of two tests + Avg. of two FA] + **II** [Avg. of (C & (D or E))]}

The documents of all the assessments shall be maintained meticulously.

Note: CAED Course shall not be considered here, it shall be considered as in sl. no. 3 in the next row.

3. IESC: CAED Course (4 credits)

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 40% of the maximum marks (20 marks out of 50).

i) CIE shall be conducted for max. marks of 100 and shall be scaled down to 50 marks

ii) CIE component should comprise of both Manual and computer drafting i.e. 50% manual and 50% computer drafting out of total 100 marks

iii) CIE component should comprise of Continuous evaluation of drawing work of students as and when the modules are covered based on below detailed weightage.

Module	Module Max. Marks	Evaluation Weightage in marks	
		Computer display and print out	Manual Sketching
Module 1	20	10	10
Module 2	20	10	10
Module 3	20	10	10
Module 4	20	10	10
Module 5	20	10	10
TOTAL	**100**	**50**	**50**

The minimum passing mark for SEE is 35% of the maximum marks (18 out of 50 marks).

Semester-End Examination:

SEE for duration of 03 hours and total marks of 100.

i) SEE shall be conducted and evaluated for maximum marks of 100 and shall be scaled down to 50 marks.

ii) Question paper shall be made available for each batch as per schedule.

iii) Evaluation shall be carried jointly by both the internal & external examiners.

iv) Scheme of Evaluation: To be defined by both the examiners jointly.

v) Maximum 3 questions shall be set as per the following pattern.

The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE and SEE taken together.

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iv) At least one Test covering all the modules is to be conducted for 100 marks during 14th week and the same is to be scaled down to **25 Marks.**

v) Assignments = **10 Marks from each module. (50 marks scaled down to 25 Marks)**

vi) The final CIE 50 marks = Test (25 marks) + Assignment (25 marks).

From Module	Marks Allotted
Module 01 (Choice between Lines or Planes)	30
Module 02 (Compulsory question)	40
Module 03 or Module 04 or Module 05	30
TOTAL	**100**

Q. No.	Manual Sketching	Computer display and print out	TOTAL MARKS
1	15	15	30
2	20	20	40
3	15	15	30
TOT.	**50**	**50**	**100**

4. PCCL: Laboratory course (01 credit course)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.

Continuous Internal Evaluation: The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50).

CIE will be conducted by the department and it will have only 01 component:

I. Theory Component. (Not required for Laboratory course)

II. Practical Component.

II. Practical Component:

C. Conduction of each experiment/program should be evaluated for 50 marks and average of all the experiments/program shall be taken (rubrics will be published by the concerned committee).

D. One laboratory Internal Assessment test will be conducted for 50 marks (rubrics will be published by the concerned committee).

E. If the course project / mini project is involved in the laboratory component. **The evaluation shall be completed by 14th week of the semester.** The rubrics required for the evaluation of the project shall be defined by the departments along with mapping of relevant COs & POs and get it approved from academic dean.

The minimum passing mark for SEE is 35% of the maximum marks (18 out of 50 marks).

Semester-End Examination:

Only laboratory SEE will be conducted jointly by the internal examiner and external examiner appointed by COE as per the scheduled timetable for duration of 03 hours.

i) The examination shall be conducted for 100 marks and shall be reduced to 50 marks proportionately.

ii) All laboratory experiments/programs are to be included for practical examination.

iii) Breakup of marks (Rubrics) 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

The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE and SEE taken together.

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Note: **i)** If component 'E' is involved in the course either component 'D' or 'E' along with component 'C' shall be considered for average of item II. **ii)** Otherwise, components 'C' & 'D' shall be considered for average of item II. **The final CIE marks will be 50** = Avg. of (C & [D or E]) **The documents of all the assessments shall be maintained meticulously.**	requirement evaluation rubrics shall be decided jointly by examiners. iv) Students can pick one question (experiment/program) from the questions lot prepared by the internal /external examiners jointly. v) Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners. vi) General rubrics suggested for SEE: writeup-20%, Conduction procedure and results-60%, Viva-voce 20% of maximum marks. vii) Change of experiment is allowed only once and shall be assessed only for 85% of the maximum marks.	

5. AEC: Ability Enhancement Courses (01 credit courses)

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 40% of the maximum marks (20 marks out of 50). **Continuous Internal Evaluation:** CIE will be conducted by the department and will have only 01 component: **I. Theory component.** Theory Component will consist of A. Internal Assessment Test (IAT). B. Formative Assessments (FA). **A. Internal Assessment Test:** i) 01 test of 50 marks conducted during 15th week. ii) The question paper will be of Multiple-Choice Questions (MCQ). iii) The student must answer all questions. iv) IAT QP shall be designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.	The minimum passing mark for SEE is 35% of the maximum marks (18 out of 50 marks). **Semester-End Examination:** Theory SEE will be conducted by COE as per the scheduled timetable for duration of 02 hours and total marks of 50. i) Multiple choice Question paper. ii) The students have to answer all questions.	The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE and SEE taken together.

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B. Formative assessments: i) 01 formative assessment of 50 marks shall be conducted by the Course coordinator based on the dept. planning during 12th week. ii) The formative assessments include Assignments/seminars/case study/field survey/ report presentation/course project/etc. iii) The assignment QP shall indicate marks of each question and the relevant COs & RBT levels. iv) The rubrics required for the other type of formal assessments shall be defined by the departments along with mapping of relevant COs & POs. **The final CIE marks will be 50:** CIE = Avg. of 02 events (01 IAT and 01 FA). **The documents of all the assessments shall be maintained meticulously.**		

6. HSMC: (01 credit course)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.

Continuous Internal Evaluation: The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). CIE will be conducted by the department and will have only 01 component: **I. Theory component.** Theory Component will consist of A. Internal Assessment Test (IAT). B. Formative Assessments (FA). **A. Internal Assessment Test:** i) 01 test of 50 marks conducted during 15th week. ii) The question paper will be of Multiple-Choice Questions (MCQ). iii) The student must answer all questions. iv) IAT QP shall be designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course **B. Formative assessments:** i) 01 formative assessment of 50 marks shall be conducted by the faculty based on the dept. planning during 12th week. ii) The formative assessments include Assignments/seminars/case study/field survey/ report presentation/course project/etc.	The minimum passing mark for SEE is 35% of the maximum marks (18 out of 50 marks). **Semester-End Examination:** Theory SEE will be conducted by COE as per the scheduled timetable for duration of 02 hours and total marks of 50. i) Multiple choice Question paper. ii) The students have to answer all questions	The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE and SEE taken together.

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iii) The assignment QP shall indicate marks of each question and the relevant COs & RBT levels. iv) The rubrics required for the other type of formal assessments shall be defined by the departments along with mapping of relevant COs & POs. **The final CIE marks will be 50:** CIE = Avg. of 02 events (01 IAT and 01 FA). **The documents of all the assessments shall be maintained meticulously.**		
7. HSMC: (0 credit courses)		
The weightage is only for Continuous Internal Evaluation (CIE).		
Continuous Internal Evaluation: The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). CIE will be conducted by the department and it will have only 01 component: **I. Theory component.** Theory Component will consist of A. Internal Assessment Test (IAT). B. Formative assessments (FA). **A. Internal Assessment Test:** i) 01 test of 50 marks conducted during 15th week. ii) The QP will be of Multiple-Choice Questions (MCQ). iii) The student must answer all questions. iv) IAT QP shall be designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course **B. Formative assessments:** i) 01 formative assessment of 50 marks shall be conducted by the faculty based on the dept. planning during 12th week. ii) The formative assessments include Assignments/seminars/case study/field survey/ report presentation/course project/etc. iii) The assignment QP shall indicate marks of each question and the relevant COs & RBT levels. iv) The rubrics required for the other type of formal assessments shall be defined by the departments along with mapping of relevant COs & POs. **The final CIE marks will be 50:** CIE = Avg. of 02 events (01 IAT and 01 FA). **The documents of all the assessments shall be maintained meticulously.**	No Semester End Examination.	The student is declared as a pass in the course if he/she secures a minimum of 40% (20 marks out of 50) in the CIE.

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8. NCMC: (0 credit course)		
The weightage is only for Continuous Internal Evaluation (CIE).		
Continuous Internal Evaluation: The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). CIE will be conducted by the department and it will have only 01 component: **I. Theory component.** Theory Component will consist of only 01 assessment A. Internal Assessment Test (not required for NCMC course). B. Formative Assessment (FA). **B. Formative assessments:** i) 01 formative assessment of 50 marks shall be conducted by the faculty based on the dept. planning during random times during 12th week. ii) The formative assessments include Quiz/Assignments/seminars/case study/field survey/ report presentation/course project/etc. iii) The assignment QP shall indicate marks of each question and the relevant COs & RBT levels. iv) The rubrics required for the other type of formal assessments shall be defined by the departments along with mapping of relevant COs & POs. **The final CIE marks will be 50.** **The documents of all the assessments shall be maintained meticulously.**	No Semester End Examination.	The student is declared as a pass in the course if he/she secures a minimum of 40% (20 marks out of 50) in the CIE.

Academic Dean
Dr. Babu N V

Principal
Dr. K V Mahendra Prashanth

Academic Director
Dr. Puttaraju

Academic Dean

Principal 10.2.2025

Academic Director

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Accredited by NAAC with A+

Recognized by UGC, New Delhi with 2(f) and 12(B)

Certified by ISO 9001 – 2015

ATAL Ranking:
Band Performer

Band of 151 to 300 in
Innovation Category

B.E.

Autonomous Scheme & Syllabus

Third Year

Department of Computer Science and Engineering

Department Vision:

To become a Centre of excellence producing "Creators of Innovative Technology" who can contribute positively to the ever changing industrial demands and societal needs.

Department Mission:

M1: To encourage participation of faculty and students in research activities for enhancing their subject knowledge and acquire information regarding current trends
M2: To provide exposure to students on latest tools and technologies in area of Computer Science and Engineering
M3: Preparation of our graduates for leadership in profession and in higher education by providing excellent teaching learning environment enabling them to serve the society