|| 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

DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

AUTONOMOUS SYLLABUS BOOK

2023 SCHEME

5TH AND 6TH SEMESTER

FUTURE-FOCUSED AND INDUSTRY-ALIGNED

SERVICE TO MANKIND IS SERVICE TO GOD

His Divine Soul Padmabhushana

Sri Sri Sri Dr. Balagangadharanath MahaSwamiji

Founder President, Sri Adichunchanagiri Shikshana Trust®

"Life needs mundane knowledge
Salvation needs spiritual knowledge
They together banish our pervading ignorance"

His Holiness Parama Pujya

Sri Sri Sri Dr. Nirmalanandanatha MahaSwamiji

President, Sri Adichunchanagiri Shikshana Trust ®

"Every youth wants to be unique - that is you!"

Revered Sri Sri Dr. Prakashanatha Swamiji

Managing Director, BGS & SJB Group of Institutions & Hospitals

"Knowledge gives discipline, from discipline comes worthiness, from worthiness one gets wealth, from wealth (one does) good deeds, from that (comes) joy."

Vision of Institute

To become a recognized technical education center with global perspective.

Mission of Institute

To provide learning opportunities that fosters student's ethical values, intelligent development in science and technology and social responsibility so that they become sensible and contributing members of the society.

Vision of Department

We envision our department as a catalyst for developing educated, engaged and employable individuals whose collective energy will be the driving force for prosperity and the quality of life in our diverse world

Mission of Department

Our mission is to provide quality technical education in the field of information technology and to strive for excellence in the education by developing and sharpening the intellectual and human potential for good industry and community.

Syllabus Book for Information Science and Engineering

Syllabus for 5th and 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 and intimated timely.

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	05/04/2025	First Release

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SRI ADICHUNCHANAGIRI SHIKSHANA TRUST (R)
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Date:05/04/2025

Department of Information Science & Engineering

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

SCHEME: 2023 **SEM: V** **Revision date: 05/04/2025**

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	23IST501	Theory of Computation	ISE	ISE	**3**	3	0	0		50	03	50	-	100
2	IPCC	5	23ISI502	Full Stack Development	ISE	ISE	**4**	3	0	2		50	03	50	-	100
3	IPCC	6	23ISI503	Database Management systems	ISE	ISE	**4**	3	0	2		50	03	50	-	100
4	PCCL	3	23ISL504	Data Visualization Lab	ISE	ISE	**1**	0	0	2		50	03	-	50	100
5	PEC	1	23ISP51y	Professional Elective Course - 1	ISE	ISE	**3**	3	0	0		50	03	50	-	100
6	ETC	3	23ISE53y	Emerging Technology Course - 3	ISE	ISE	**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	23xxAE5y	Ability Enhancement Course - 5	ISE	ISE	**1**	1	0	0		50	02	50	-	100
								(or)				(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 (23ISP51y)		Emerging Technology Course - 3 (23ISE53y)		Ability Enhancement Course - 5 (23ISAE5y)	
Course Code	**Course Title**	**Course Code**	**Course Title**	**Course Code**	**Course Title**
23ISP511	Advanced Java and J2EE	23ISE531	Ethical Hacking	23ISAE51	Generative AI
23ISP512	Software Engineering and Project Management	23ISE532	Predictive Analytics	23ISAE52	Data Security & Privacy
23ISP513	Introduction to Java Script	23ISE533	Digital Image Processing	23ISAE53	UI/UX
23ISP514	Information Retrieval	23ISE534	Block Chain Applications	23ISAE54	Capacity planning for IT

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

SCHEME: 2023 **SEM: VI** **Revision date: 05/04/2025**

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	23IST601	Machine Learning	ISE	ISE	3	3	0	0		50	03	50	-	100
2	IPCC	7	23ISI602	Software Testing and Automation	ISE	ISE	4	3	0	2		50	03	50	-	100
3	PCCL	4	23ISL603	Machine Learning Lab	ISE	ISE	1	0	0	2		50	03	-	50	100
4	PEC	2	23ISP62y	Professional Elective Course - 2	ISE	ISE	3	3	0	0		50	03	50	-	100
5	OEC	1	23ISO61y	Open Elective Course - 1	Any dept.	Any dept.	3	3	0	0		50	03	50	-	100
6	ETC	4	23ISE64y	Emerging Technology Course - 4	ISE	ISE	3	3	0	0	@	50	03	50	-	100
7	AEC	6	23RMAE61	Research Methodology & IPR	ISE	ISE	3	3	0	0	@	50	03	50	-	100
8	PRJ	1	23ISPRJ1	Major Project - Phase I	ISE	ISE	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 (23ISP62y)		Open Elective Course - 1 (23ISO61y)		Emerging Technology Course - 4 (23ISE64y)	
Course Code	Course Title	Course Code	Course Title	Course Code	Course Title
23ISP621	File Structures	23ISO611	Introduction to Network security	23ISE641	Distributed Systems
23ISP622	Cloud Computing and Applications	23ISO612	Introduction to cloud computing	23ISE642	Big Data Analytics
23ISP623	Compiler Design	23ISO613	Programming in Java	23ISE643	Deep Learning
23ISP624	Mobile Application Development	23ISO614	Introduction to Operating systems	23ISE644	Block Chain and Distributed Ledgers

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Department of Information Science & Engineering

RELEASE - 2 **Date: 16/12/2024**

SELF LEARNING COURSES(SLC)

Self-Learning course - 1 (NPTEL) (23ISS1yy)					Self-Learning course - 2 (NPTEL) (23ISS2yy)				
Sl.NO	Course Code	Course Ttile	NPTEL Course Code	Remarks	Sl.NO	Course Code	Course Ttile	NPTEL Course Code	Remarks
1	23ISS101	Computer Architecture	noc24-cs83	*	1	23ISS201	Patent Law for Engineers and Scientists	noc24-hs155	
2	23ISS102	Advanced Distributed Systems	noc24-cs99	*	2	23ISS202	E-Business	noc24-mg92	
3	23ISS103	Getting Started with Competitive Programming	noc24-cs103		3	23ISS203	Advanced R Programming for Data Analytics in Business	noc24-mg113	*
4	23ISS104	Social Network Analysis	noc24-cs90	*	4	23ISS204	Regression Analysis	noc24-ma82	*
5	23ISS105	Deep Learning	noc24-cs114	*	5	23ISS205	Foundations of R Software	noc24-ma95	*
6	23ISS106	C-Based VLSI Design	noc24-cs122	*	6	23ISS206	Probability Theory for Data Science	noc24-ma64	*
7	23ISS107	Computer Vision	noc24-cs124	*	7	23ISS207	Introduction To Probability Theory And Stochastic Processes	noc24-ma97	*
8	23ISS108	Algorithmic Game Theory	noc24-cs109	*	8	23ISS208	5G Wireless Standard Design	noc24-ee152	*
9	23ISS109	Responsible & Safe AI Systems	noc24-cs132	*	9	23ISS209	Medical Image Analysis	noc24-bt53	*
10	23ISS110	Text, Textuality and Digital Media	noc24-hs122	*	10	23ISS210	Pattern Recognition and Application	noc24-ee118	*
11	23ISS111	Advanced Computer Architecture	noc25-cs01		11	23ISS211	Circuit Complexity Theory	noc25-cs10	
12	23ISS112	Affective Computing	noc25-cs04		12	23ISS212	Digital Design with Verilog	noc25-cs25	
13	23ISS113	Patent Law for Engineers and Scientists	noc25-hs61	Repeated	13	23ISS213	Talent Acquisition and Management	noc25-mg64	
14	23ISS114	Foundations of Cyber Physical Systems	noc25-cs32		14	23ISS214	GPU Architectures and Programming	noc25-cs37	
15	23ISS115	Getting Started with Competitive Programming	noc25-cs36	Repeated	15	23ISS215	Introduction to Embedded System Design	noc25-cs41	

16	23ISS116	Human Computer Interaction	noc25-cs38		16	23ISS216	Introduction to Large Language Models (LLMs)	noc25-cs45	
17	23ISS117	Practical High-Performance Computing	noc25-cs55		17	23ISS217	Parallel Computer Architecture	noc25-cs54	
18	23ISS118	Quantum Algorithms and Cryptography	noc25-cs61		18	23ISS218	Reinforcement Learning	noc25-cs62	
19	23ISS119	Social Networks	noc25-cs65		19	23ISS219	Introduction to Probability Theory and Statistics	noc25-ma33	
20	23ISS120	Business Fundamentals for Entrepreneurs	noc25-mg13		20	23ISS220	E-Business	noc25-mg19	Repeated

*** Not offered by NPTEL for Jan- Apr 2025 semester**

Note: List of Self-learning courses will be published periodically inline with NPTEL/SWAYAM after rectification from BOS

Sl.No	BOS member	Affiliation	Signature
1	Dr. Abhilash C N	Dept of ISE , SJBIT	
2	Dr. Pavitra Bai S	Dept of ISE , SJBIT	
			BOS Chairman(Sign & Seal)

Head of the Department
Dept. of Information Science & Engineering
S.J.B. Institute of Technology
Kengeri, Bangalore-560 060.

Dr. BABU M V
Prof & Academic Dean
SJB Institute of Technology
BGS Health & Education City
Kengeri Bengaluru-560060

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

5th Semester

Semester:	V	**Course Type:**	PCC		
Course Title: Theory of Computation					
Course Code:	**23IST501**		**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
Pre-requisite: Set theory, elementary formal logic, proof construction, and recurrence relations.					

I. Course Objectives:

- Understand the fundamental concepts of Automata and Theory of Computation.
- Explore various classes of formal languages and their interrelationships.
- Study grammars and recognizers for different types of formal languages.
- Apply properties of automata theory to prove or disprove theorems.
- Evaluate the decidability and computational complexity of different problems.

II. Teaching-Learning Process (General Instructions):

The following are some of the strategies that teachers can employ to facilitate the achievement of various course outcomes:

1. **Diverse Teaching Methods**: Instead of relying solely on traditional lecture methods, can explore alternative and effective teaching approaches. These might include interactive discussions, hands-on activities, or multimedia presentations.
2. **Visual Aids**: Utilize videos and animations to elucidate complex concepts. Visual representations enhance understanding and engagement among students.
3. **Collaborative Learning**: Encourage group learning within the classroom. Collaborative activities foster teamwork, communication, and a deeper grasp of subject matter.
4. **Higher Order Thinking (HOT) Questions**: Pose at least three thought-provoking questions during class. These questions stimulate critical thinking and encourage students to analyse and evaluate information.
5. **Problem-Based Learning (PBL):** Implement PBL, which nurtures analytical skills. PBL goes beyond rote memorization by challenging students to design solutions, evaluate evidence, and think critically.
6. **Multiple Representations**: Introduce topics using various representations. Visuals, diagrams, and real-world examples cater to diverse learning styles.
7. **Creative Problem Solving**: Present different approaches to solving the same problem. Encourage students to think outside the box and devise their own innovative solutions.
8. **Real-World Application**: Discuss how each concept relates to practical scenarios. Connecting theoretical knowledge to real-world contexts enhances students' comprehension and retention.

□ Chalk & Talk □ Stud. Assignment □ Web Resources □ LCD/Smart Boards □ Stud. Seminars

III. Course Content

Module-1: Introduction to Finite Automata	8 Hrs
Introduction to Finite Automata, Structural Representations, Automata and Complexity. The Central Concepts of Automata Theory. Deterministic Finite Automata, Nondeterministic Finite Automata, AnApplication: Text Search, Finite Automata with Epsilon-Transitions. **TEXTBOOK 1**: **Sections 1.1, 1.5, 2.2,2.3,2.4,2.5**	
RBT Levels: L1, L2, L3	
Module-2: Regular Expressions and Languages	8 Hrs
Regular Expressions, Finite Automata and Regular Expressions, Proving Languages not to be Regular.Closure Properties of Regular Languages, Equivalence and Minimization of Automata, Applications ofRegular Expressions **TEXTBOOK 1: Sections 3.1, 3.2, 3.3, 4.1, 4.2, 4.4**	
RBT Levels: L1,L2,L3	
Module-3:Context Free Grammar and Languages	8 Hrs
Context-Free Grammars, Parse Trees, Ambiguity in Grammars and Languages, Ambiguity inGrammars and Languages, Definition of the Pushdown Automaton, The Languages of a PDA,Equivalence of PDA's and CFG's, Deterministic Pushdown Automata. **TEXTBOOK 1**: **Sections 5.1, 5.2, 5.4, 6.1,6.2,6.3.1,6.4**	
RBT Levels: L1,L2,L3	
Module-4:Normal Forms for Context-Free Grammars	8 Hrs
Normal Forms for Context-Free Grammars, The Pumping Lemma for Context-Free Languages, Closure Properties of Context-Free Languages. **TEXTBOOK 1: Sections 7.1, 7.2, 7.3**	
RBT Levels: L1,L2,L3	
Module-5: Introduction to Turing Machines	8 Hrs
Introduction to Turing Machines: Problems That Computers Cannot Solve, The Turing Machine,Programming Techniques for Turing Machines, Extensions to the Basic Turing Machine, Undecidability: ALanguage That Is Not Recursively Enumerable. **TEXTBOOK 1: Sections 8.1,8.2**, **8.3,8.4, 9.1, 9.2**	
RBT Levels: L1,L2,L3	

IV. Course Outcomes

CO1	Design Deterministic Finite Automata (DFAs), Non-deterministic Finite Automata (NFAs), Epsilon-NFAs, and apply conversion techniques between these models.
CO2	Prove the properties of regular languages using regular expressions
CO3	Construct Context-Free Grammars (CFGs) and Pushdown Automata (PDAs) for representing formal languages.
CO4	Design Turing machines to solve computational problems
CO5	Explain the concepts of decidability and undecidability in computational theory.

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

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

VI.Assessment Details (CIE & SEE)				
General Rules: Refer Annexure-1 section 1				
Continuous Internal Evaluation (CIE): Refer Annexure-1section 1				
Semester End Examination (SEE): Refer Annexure-1 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	Introduction to Automata Theory, Languages and Computation	John E Hopcroft, Rajeev Motwani, Jeffrey D. Ullman	Second Edition	Pearson.
VII(b): Reference Books:				
1	Automata, Computability and complexity	Elain Rich,	1st Edition, 2018.	Pearson Education,
2	Theory of Computer Science	K.L.P Mishra, N Chandrashekaran	3rd Edition, 2012.	PHI,
3	An introduction to Formal Languages and Automata	Peter Linz	3rd Edition, 1998	NarosaPublishers,
4	Introduction to the Theory of Computation	Michael Sipser	3rd edition, 2013	Cengage learning
5	Introduction to Languages and The Theory of Computation	John C Martin	3rd Edition, 2013.	TataMcGraw –Hill Publishing Company Limited
VII(c): Web links and Video Lectures (e-Resources):				
●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:				
Assignments, Quizzes and Seminar, Presentation, Project based learning				

Semester:	V	**CourseType:**	IPCC		
Course Title: Full Stack Development					
Course Code:	**23ISI502**		**Credits:**		4
Teaching Hours/Week (L: T:P:O)			3:0:2:0	**TotalHours:**	40 + 10 to 12 Lab Slots
CIEMarks:	50	**SEEMarks:**	50	**TotalMarks:**	100
SEEType:	Theory			**ExamHours:**	3

Pre-requisite: Studentsshould have a fundamental understanding of JavaScript- including variables, data types, functions, objects, arrays, loops, and conditional statements.

I. Course Objectives

Students Will be able to:

- To understand the essential JavaScript concepts for web development.
- To style Web applications using bootstraps.
- To utilize React JS to build front end User Interface.
- To understand the usage of APIs to create web applications using Express JS.
- To store and model data in a no sql database

II.Teaching-Learning Process (General Instructions)

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

- Classicalteachingmethods-chalkandtalk
- Demonstration using Visual Studio Code
- PPT/Presentation for Architecture and Design Patterns
- Live coding of all concepts with simple examples
- Adopt problem-based learning

III(a). Course content

Module-1	8 Hours

Basic JavaScript Instructions: Statements, Comments, Variables, Data Types, Arrays, Strings, Functions, Methods & Objects, Decisions & Loops.

Textbook1: Chapter:2,3,4

RBTLevels: L1, L2

Module-2	8 Hours
Document Object Model: DOM Manipulation, Selecting Elements, Working with DOM Nodes, Updating Element Content & Attributes, **Events**: Different Types of Events, How to Bind an Event to an Element, Event Delegation, Event Listeners.	
Textbook 1: Chapter:5,6	
RBTLevels: L1, L2, L3	
Module-3	8 Hours
Introduction to MERN: MERN components, Server less Hello world. **React Components**: Issue Tracker, React Classes, Composing Components, Passing Data Using Properties, Passing Data Using Children, Dynamic Composition.	
Textbook2: Chapter:1,2and3	
RBT Levels: L1, L2, L3	
Module-4	8 Hours
React State: Initial State, Async State Initialization, Updating State, Lifting State Up, Event Handling, Stateless Components, Designing Components, State vs. Props, Component Hierarchy, Communication, Stateless Components. **Express**: REST API, GraphQL, Field Specification, Graph Based, Single Endpoint, Strongly Typed, Introspection, Libraries, The About API GraphQL Schema File, The List API, List API Integration, Custom Scalar types.	
Textbook2: Chapter:4,5	
RBT Levels: L1, L2, L3	
Module-5	8 Hours
MongoDB: Basics, Documents, Collections, Databases, Query Language, Installation, The Mongo Shell, MongoDB CRUD Operations, Create, Read, Projection, Update, Delete, Aggregate, MongoDB Node.js Driver, Schema Initialization, reading from MongoDB, Writing to MongoDB. **Modularization:** Modularizationand Webpack, Back-End Modules Front-End Modules and Webpack Transform and Bundle, Libraries Bundle, Hot Module Replacement.	
Textbook2: Chapter:6,8	
RBT Levels: L1, L2, L3	

III(b). Practical Part

Sl. No.	Experiments/Programs using Java
	Part A
1.	Write a JavaScript that Logs "Hello, World!" to the console. Create a script that calculates the sum of two numbers and displays the result in an alert box.
2.	Create an array of 5 cities and perform the following operations: Log the total number of cities. Add a new city at the end. Remove the first city. Find and log the index of a specific city.
3.	Read a string from the user, Find its length. Extract the word "JavaScript" using substring () or slice (). Replace one word with another word and log the new string. Write a function is Palindrome(str) that checks if a given string is a palindrome (reads the same backward).
4.	Create a button in your HTML with the text "Click Me". Add an event listener to log "Button clicked!" to the console when the button is clicked. Select an image and add a mouseover event listener to change its border color. Add an event listener to the

	document that logs the key pressed by the user
5.	Create an object student with properties: name (string), grade (number), subjects (array), displayInfo() (method to log the student's details) Write a script to dynamically add a passed property to the student object, with a value of true or false based on their grade. Create a loop to log all keys and values of the student object.
6.	Build a React application to track issues. Display a list of issues (use static data). Each issue should have a title, description, and status (e.g., Open/Closed). Render the list using a functional component.
7.	Create a component Counter with A state variable count initialized to 0. Create Buttons to increment and decrement the count. Simulate fetching initial data for the Counter component using useEffect (functional component) or componentDidMount (class component). Extend the Counter component to Double the count value when a button is clicked. Reset the count to 0 using another button.
8.	Install Express (npm install express). Set up a basic server that responds with "Hello, Express!" at the root endpoint (GET /). Create a REST API. Implement endpoints for a Product resource: GET : Returns a list of products. POST : Adds a new product. GET /:id: Returns details of a specific product. PUT /:id: Updates an existing product. DELETE /:id: Deletes a product. Add middleware to log requests to the console. Use express.json() to parse incoming JSON payloads.
PART B	
1.	Mini Project Instruction: Build Web applications using MERN stack. Students (group of 4) can choose any real-world problem from domains such as finance, marketing, medical, or enterprise projects

IV. Course Outcomes

CO1	Elucidate JavaScript to build dynamic and interactive Web projects.
CO2	Implement user interface components for JavaScript-based Web using React.JS
CO3	Apply Express/Node to build web applications on the server side.
CO4	Develop data models in an open-sourceNoSQL database.
CO5	Demonstrate modularization and packing of the front-end modules.

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

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

VI. Assessment Details (CIE & SEE)

General Rules: Refer Annexure 1-Section2

Continuous Internal Evaluation (CIE): Refer Annexure 1-Section2

SemesterEnd Examination (SEE): Refer Annexure1- Section2

VII. Learning Resources

VII(a): Textbooks

Sl. No.	Title of the Book	Name of the author	Name of the publisher	Edition and Year
1	JavaScript & jQuery: Interactive Front-End Web Development	Jon Duckett	Wiley	2014
2	Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node	Vasan Subramanian	Apress	2019

VII(b): Reference

1	Django Design Patterns and Best Practices	Arun Ravindran	Pack Publishers	2nd Edition 2020

VII(c): Weblinks andVideoLectures(e-Resources)

1. https://github.com/vasansr/pro-mern-stack
2. https://nptel.ac.in/courses/106106156
3. https://archive.nptel.ac.in/courses/106/105/106105084/

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

Assignments, Quizzes, Seminar and Mini Project

Semester:	**V**	**Course Type:**	IPCC		
Course Title: Database Management Systems					
Course Code:	**23ISI503**		**Credits:**		4
Teaching Hours/Week (L:T:P:O)			3:0:2:0	**Total Hours:**	40 + 10 to 12 Lab Slots
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3

Pre-requisites: Fundamentals of Computers.

I. Course Objectives

Students Will be able to:

- To Provide a strong foundation in database concepts, technology, and practice.
- To Practice SQL programming through a variety of database problems.
- To Understand the relational database design principles.
- To Demonstrate the use of concurrency and transactions in database.
- Design and build database applications for real world problems.
- To become familiar with database storage structures and access techniques.

I. Teaching-Learning Process (General Instructions)

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

- Lecturer method (L) needs not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
- Use of Video/Animation to explain functioning of various concepts.
- Encourage collaborative (Group Learning) Learning in the class.
- Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
- Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develops design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
- Introduce Topics in manifold representations.
- 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.
- Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
- Use any of these methods: Chalk and board, Active Learning, Case Studies.

III(a). Course Content	
Module-1: Introduction to Databases and Architecture	**8 Hours**
Introduction to Databases: Introduction, Characteristics of database approach, Actors on the Scene, Workers behind the Scenes, Advantages of using the DBMS approach, History of database applications. **Database System Concepts and Architecture**: Data Models, Schemas, and Instances. Three schema architecture and data independence, database languages and interfaces, The Database System environment.	
Textbook 1: Chapter 1: Sections: 1.1 – 1.8, Chapter 2: Sections: 2.1 - 2.4	
Pre-requisites (Self Learning): Understanding the basic concepts of Data Collection and Aggregation.	
RBT Levels:L1, L2, L3	
Module-2: Relational Data Models and Database Design	**8 Hours**
Conceptual Data Modeling using Entities and Relationships: Entity types, Entity sets, Attributes and Keys, Relationship Types, Relationship Sets, Roles and Structural Constraints, Weak Entity Types, ER Diagrams Naming Conventionsand Design Issues. **The Relational Data Model andRelational Database Constraints**: Relational Model Concepts, Relational Model Constraints and relational database schemas, Update operations, transactions and dealing with constraint violations. **Relational DatabaseDesign by ER-to-Relational Mapping**: Relational Database Design using ER-to-Relational mapping.	
Textbook 1: Chapter 3: Sections: 3.3 – 3.5,3.7, Chapter 5: Sections: 5.1 – 5.3, Chapter 9: Sections: 9.1	
RBT Levels: L1, L2, L3	
Module-3: SQL and Relational Algebra	**8 Hours**
SQL: SQL data definition and data types, Specifying Constraints in SQL, Basic Retrieval Queries in SQL, INSERT, DELETE, and UPDATE statements in SQL, Additional features of SQL. **Relational Algebra**: Unary Relational operations, Relational Algebra Operations from Set Theory, Binary Relational Operations: JOIN and DIVISION, Additional relational operations (aggregate, grouping, etc.), Examples of Queries in relational algebra.	
Textbook 1: Chapter 6: Sections: 6.1 – 6.5, Chapter 8: Sections: 8.1 – 8.5	
RBT Levels:L1, L2, L3	
Module-4: Advanced SQL and Normalization	**8 Hours**
Advanced SQL Queries: More complex SQL retrieval queries, Specifying constraints as assertions and action triggers, Views in SQL. **Basics of Functional Dependencies and Normalization for Relational Databases:** 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 7 : Sections: 7.1 – 7.3, Chapter 14 : Sections: 14.1 – 14.7	
RBT Levels:L1, L2, L3	
Module-5: Transaction Processing and Concurrency Control in Databases	**8 Hours**
Introduction to Transaction ProcessingConcepts and Theory: Introduction to Transaction Processing, Transaction and System concepts, Desirable properties of Transactions,	

characterizingschedules based on Recoverability, characterizing schedules based on Serializability. **Concurrency Control in Databases:** Two-phase locking techniques for Concurrency control, Concurrency control based on Timestamp ordering, Mult version Concurrency control techniques.	
Textbook 1: Chapter 20 : Sections: 20.1 – 20.5, Chapter 21 : Sections: 21.1 – 21.3	
RBT Levels:L1, L2, L3	
III(b). Practical Part	
Sl. No.	**Experiments**
1.	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 any three records in the employee table containing attributes EMPNO, ENAME JOB, MANAGER_NO, SAL, COMMISSION and use rollback. Check the result. 3. Add a primary key constraint and not null constraint to the employee table. 4. Insert null values into the employee table and verify the result.
2.	Create a table called Employee that contains attributes EMPNO, ENAME, JOB, MGR, SAL & execute the following. 1. Add a column commission with domain to the Employee table. 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.
3.	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 employee table 3. Find the Maximum age from employee table. 4. Find the Minimum age from the employee table. 5. Find salaries of employees in an Ascending Order. 6. Find group salaries of employees.
4.	Create a row level trigger for the customers table that would fire for INSERT or UPDATE or DELETE operations performed on the CUSTOMERS table. This trigger will display the salary difference between the old & new Salary. **CUSTOMERS (ID, NAME, AGE,ADDRESS, SALARY).**
5.	Create cursor for the Employee table & extract the values from the table. Declare the variables, Open the cursor & extract the values from the cursor. Close the cursor. **Employee (E_id, E_name, Age, Salary)**
6.	Write a PL/SQL block of code using parameterized Cursor, that will merge the data available in the newly created table N_RollCall with the data available in the table O_RollCall. If the data in the first table already exists in the second table then that data should be skipped.
7.	Aim: Demonstrating creation of tables, applying the view concepts on the tables. Consider the following schema for a Library Database: **BOOK (Book_id, Title, Publisher_Name, Pub_Year)** **BOOK_AUTHORS (Book_id, Author_Name)**

	PUBLISHER (Name, Address, Phone) **BOOK_COPIES (Book_id, Programme_id, No-of_Copies)** **BOOK_LENDING (Book_id, Programme_id, Card_No, Date_Out, Due_Date)** **LIBRARY_PROGRAMME (Programme_id, Programme_Name, Address)** Write SQL queries to 1. Retrieve details of all books in the library – id, title, name of publisher, authors, number of copies in each Programme, etc. 2. Get the particulars of borrowers who have borrowed more than 3 books, but from Jan 2017 to Jun 2017. 3. Delete a book from the BOOK table. Update the contents of other tables to reflect this data manipulation operation. 4. Partition the BOOK table based on year of publication. Demonstrate its work with a simple query. 5. Create a view of all books and the number of copies that are currently available in the library.

Instructions for conduction of practical part:

- **LAB Activities:** Conduct laboratory exercises, prepare lab reports, observations and analyze results, perform lab tests and work on design and implementation tasks.
- **Experiential Learning**: Students will be evaluated based on their creativity and practical problem-solving skills. This includes program-specific requirements and video-based seminars, presentations, or demonstrations.

IV. Course Outcomes

CO1	Describe the basic elements of a relational database management system.
CO2	Design entity relationship for the given scenario.
CO3	Apply various Structured Query Language (SQL) statements for database manipulation.
CO4	Analyze various normalization forms for the given application.
CO5	Develop database applications for the given real-world problem.

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
CO1	3	2	1									2		
CO2	1	3	2									1		
CO3	2	1	3	1	3							1	2	
CO4	1	2	2	1								2	2	
CO5	3	2	1	2	2	1		2	3	2	1	2	2	3

VI. Assessment Details (CIE & SEE)

General Rules: Refer Annexure 1- Section 2

Continuous Internal Evaluation (CIE): Refer Annexure 1- Section 2

Semester End Examination (SEE): Refer Annexure 1- Section 2

VII. Learning Resources				
VII(a): Textbooks:				
Sl. No.	**Title of the Book**	**Name of the author**	**Name of the publisher**	**Edition and Year**
1	Fundamentals of Database Systems	Ramez Elmasri and Shamkant B. Navathe	Pearson	7th Edition 2017
VII(b): Reference Books:				
1	Database management systems	Ramakrishnan and Gehrke	McGraw Hill	3rd Edition, 2014
VII(c): Web links and Video Lectures (e-Resources)				
1. https://www.tutorialspoint.com/sql/index.htm				
VIII: Activity Based Learning				
1. Project Based Learning				

Semester:	**V**	**Course Type:**	PCCL		
Course Title: Data Visualization Lab					
Course Code:	**23ISL504**		**Credits:**		1
Teaching Hours/Week (L: T:P: O)			0:0:2:0	**Total Hours:**	10 to 12 Lab Slots
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	**Practical**			**Exam Hours:**	3

Pre-Prerequisite: Basic understanding of Programming concepts and skills in Python.

I. Course Objectives:

- Demonstrate the use of IDLE or PyCharm IDE to create Python applications
- Use the Python programming language to develop programs for solving real-world problems.
- Implement Matplotlib for creating various types of plots.
- Demonstrate proficiency in working with Seaborn and Bokeh.
- Work with Plotly for 3D plots, time series analysis, and maps.

II. Teaching-Learning Process (General Instructions)

- List of problems for which students should develop and execute programs in the laboratory using Python.
- Encourage collaborative (Group Learning) Learning in the Lab.
- Show the different ways to solve the same problem with different logic and encourage the students to come up with their own creative ways to solve them.

III. Practical Part

Sl. No.	Experiments
1.	a) Write a Python program to find the highest average of two out of three test scores entered by the user. b) Develop a Python program to check if a given number is a palindrome and count the occurrences of each digit.
2.	a) Define a function F where Fn = Fn-1 + Fn-2. Write a Python program that accepts a value for N (N > 0) and passes it to the function. Display an error message if the input value is invalid. b) Develop a Python program to convert binary to decimal and octal to hexadecimal using functions.

3.	a) Write a Python program that accepts a sentence and counts the number of words, digits, uppercase letters, and lowercase letters. b) Write a Python program to find the string similarity between the two given strings.
4.	a) Write a Python program to demonstrate how to draw a bar plot using Matplotlib. b) Write a Python program to demonstrate how to draw a scatter plot using Matplotlib.
5.	a) Write a Python program to demonstrate how to draw a histogram using Matplotlib. b) Write a Python program to demonstrate how to draw a pie chart using Matplotlib.
6.	a) Write a Python program to illustrate linear plotting using Matplotlib. b) Write a Python program to illustrate linear plotting with line formatting using Matplotlib.
7.	Write a Python program that demonstrates the use of customizing Seaborn plots with aesthetic functions.
8.	a) Write a Python program to explain how to work with Bokeh line graphs using annotations and legends. b) Write a Python program to plot different types of plots using Bokeh.
9.	Write a Python program to create 3D plots using the Plotly library.
10	a) Write a Python program to draw Time Series using Plotly Libraries. b) Write a Python program for creating Maps using Plotly Libraries.

IV. Course Outcomes

CO1	Demonstrate basic Python functions and implement control structures to solve problems.
CO2	Analyze and process datasets using appropriate Python techniques and libraries.
CO3	Develop basic data visualizations using Python libraries like Matplotlib or Seaborn.
CO4	Construct advanced and customized data visualizations using advanced plotting techniques in Python.

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**
CO1	2		1		2								1	
CO2	2	2			2								1	
CO3	2		3		2								1	
CO4	2	2	2		2								1	

VI. Assessment Details (CIE & SEE)
General Rules: Refer Annexure 1 - Section 4
Continuous Internal Evaluation (CIE): Refer Annexure 1 - Section 4
Semester End Examination (SEE): Refer Annexure 1 -Section 4
VII. Learning Resources
VII(a): Web links and Video Lectures (e-Resources)
1. https://www.youtube.com/watch?v=_uQrJ0TkZlc
VIII: Activity Based Learning
For the above experiments, the following pedagogical approaches can be considered: Problem-based learning, Active learning, MOOCs and Chalk & Talk.

Professional Elective Course-1

Department of Information Science and Engineering

Semester:	**V**	**Course Type:**	PEC		
Course Title: Advanced Java and J2EE					
Course Code:	**23ISP511**		**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

Pre-requisites: Basic understanding of object-oriented concepts and core java concepts.

I. Course Objectives:

- Understanding the fundamental concepts of Enumerations and Annotations.
- Apply the concepts of Generic classes in Java programs.
- Demonstrate the fundamental concepts of String operations.
- Design and develop web applications using Java servlets and JSP.
- Apply database interaction through Java database Connectivity.

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 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 program
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

Module-1:	**8 Hrs**

Enumerations, Autoboxing and Annotations:

Enumerations, Enumeration fundamentals, the values() and valueOf() methods, Java enumerations are class types, enumerations inherit Enum, example, type wrappers, Autoboxing, Autoboxing methods, Autoboxing/Unboxing occurs in Expressions, Autoboxing/Unboxing, Boolean and character values, Autoboxing/Unboxing helps prevent errors, A word of warning.

Annotations, Annotation basics, specifying retention policy, obtaining annotations at run time by

use of reflection, Annotated element interface, using default values, Marker Annotations, Single member annotations, Built in annotations

Textbook:1Chapter:12

RBT Levels:L1,L2,L3

Module-2:	**8 Hrs**

Generics: What are Generics, A Simple Generics Example, A Generic Class with Two Type Parameters, The General Form of a Generic Class, Bounded Types, Using Wildcard Arguments, Bounded Wildcards, Creating a Generic Method, Generic Interfaces, Raw types and Legacy code, Generic Class Hierarchies, Erasure, Ambiguity errors, Some Generic Restrictions.

Textbook:1 Chapter:14

RBT Levels: L1,L2,L3

Module-3:	**8 Hrs**

String Handling: The String Constructors, 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, String Buffer, String Builder

Textbook:1 Chapter:16

RBT Levels: L1,L2,L3

Module-4:	**8 Hrs**

Introducing Servlets: Background, The life cycle of a servlet, A simple servlet, the servlet API, The javax.servlet package, reading servlet parameter, the javax.servlet.http package, Handling HTTP Requests and Responses, using Cookies, Session Tracking.

Java Server Pages (JSP): JSP tags, Variables and Objects, Methods, Control statements, Loops, Request String, parsing other information, User sessions, Cookies, Session Objects.

Textbook:1 Chapter:38

Textbook:2 Chapter:11

RBT Levels: L1,L2,L3

Module-5:	**8 Hrs**

JDBC Objects: The concept of JDBC**,** JDBC Driver Types, JDBC packages, A brief overview of the JDBC Process, Database Connection, Associating the JDBC/ODBC Bridge with the Database, Statement Objects, Result Set, Transaction Processing, Metadata, Data Types, Exceptions.

Textbook:2 Chapter:6

RBT Levels: L1,L2,L3

IV. Course Outcomes

CO1	Understanding the fundamental concepts of Enumerations and Annotations
CO2	Apply the concepts of Generic classes in Java programs
CO3	Demonstrate the concepts of String operations in Java
CO4	Develop web-based applications using Java servlets and JSP
CO5	Illustrate database interaction and transaction processing in Java

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
CO1	3	2	2		2							2	2	
CO2	3	2	2		2							2	2	
CO3	3	2	2		2							2	2	
CO4	3	3	3		3							3	3	
CO5	3	3	3		3							3	3	

VI. Assessment Details (CIE & SEE)

General Rules: Refer Annexure-1 section 1

Continuous Internal Evaluation (CIE): Refer Annexure-1 section 1

Semester End Examination (SEE): Refer Annexure-1 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.	JAVA the Complete Reference	Herbert Schildt	9th Edition	Tata McGraw-Hill
2.	The Complete Reference J2EE	Jim Keogh	-	Tata McGraw-Hill

VII(b): Reference Books:

1.	Introduction to JAVA Programming	Y. Daniel Liang	7th Edition	Pearson Education 2007

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/

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

Programming exercises

Semester:	V	**Course Type:**	PEC		
Course Title: Software Engineering & Project Management					
Course Code:	**23ISP512**		**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

Pre-requisites : Basic knowledge of Software and its types, The softwareMyths.

I. Course Objectives:

1. Outline software engineering principles and activities involved in building large software
2. Programs. Identify ethical and professional issues and explain why they are of concern to Software Engineers.
3. Infer the fundamentals of object-oriented concepts, differentiate system models, use UMLdiagrams and apply design patterns.
4. Explain the role of Agile Implementation.
5. Discuss various types of software testing practices and software evolution processes.
6. Recognize the importance of Project Management with its methods and methodologies.
7. Identify software quality parameters and quantify software using measurements andmetrics. List software quality standards and outline the practices involved

II. Teaching-Learning Process (General Instructions):

1. Chalk and talk/PPT/case study/web content

III. Course Content

Module-1:	8 Hours

Software and Software Engineering: The nature of Software, The unique nature of Web Apps,Software Engineering, The software Process, The software Engineering practice.
Process Models: A generic process model, Process assessment and improvement, Prescriptiveprocess models, Waterfall model, Incremental process models, Evolutionary process models, Concurrent models, Specialized process models.

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

RBT Levels:L3

Module-2:	8 Hours

Understanding Requirements: Requirements Engineering, Establishing the groundwork,Eliciting Requirements, developing use cases, Building the requirements model, NegotiatingRequirements, Validating Requirement, Requirements Modeling Scenarios, Information and Analysis classes: Requirement Analysis,Scenario based modeling; UML models that supplement the Use Case, Data modeling Concepts.

Textbook 1: Chapter 5: 5.1 to 5.7
Textbook 1: Chapter 6: 6.1 to 6.4

RBT Levels:L3

Module-3:	8 Hours

AGILE DEVELOPMENT: What is Agility? Agility and the cost of change. What is an agile Process? Extreme Programming (XP), Other Agile Process Models, A tool set for Agile process Principles that guide practice: Software Engineering Knowledge, Core principles.

Textbook 1: Chapter 3: 3.1 to 3.6, Chapter 4: 4.1 to 4.2

RBT Levels:L3

Module-4:	8 Hours

Introduction to Project Management:
Introduction, Project and Importance of Project Management, Contract Management, Activities Covered by Software Project Management, Plans, Methods and Methodologies, some ways of categorizing Software Projects, Stakeholders, Setting Objectives, Business Case, Project Success and Failure, Management and Management Control, Project Management life cycle

Textbook 2: Chapter 1: 1.1 to 1.17

RBT Levels:L3

Module-5:	8 Hours

Software Quality:
Introduction, the place of software quality in project planning, Importance of software quality, Defining software quality, quality models, ISO 9126, product and process metrics, product versus process quality management, testing, Software reliability (ROCOF, MTTF,MTTR, MTBF,POFOD), quality plans.

Textbook 2: Chapter 13: (13.1 to 13.8 and 13.12, 13.13, 13.14)

RBT Levels:L2

IV. Course Outcomes

CO1	Understand the activities involved in software engineering and analyze the role of various process models
CO2	Explain the basics of object-oriented concepts and build a suitable class model using modeling techniques
CO3	Illustrate the role of project planning and quality management in software development

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**
CO1	3		2										2	2
CO2			2							2			2	
CO3		1			2								2	

VI. Assessment Details (CIE & SEE)

General Rules: Refer Annexure-1 section 1

Continuous Internal Evaluation (CIE): Refer Annexure-1 section 1

Semester End Examination (SEE): Refer Annexure-1 section 1

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Name of the publisher	Edition and Year
1	Software Engineering-A Practitioners approach	Roger S. Pressman	Tata McGraw Hill	7th Edition
2	Software Project Management	Bob Hughes, Mike Cotterell, Rajib Mal	McGraw Hill Education	6th edition, 2018

VII(b): Reference Books:

1	An Integrated Approach to Software Engineering	Pankaj Jalote	Wiley India	

VII(c): Web links and Video Lectures (e-Resources): (Insert or delete rows as per requirement)

1. https://onlinecourses.nptel.ac.in/noc20_cs68/preview
2. https://www.youtube.com/watch?v=WxkP5KR_Emk&list=PLrjkTql3jnm9b5nr-ggx7Pt1G4UAHeFlJ
3. http://elearning.vtu.ac.in/econtent/CSE.php
4. http://elearning.vtu.ac.in/econtent/courses/video/CSE/15CS42.html
5. https://nptel.ac.in/courses/128/106/128106012/ (DevOps)

VIII: Activity Based Learning

Student Presentation, Quiz and Group discussions.

Semester:	**V**	**Course Type:**	PEC		
Course Title: Introduction to Java Script					
Course Code:	**23ISP513**		**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

Pre-requisites (Self Learning): A general understanding of how computers and web browsers work is helpful. Knowing the difference between client-side (browser) and server-side (server) scripting will help you understand where JavaScript fits into the web development landscape.

I. Course Objectives:

- Explain how JavaScript interacts with HTML and CSS to create dynamic web pages.
- Implement if, else if, and else statements for decision-making, utilize for, while, and do...while loops for iteration, understand and use the switch statement.
- Define and call functions with parameters and return values, understand the difference between function declarations and function expressions.
- Explain how the browser represents HTML documents as a tree-like structure (DOM) Respond to user events: Attach event listeners to elements (e.g., click, mouseover, keydown). Handle events and execute corresponding JavaScript code

II. Teaching-Learning Process (General Instructions)

The following are some of the strategies that teachers can employ to facilitate the achievement of various course outcomes:

1. **Diverse Teaching Methods**: Instead of relying solely on traditional lecture methods, can explore alternative and effective teaching approaches. These might include interactive discussions, hands-on activities, or multimedia presentations.
2. **Visual Aids**: Utilize videos and animations to elucidate complex concepts. Visual representations enhance understanding and engagement among students.
3. **Collaborative Learning**: Encourage group learning within the classroom. Collaborative activities foster teamwork, communication, and a deeper grasp of subject matter.
4. **Higher Order Thinking (HOT) Questions**: Pose at least three thought-provoking questions during class. These questions stimulate critical thinking and encourage students to analyze and evaluate information.
5. **Problem-Based Learning (PBL):** Implement PBL, which nurtures analytical skills. PBL goes beyond rote memorization by challenging students to design solutions, evaluate evidence, and think critically.
6. **Multiple Representations**: Introduce topics using various representations. Visuals, diagrams, and real-world examples cater to diverse learning styles.
7. **Creative Problem Solving**: Present different approaches to solving the same problem.

Encourage students to think outside the box and devise their own innovative solutions.

8. **Real-World Application**: Discuss how each concept relates to practical scenarios. Connecting theoretical knowledge to real-world context enhances students' comprehension and retention.

□ Chalk & Talk □ Stud. Assignment □ Web Resources □ LCD/Smart Boards □ Stud. Seminars

III. Course Content

Module-1: Getting Started with JavaScript and JavaScript Essentials	8 Hours

Getting Started with JavaScript: Why should you learn JavaScript? Setting up your environment, how does the browser understand JavaScript? Using the browser console, Adding JavaScript to a web page, and Writing JavaScript code.
JavaScript Essentials: Variables, Primitive data types, Analyzing and modifying data types, Operators

Textbook 1: Ch. 1, 2

RBT Levels: L1, L2

Module-2: JavaScript Multiple Values, Logic Statements, Loops	8 Hours

JavaScript Multiple Values: Arrays and their properties, Array methods, Multidimensional arrays, Objects in JavaScript, Working with objects and arrays,
Logic Statements: if and if else statements, else if statements, Conditional ternary operators, switch statements.
Loops: while loops, do while loops, for loops, Nested loops, Loops and arrays, Loops and objects, break and continue

Textbook 1: Ch. 3,4,5

RBT Levels: L1, L2

Module-3: Functions, Classes	8 Hours

Functions: Basic functions, Parameters and arguments, Special functions and operators, Returning function values, Variable scope in functions, Recursive functions, Nested functions, Anonymous functions.
Classes: Object-oriented programming, Classes and objects, Classes, Inheritance, Prototypes.

Textbook 1: Ch. 6,7

RBT Levels: L1, L2,L3

Module-4: Built-In JavaScript Methods, DOM	8 Hours

Built-In JavaScript Methods: Introduction to built-in JavaScript methods, Global methods, Array methods, String methods, Number methods, Math methods, Date methods.
The Document Object Model: HTML crash course, The BOM, The DOM.
Dynamic Element Manipulation Using the DOM: Basic DOM traversing, accessing elements in the DOM, Element click handler, This and the DOM, manipulating element style, Changing the classes of an element, manipulating attributes, Event listeners on elements, Creating new elements

Textbook 1: Ch. 8,9,10

RBT Levels: L1, L2,L3,L4

Module-5: Interactive Content and Event Listeners	8 Hours

Interactive Content and Event Listeners: Introducing interactive content, specifying events, the onload event handler, Mouse event handlers, the event target property, DOM event flow, on change and on blur, Key event handler, Drag and drop elements, Form submission, Animating elements
Intermediate JavaScript: Regular expressions, Functions and the arguments object, JavaScript hoisting, using strict mode, Debugging, Using cookies, Local storage, JSON.

Textbook 1: Ch. 11,12

RBT Levels : L1, L2,L3,L4

IV. Course Outcomes

Students will be able to

CO1	Gain a solid understanding of core JavaScript concepts, including variables, primitive data types, and operators.
CO2	Use loops to interact with arrays and objects, and leverage control statements like break and continue to optimize and control loop execution.
CO3	Understand and create basic functions in JavaScript, utilizing parameters and arguments to pass data.
CO4	Apply basic DOM traversing techniques to navigate and manipulate elements within the DOM.
CO5	Implement various event handlers, including the onload event, mouse events**,** key events, and the onchange and onblu**r** events, to manage user interactions

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
CO1	1			1									1	
CO2		2	2										1	
CO3		3	3										1	
CO4	1			1									1	
CO5		1	2										1	

VI. Assessment Details (CIE & SEE)

General Rules: Refer Annexure 1- Section 1

Continuous Internal Evaluation (CIE): Refer Annexure 1- Section 1

Semester End Examination (SEE): Refer Annexure 1- Section 1

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Name of the publisher	Edition and Year
1	JavaScript from Beginner to Professional	Laurence Lars Svekis Maaike van Putten Rob Percival	Packt Publishing	First published: December 2021

VII(b): Reference Books:

1	Programming the World Wide Web	W. Sebesta	Pearson Education	Fourth edition, 2007
2	Web Programming: Desktop Management	Aferganatel	PHI	2004

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

1. Web links and Video Lectures (e-Resources): https:// https://www.codecademy.com/learn/introduction-to-javascript
2. https://www.simplilearn.com/learn-javascript-basics-free-course-skillup

VIII: Activity Based Learning

1. Develop simple GUI interfaces for a computer program to interact with users

Semester:	**V**	**Course Type:**	PEC		
Course Title: Information Retrieval					
Course Code:	**23ISP514**		**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

Pre-requisite: Knowledge of Data structures and Database.

I. Course Objectives

- An information retrieval system is crucial for efficiently accessing relevant data from large datasets.
- Understanding various retrieval models, evaluation factors like precision and recall, and processing techniques such as text, query, and indexing is essential.
- User interfaces are important for visualizing search results, improving the user experience, and supporting effective web-based searches.

II. Teaching-Learning Process (General Instructions):

The following are some of the strategies that teachers can employ to facilitate the achievement of various course outcomes:

1. **Diverse Teaching Methods**: Instead of relying solely on traditional lecture methods, can explore alternative and effective teaching approaches. These might include interactive discussions, hands-on activities, or multimedia presentations.
2. **Visual Aids**: Utilize videos and animations to elucidate complex concepts. Visual representations enhance understanding and engagement among students.
3. **Collaborative Learning**: Encourage group learning within the classroom. Collaborative activities foster teamwork, communication, and a deeper grasp of subject matter.
4. **Higher Order Thinking (HOT) Questions**: Pose at least three thought-provoking questions during class. These questions stimulate critical thinking and encourage students to analyze and evaluate information.
5. **Problem-Based Learning (PBL):** Implement PBL, which nurtures analytical skills. PBL goes beyond rote memorization by challenging students to design solutions, evaluate evidence, and think critically.
6. **Multiple Representations**: Introduce topics using various representations. Visuals, diagrams, and real-world examples cater to diverse learning styles.
7. **Creative Problem Solving**: Present different approaches to solving the same problem. Encourage students to think outside the box and devise their own innovative solutions.
8. **Real-World Application**: Discuss how each concept relates to practical scenarios. Connecting theoretical knowledge to real-world contexts enhances students' comprehension and retention.

□ Chalk & Talk □ Stud. Assignment □ Web Resources □ LCD/Smart Boards □ Stud. Seminars

III. Course Content

Module-1:Introduction	8 Hrs
Introduction: Information retrieval, IR problem, IR System, The web. User interfaces for search: Introduction, how people search, Search interfaces today, Visualization on search interfaces, Design and evaluation of search interfaces. **Textbook: Chapter 1: 1.1 to 1.4, Chapter 2: 2.1 to 2.5**	
RBT Levels: L1, L2,L3	
Module-2:Modeling	8 Hrs
Modelling: IR models, Classic information retrieval, Alternative set theoretic models, Alternative algebraic models, Alternative probabilistic models, other models. **Textbook: Chapter 3: 3.1 to 3.6**	
RBT Levels: L1, L2,L3	
Module-3: Retrieval Evaluation	8 Hrs
Retrieval Evaluation: Retrieval metrics, Reference Collections, User-based evaluation Relevance **feedback and Query expansion**: A framework for feedback methods, Explicit relevance feedback, Explicit feedback through clicks, Implicit feedback through local analysis, Implicit feedback through global analysis **Documents - Languages and Properties**: Metadata, Document formats, Text properties, Document preprocessing, Organizing documents, Text compression **Textbook: Chapter 4: 4.3 to 4.5, Chapter 5: 5.2 to 5.6, Chapter 6: 6.2 to 6.3, 6.5 to 6.8**	
RBT Levels: L1, L2, L3	
Module-4: Indexing and searching	8 Hrs
Indexing and Searching: Inverted indexes, Signature files, Suffix trees and suffix arrays, Sequential searching, multi-dimensional indexing. **Textbook: Chapter 9: 9.2 to 9.6**	
RBT Levels: L1, L2, L3	
Module-5: Web retrieval	8 Hrs
Web retrieval: The web, Search engine architectures, Search engine ranking, Managing web data, Search engine user interaction. **Structured Text Retrieval**: Structuring Power, Early text retrieval models, XML retrieval, XML retrieval evaluation. **Textbook: Chapter 11: 11.2 to 11.7, Chapter 13: 13.2 to 13**.5	
RBT Levels: L1, L2, L3	

IV. Course Outcomes

CO1	Identifythe models and tools for building an Information Retrieval system.
CO2	Applyquery-based operations for information retrieval.
CO3	Use text-based operations for retrieving information from documents.
CO4	Apply indexing and searching techniques for information retrieval.
CO5	Designa user interface for searching and retrieving information from the web/documents.

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

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

VI. Assessment Details (CIE & SEE)				
General Rules: Refer Annexure-1 section 1				
Continuous Internal Evaluation (CIE): Refer Annexure-1section 1				
Semester End Examination (SEE): Refer Annexure-1 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	Modern Information Retrieval	Ricardo Baeza Yates and Berthier Ribeiro Neto	2nd Edition, 2011	Pearson
VII(b): Reference Books:				
1	Information Retrieval: Implementing and Evaluating Search Engines	Stefan Buettcher, Charles L. A. Clarke and Gordon V. Cormack,	2010	The MIT Press
2	Information Storage and Retrieval Systems: Theory and Implementation,	Kowalski, Gerald, Mark T Maybury,	2nd Edition, 2002	Springer
3	Modern Information	Retrieval, Ricardo Baeza-Yates	2007	Pearson Education
VII(c): Web links and Video Lectures (e-Resources):				
• https://www.youtube.com/watch?v=cv7ztWiIaAM • https://www.youtube.com/watch?v=ecRMy60oBrA • https://www.youtube.com/watch?v=dXHxPvAIwcI • https://www.youtube.com/playlist?list=PLpwnR8mPhhf8m7L_b9cSRLdjPW2soerAd • https://www.youtube.com/watch?v=m0oiAOgSQFw • https://www.youtube.com/watch?v=yluvahNq3wk				
VIII: Activity Based Learning / Practical Based Learning/Experiential learning:				
Assignments, Quizzes and Seminar.				

Emerging Technology Course-3

Semester:	**V**	**Course Type:**	ETC		
Course Title: Ethical Hacking					
Course Code:	**23ISE531**		**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

Pre-requisite: Basic understanding of networking, operating systems, web technologies, programming, and cybersecurity concepts

I. Course Objectives:

- The course aims to equip students with the ability to describe web applications and identify their vulnerabilities.
- It will also focus on recognizing and explaining vulnerabilities related to authentication, access control, session management, and data sources.
- Additionally, the course will cover how attacks exploit weaknesses in these areas, providing a comprehensive understanding of web application security.

II. Teaching-Learning Process (General Instructions):

The following are some of the strategies that teachers can employ to facilitate the achievement of various course outcomes:

1. **Diverse Teaching Methods**: Instead of relying solely on traditional lecture methods, can explore alternative and effective teaching approaches. These might include interactive discussions, hands-on activities, or multimedia presentations.
2. **Visual Aids**: Utilize videos and animations to elucidate complex concepts. Visual representations enhance understanding and engagement among students.
3. **Collaborative Learning**: Encourage group learning within the classroom. Collaborative activities foster teamwork, communication, and a deeper grasp of subject matter.
4. **Higher Order Thinking (HOT) Questions**: Pose at least three thought-provoking questions during class. These questions stimulate critical thinking and encourage students to analyze and evaluate information.
5. **Problem-Based Learning (PBL):** Implement PBL, which nurtures analytical skills. PBL goes beyond rote memorization by challenging students to design solutions, evaluate evidence, and think critically.
6. **Multiple Representations**: Introduce topics using various representations. Visuals, diagrams, and real-world examples cater to diverse learning styles.
7. **Creative Problem Solving**: Present different approaches to solving the same problem. Encourage students to think outside the box and devise their own innovative solutions.
8. **Real-World Application**: Discuss how each concept relates to practical scenarios. Connecting theoretical knowledge to real-world contexts enhances students' comprehension and retention.

III. Course Content	
Module-1:	**8 Hrs**
Web Application (In)security: The Evolution of Web Applications, Common Web Application Functions, Benefits of Web Applications, Web Application Security, "This Site Is Secure", The Core Security Problem: Users Can Submit; Arbitrary Input, Key Problem Factors, The New Security Perimeter, The Future of Web Application Security. **Textbook: 1 Chapter: 1**	
RBT Levels:L1,L2,L3	
Module-2:	**8 Hrs**
Core Defense Mechanisms: Handling User Access, Authentication, Session Management, Access Control, Handling User Input, Varieties of Input, Approaches to Input Handling, Boundary Validation, Multistep Validation and Canonicalization, Handling Attackers, Handling Errors, Maintaining Audit Logs, Alerting Administrators, Reacting to Attacks. **Textbook:1 Chapter: 2**	
RBT Levels: L1,L2,L3	
Module-3:	**8 Hrs**
Attacking Authentication: Authentication Technologies, Design Flaws in Authentication Mechanisms, Bad Passwords, Brute-Forcible Login, Verbose Failure Messages, Vulnerable Transmission of Credentials, Password Change Functionality, Forgotten Password Functionality, "Remember Me" Functionality, User Impersonation Functionality, Incomplete Validation of Credentials, Nonunique Usernames, Predictable Usernames, Predictable Initial Passwords, Insecure Distribution of Credentials, Implementation Flaws in Authentication, Fail-Open Login Mechanisms, Defects in Multistage Login Mechanisms, Insecure Storage of Credentials, Securing Authentication, Use Strong Credentials, Handle Credentials Secretively, Validate Credentials Properly, Prevent Information Leakage, Prevent Brute-Force Attacks, Prevent Misuse of the Password Change Function, Prevent Misuse of the Account Recovery Function, Log, Monitor, andNotify. **Textbook:1 Chapter: 6**	
RBT Levels: L1,L2,L3	
Module-4:	**8 Hrs**
Attacking Session Management: The Need for State, Alternatives to Sessions, Weaknesses in Token Generation, Meaningful Tokens, Predictable Tokens, Encrypted Tokens, Weaknesses in Session Token Handling, Disclosure of Tokens on the Network, Disclosure of Tokens in Logs, Vulnerable Mapping of Tokens to Sessions, Vulnerable Session Termination, Client Exposure to Token Hijacking, Liberal Cookie Scope, Securing Session Management, Generate Strong Tokens, Protect Tokens Throughout Their Life Cycle, Log, Monitor, and Alert. **Textbook:1 Chapter: 7**	
RBT Levels: L1,L2,L3	
Module-5:	**8 Hrs**
Attacking Access Controls: Common Vulnerabilities, Completely Unprotected Functionality, Identifier Based Functions, Multistage Functions, Static Files, Platform Misconfiguration, Insecure Access Control Methods, Attacking Access Controls, Testing with Different User Accounts, Testing Multistage Processes, Testing with Limited Access, Testing Direct Access to Methods, Testing Controls Over Static Resources, Testing Restrictions on HTTP Methods, Securing Access Controls, A Multilayered Privilege Model. **Textbook:1 Chapter:8,9**	
RBT Levels: L1,L2,L3	

IV. Course Outcomes

CO1	Explain the security challenges in web applications and discuss the core defense mechanisms.
CO2	Identify flaws in authentication and explain methods for testing and attacking authentication.
CO3	Describe weaknesses in tokens and methods for attacking session management.
CO4	Identify vulnerabilities in access control and discuss methods for exploiting them.
CO5	Illustrate injection methods for attacking data stores.

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
CO1	3	3	-	2	-	2	-	-	-	-	-	3	2	-
CO2	3	3	-	3	-	2	-	-	-	-	-	3	2	-
CO3	3	3	-	3	2	2	-	-	-	-	-	3	2	-
CO4	3	3	-	3	2	2	-	-	-	-	-	3	2	-
CO5	3	3	-	3	3	2	-	-	-	-	-	3	2	-

VI. Assessment Details (CIE & SEE)

General Rules: Refer Annexure-1 section 1

Continuous Internal Evaluation (CIE): Refer Annexure-1 section 1

Semester End Examination (SEE): Refer Annexure-1 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: finding and exploiting security flaws	DafyddStuttard, Marcus Pinto	2011	Wiley

VII(b): Reference Books:

1	Hacking Exposed 7: Network Security Secrets & Solutions	Stuart McClure, Joel Scambray and Goerge Kurtz,	2010	Tata McGraw Hill Publishers,
2	Microsoft Windows Security Resource Kit,	Bensmith, and Brian Komer,	2010	Prentice Hall of India

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

1. https://owasp.org/
2. https://www.youtube.com/c/TheCyberMentor

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

Assignments, Quizzes and Seminar.

Semester:	**V**	**Course Type:**	ETC		
Course Title: Predictive Analytics					
Course Code:	**23ISE532**		**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
Pre-requisite: Basic knowledge of statistics and data analysis techniques					

I. Course Objective

- Comprehend the fundamental principles of business analytics.
- Explore various techniques for predictive Modelling.
- Analyse the data transformation of different predictors.
- Examine how predictive analytics can be used in decision-making.
- Apply predictive models to generate predictions for new data.

II. Teaching-Learning Process (General Instructions):

The following are some of the strategies that teachers can employ to facilitate the achievement of various course outcomes:

1. **Diverse Teaching Methods**: Instead of relying solely on traditional lecture methods, can explore alternative and effective teaching approaches. These might include interactive discussions, hands-on activities, or multimedia presentations.
2. **Visual Aids**: Utilize videos and animations to elucidate complex concepts. Visual representations enhance understanding and engagement among students.
3. **Collaborative Learning**: Encourage group learning within the classroom. Collaborative activities foster teamwork, communication, and a deeper grasp of subject matter.
4. **Higher Order Thinking (HOT) Questions**: Pose at least three thought-provoking questions during class. These questions stimulate critical thinking and encourage students to analyse and evaluate information.
5. **Problem-Based Learning (PBL):** Implement PBL, which nurtures analytical skills. PBL goes beyond rote memorization by challenging students to design solutions, evaluate evidence, and think critically.
6. **Multiple Representations**: Introduce topics using various representations. Visuals, diagrams, and real-world examples cater to diverse learning styles.
7. **Creative Problem Solving**: Present different approaches to solving the same problem. Encourage students to think outside the box and devise their own innovative solutions.
8. **Real-World Application**: Discuss how each concept relates to practical scenarios. Connecting theoretical knowledge to real-world contexts enhances students' comprehension and retention.

□ Chalk & Talk □ Stud. Assignment □ Web Resources □ LCD/Smart Boards □ Stud. Seminars

III. Course Content	
Module-1: Introduction to Predictive Analytics	8 Hrs
Introduction to Predictive Analytics – Business analytics: types, applications, Analytical Techniques, Tools Predictive Modeling: Propensity Models, Cluster Models, Applications. **Textbook 1: Chapter 1, 2.**	
RBT Levels: L1, L2, L3	
Module-2:Modeling Techniques	8 Hrs
Modeling Techniques: Statistical Modeling, Machine Learning, Empirical Bayes Method, Point Estimation. **Textbook 1: Chapter 3,4**	
RBT Levels: L1, L2, L3	
Module-3: Data Pre-processing	8 Hrs
Data Pre-processing: Data Transformations for Individual Predictors, Data Transformation for Multiple Predictors, Dealing with Missing Values, Removing Predictors, Adding Predictors, Binning Predictors. Over-Fitting and Model Tuning. **Textbook 2: 3, 4**	
RBT Levels: L1, L2, L3	
Module-4: Regression Models	8 Hrs
Regression Models: Measuring Performance in Regression Models - Linear Regression and Its Cousins - Non-Linear Regression Models - Regression Trees and Rule-Based Models Case Study: Compressive Strength of Concrete Mixtures. **Textbook 2: Chapter 5,6,7,8**	
RBT Levels: L1, L2, L3	
Module-5: Classification Models	8 Hrs
Classification Models: Measuring Performance in Classification Models - Discriminant Analysis and Other Linear Classification Models - Non-Linear Classification Models - Classification Trees and Rule-Based Models – Model Evaluation Techniques. **Textbook 2: Chapter 11,12,13,14**	
RBT Levels: L1, L2, L3	

IV. Course Outcomes	
Students will be able to learn	
CO1	Explore the importance of predictive analytics and gain the ability to prepare and process data for modeling.
CO2	Apply statistical techniques for predictive modelling.
CO3	Comprehend the transformation of data into predictors.
CO4	Apply regression and classification models for decision-making and evaluate their performance.
CO5	Apply time series forecasting models in a variety of business contexts.

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
CO1	3	1											1	
CO2	1	2	3										1	
CO3	1	2	3	3									1	1
CO4	1	3	3	2										1
CO5	1	1	3	2									1	1

VI. Assessment Details (CIE & SEE)				
General Rules: Refer Annexure-1 section 1				
Continuous Internal Evaluation (CIE): Refer Annexure-1 section 1				
Semester End Examination (SEE): Refer Annexure-1 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	Predictive Analytics using R	Jeffrey S. Strickland	1st Edition, 2014	
2	Applied Predictive Modeling	Max Kuhn and Kjell Johnson	1st Edition, 2013	Springer
VII(b): Reference Books:				
1	Applied Predictive Analytics: Principles and Techniques for the Professional Data Analyst	Dean Abbott	1st Edition, 2014.	Wiley
VII(c): Web links and Video Lectures (e-Resources):				
• https://www.coursera.org/lecture/fundamentals-of-data-analysis/introduction-to-predictiveanalytics-u4H61				
VIII: Activity Based Learning / Practical Based Learning/Experiential learning:				
Assignments, Quizzes and Seminar, Group Discussion, mini projects				

Semester:	**V**	**Course Type:**	ETC		
Course Title: Digital Image Processing					
Course Code:	**23ISE533**		**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

Pre-requisite: Students need to have a knowledge on Linear Algebra, Probability & Statistics, Fourier Analysis, Differential Equations, Signals and Systems, Basic Image Processing Concepts

I. Course Objectives

Students will be able to:

1. Understanding Image Processing Fundamentals
2. Exploring Image Processing Techniques & Algorithms
3. Developing Theoretical Foundations
4. Developing Practical Image Processing Applications
5. Advancing Towards Computer Vision

II. Teaching-Learning Process (General Instructions)

The following are some of the strategies that teachers can employ to facilitate the achievement of various course outcomes:

1. **Diverse Teaching Methods**: Instead of relying solely on traditional lecture methods, can explore alternative and effective teaching approaches. These might include interactive discussions, hands-on activities, or multimedia presentations.
2. **Visual Aids**: Utilize videos and animations to elucidate complex concepts. Visual representations enhance understanding and engagement among students.
3. **Collaborative Learning**: Encourage group learning within the classroom. Collaborative activities foster teamwork, communication, and a deeper grasp of subject matter.
4. **Higher Order Thinking (HOT) Questions**: Pose at least three thought-provoking questions during class. These questions stimulate critical thinking and encourage students to analyze and evaluate information.
5. **Problem-Based Learning (PBL):** Implement PBL, which nurtures analytical skills. PBL goes beyond rote memorization by challenging students to design solutions, evaluate evidence, and think critically.
6. **Multiple Representations**: Introduce topics using various representations. Visuals, diagrams, and real-world examples cater to diverse learning styles.
7. **Creative Problem Solving**: Present different approaches to solving the same problem. Encourage students to think outside the box and devise their own innovative solutions.
8. **Real-World Application**: Discuss how each concept relates to practical scenarios. Connecting theoretical knowledge to real-world contexts enhances students' comprehension and retention.

Chalk &Talk, concept videos, Web Resources, smartboards in classroom, Student presentations, Seminars

III. Course Content

Module-1: Fundamentals of Image Processing and Image Transforms	8 Hrs
Introduction, Image sampling Quantization, Resolution, Relationship between pixels, Image formats. **Transforms**: Need of transform, image transforms, Fourier transform, 2 D Discrete Fourier transform and its transforms, Importance of phase, Walsh transform, Hadamard transform, Haar transform	
Textbook 1: Chapter 1,2,3,4 : Section-1.1 to 1.4, 2.4, 2.5& Textbook 2:Chapter 2,3	
RBT Levels: L1, L2,L3	
Module-2: Image Enhancement	8 Hrs
Spatial domain methods: Histogram processing, Fundamentals of Spatial filtering, smoothing spatial filters, Sharpening spatial filters. Frequency domain methods: Basics of filtering in frequency domain, image smoothing, image sharpening, Selective filtering.	
Textbook 2:Chapter 5	
RBT Levels: L1, L2,L3	
Module-3:Image Restoration	8 Hrs
Introduction to Image restoration, Image degradation, Types of image blur, Classification of image restoration techniques, Image restoration model, Linear and Nonlinear image restoration techniques	
Textbook 2:Chapter 6	
RBT Levels: L1, L2, L3	
Module-4:Image Segmentation	8 Hrs
Introduction to image segmentation, Point, Line and Edge Detection, Region based segmentation. Classification of segmentation techniques, Region approach to image segmentation, clustering techniques, Image segmentation based on thresholding, Edge based segmentation, Edge detection and linking, Hough transform, Active contour.	
Textbook 2:Chapter 7	
RBT Levels: L1, L2, L3	
Module-5:Image Compression	8 Hrs
Introduction, Need for image compression, Redundancy in images, Classification of redundancy in images, image compression scheme, Classification of image compression schemes, Fundamentals of information theory, run length coding, Shannon – Fano coding, Huffman coding, Arithmetic coding, Predictive coding, Transformed based compression, Image compression standard, Wavelet-based image compression, JPEG Standards.	
Textbook 2:Chapter 9	
RBT Levels: L1, L2, L3	

IV. Course Outcomes

CO1	Explain the fundamentals of image processing and apply mathematical transforms for image analysis.
CO2	Apply image enhancement, restoration, and segmentation techniques to improve image quality
CO3	Implement image compression algorithms to optimize storage and transmission efficiency.
CO4	Designand develop image processing applications using appropriate tools and algorithms.

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
CO1	3	3	1										2	
CO2	3	3	3										2	
CO3	3	2		2									2	
CO4	1	1	2		2							3	2	

VI. Assessment Details (CIE & SEE)				
General Rules: Refer Annexure-1 section 1				
Continuous Internal Evaluation (CIE): Refer Annexure-1section 1				
Semester End Examination (SEE): Refer Annexure-1 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	Digital Image Processing	Gonzaleze and Woods	Ed. 3rd	Pearson
2	Digital Image processing	S.Jayaraman,S.Esakkirajan and T.VeeraKumar	-	TataMcGraw Hill publishers
VII(b): Reference Books:				
1	Digital Image Processing and Analysis-Human and Computer Vision Application with CVIP Tools	ScotteUmbaugh	Ed. 2nd	CRC Press
VII(c): Web links and Video Lectures (e-Resources):				
• https://www.youtube.com/watch?v=ArKe6zMkXnk&t=27s • https://www.bing.com/videos/riverview/relatedvideo?&q=Digital+Image+processing%09mathworks&&mid=B85180AFCE2F78DFD7EFB85180AFCE2F78DFD7EF&mmscn=mtsc&aps=0&FORM=VRDGAR • https://www.mathworks.com/discovery/digital-image-processing.html • https://onlinecourses.nptel.ac.in/noc21_ee78/preview				
VIII: Activity Based Learning / Practical Based Learning/Experiential learning:				
Assignments, Quizzes, Presentations and ABL.				

Semester:	**V**	**Course Type:**	ETC		
Course Title: Block Chain Applications					
Course Code:	**23ISE534**		**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
Pre-requisites: Basic Programming Concepts, Data Structures and Algorithms , Networking Fundamentals					

I. Course Objectives:

- Analyse and Evaluate Blockchain Use Cases: Students will be able to identify, analyse, and critically evaluate various real-world use cases across different industries where blockchain technology can be applied effectively, considering factors like feasibility, benefits, and limitations.
- Design and Propose BlockChain-Based Solutions: Students will be able to design and propose conceptual blockchain-based solutions for specific problems or opportunities, demonstrating an understanding of core blockchain principles, consensus mechanisms, and smart contract functionality.
- Understand the Implementation and Challenges of Blockchain Applications: Students will be able to explain the practical aspects of implementing blockchain applications, including platform selection, security considerations, regulatory frameworks, and potential challenges related to scalability, interoperability, and governance.

II. Teaching-Learning Process (General Instructions):

1. The following are some of the strategies that teachers can employ to facilitate the achievement of various course outcomes:
2. Diverse Teaching Methods: Instead of relying solely on traditional lecture methods, can explore alternative and effective teaching approaches. These might include interactive discussions, hands-on activities, or multimedia presentations.
3. Visual Aids: Utilize videos and animations to elucidate complex concepts. Visual representations enhance understanding and engagement among students.
4. Collaborative Learning: Encourage group learning within the classroom. Collaborative activities foster teamwork, communication, and a deeper grasp of subject matter.
5. Higher Order Thinking (HOT) Questions: Pose at least three thought-provoking questions during class. These questions stimulate critical thinking and encourage students to analyse and evaluate information.
6. Problem-Based Learning (PBL): Implement PBL, which nurtures analytical skills. PBL goes beyond rote memorization by challenging students to design solutions, evaluate evidence, and think critically.
7. Real-World Application: Discuss how each concept relates to practical scenarios. Connecting theoretical knowledge to real-world contexts enhances students' comprehension and retention.

III. Course Content	
Module-1:Blockchain Technology Introduction, Applications, Challenges ,Bitcoins	8 Hrs
Introduction, Evolution of blockchain , Applications of blockchain , Challenges of blockchain, Bitcoins block structure , Bitcoins block's structure , Bitcoins anonymity & privacy , machine learning approach on price prediction , threats and machine learning based solution **Textbook:1Chapter: 1 and 2:sections : 1.1 to 1.4 and 2.1 to 2.6**	
RBT Levels: L1 & L2	
Module-2:Blockchain 1.0 to Blockchain 4.0 and anatomy of Blockchain	8 Hrs
Fundamentals of blockchain , the evolutionary transformation of blockchain3.1 , comparison of different generation of blockchain, Characteristics of Blockchain, Flow of Bitcoins Transaction, Types of Encryption Algorithms, Crypto currency, Initial Coin Offering (ICO), Tokens in Blockchain, Blockchain in Healthcare, Blockchain Implementations in Healthcare, Issues in Healthcare that Could Be Solved Using Blockchain Technology **Textbook: 1 Chapter: 3 and 4 : sections : 3.1 to 3.5 and 4.1 to 4.3 ,4.5**	
RBT Levels: L2 & L3	
Module-3:A Blockchain Framework for Healthcare Data Management , opportunities and challenges	8 Hrs
Traditional Healthcare Data Management, Blockchain-Based Healthcare Data Management, Proposed Methodology ,Management of Data in Healthcare Sector ,Management in Pharmacy Sector ,Architecture of Blockchain and Existing Systems, Securities in Healthcare: Requirements,Applications, An Example Application: Mindshare,Possible Attacks in Blockchain,Issues and Challenges to Design Secure Protocol **Textbook: 1 Chapter: 5,6 and 7:sections: 5.1 to 5.3 , 6.1 to 6.3 and 7.1 to 7.7**	
RBT Levels: L2 & L3	
Module-4:Blockchain Technology in Smart-Cities and fashion industry	8 Hrs
Introduction , Groundwork of blockchain and applications , Smart city , Smart city security requirements , Open research challenges , Issues in Fashion Industry , Blockchain for Fashion Industry , Blockchain for Fashion Industry-Issues and Challenges **Textbook: 1 Chapter: 11 , 12 :sections : 11.1 to 11.6 , 12.1 to 12.5**	
RBT Levels: L2 & L3	
Module-5:Secure Event Ticket Booking Using Decentralized System , A New Safeguard to Cyber security	8 Hrs
Introduction , Literature Survey,Preliminaries,System Overview,Smart Contracts,Security Analysis, Identity and Access Management (IAM),IAM Related Concerns,Methodology,Ethereum,Private Versus Public Blockchain,Cyber Threats and Blockchain Transformation **Textbook: 1 Chapter: 13 and 15 : sections : 13.1 to 13.6 and 15.1 to 15.5**	
RBT Levels: L3 & L4	

IV. Course Outcomes	
CO1	Understanding Real-World Blockchain Applications
CO2	Applying of Blockchain in Healthcare and Smart Cities
CO3	AnalysingBlockchain-Based Solutions for Healthcare and Smart Cities
CO4	analysing the Implementation and Challenges of Blockchain in Healthcare and Smart Cities

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

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

VI. Assessment Details (CIE & SEE)

General Rules: Refer Annexure-1 section 1

Continuous Internal Evaluation (CIE): Refer Annexure-1 section 1

Semester End Examination (SEE): Refer Annexure-1 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	Blockchain technology: Applications and challenges	Sandeep Kumar Panda, Ajay Kumar Jena, Santosh Kumar Swain, Suresh Chandra Satapathy	1st edition,2023	Springer

VII(b): Reference Books:

1	Blockchain developers guide	Brenn Hill , Samanyu Chopra	Packt Publishing Limited	1st Edition , 2022
2	The Basics of Bitcoins Technology	Antony Lewis	Podium Publishing	2nd Edition 2021

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

- https://www.youtube.com/playlist?list=PLYwpaL_SFmcDFRupamGc-9zc-vQqvkQnn
- https://www.youtube.com/watch?v=RZFjrI0oWyw&list=PLPIwNooIb9vgfXs-=QkRYqqZbDXX-yLf59

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

- One day workshop by industry expert
- Group discussion
- Student presentation on relevant topic of blockchain applications

Ability Enhancement Course-5

Semester:	**V**	**Course Type:**	AEC		
Course Title: Generative AI					
Course Code:	**23ISAE51**		**Credits:**		1
Teaching Hours/Week (L:T:P:O)			1:0:0:0	**Total Hours:**	15
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	2

Pre-requisite: Basic knowledge of operating understanding of calculus, matrices and Python programming.

I. Course Objectives:

- Demystify generative AI models like GANs and VAEs to understand how they create new content.
- Unpack the training secrets of generative AI to see how they "learn" and generate.
- Explore the real-world use cases of generative AI - from creating realistic visuals to accelerating scientific breakthroughs.
- Navigate the ethical landscape of generative AI, identifying potential biases and misuse.
- Get hands-on with generative AI! Build basic models using Python and powerful

II. Teaching-Learning Process (General Instructions):

The following are some of the strategies that teachers can employ to facilitate the achievement of various course outcomes:

1. **Diverse Teaching Methods**: Instead of relying solely on traditional lecture methods, can explore alternative and effective teaching approaches. These might include interactive discussions, hands-on activities, or multimedia presentations.
2. **Visual Aids**: Utilize videos and animations to elucidate complex concepts. Visual representations enhance understanding and engagement among students.
3. **Collaborative Learning**: Encourage group learning within the classroom. Collaborative activities foster teamwork, communication, and a deeper grasp of subject matter.
4. **Higher Order Thinking (HOT) Questions**: Pose at least three thought-provoking questions during class. These questions stimulate critical thinking and encourage students to analyse and evaluate information.
5. **Problem-Based Learning (PBL):** Implement PBL, which nurtures analytical skills. PBL goes beyond rote memorization by challenging students to design solutions, evaluate evidence, and think critically.
6. **Multiple Representations**: Introduce topics using various representations. Visuals, diagrams, and real-world examples cater to diverse learning styles.
7. **Creative Problem Solving**: Present different approaches to solving the same problem. Encourage students to think outside the box and devise their own innovative solutions.
8. **Real-World Application**: Discuss how each concept relates to practical scenarios. Connecting theoretical knowledge to real-world contexts enhances students' comprehension

and retention.

□ Chalk & Talk □ Stud. Assignment □ Web Resources □ LCD/Smart Boards □ Stud. Seminars

III .Course Content

Module-1:Introduction to Generative AI	3 Hrs
What is Generative AI? Difference between Generative and Discriminative AI, Evolution of AI: From Rule-Based Systems to Deep Learning, Applications of Generative AI: Text, Image, Audio, Video Generation **Textbook1: Chapter 1: Introduction**	
RBT Levels: L1, L2	
Module-2:Basics of Neural Networks	3 Hrs
What are Neural Networks? How do they learn, Intuition behind Deep Learning (No coding, if required a demonstration on Tensor board can be shown, only concepts), Key Terminologies: Weights, Biases, Activation Functions, Loss Functions **Textbook1: Chapter 2: Neural Networks**	
RBT Levels: L1, L2	
Module-3:Understanding Generative Models	3 Hrs
What are Generative Models? Types of Generative AI, High-level understanding of Autoencoders and GANs, Everyday applications: Deepfake Technology, AI-Generated Art. **Textbook1: Chapter 6: Generative Models**	
RBT Levels: L1, L2	
Module-4:Large Language Models & AI Ethics	3 Hrs
What are Large Language Models (LLMs)? GPT, BERT, and ChatGPT Overview, How AI generates text and understands context, Ethical concerns: Bias, Misinformation, Copyright Issues **Textbook1: Chapter 8: Natural Language Processing**	
RBT Levels: L2, L3	
Module-5:Future of Generative AI & Industry Applications	3 Hrs
AI in Creative Industries: Art, Music, Marketing, Software Development, Generative AI in Research and Healthcare, Open-source AI models **Textbook1: Chapter 10: The Future of AI**	
RBT Levels: L2, L3	

IV. Course Outcomes

CO1	Explain the core concepts and working principles of Generative AI.
CO2	Explore the practical applications of generative AI in diverse fields like image/videocreation, text generation, and scientific discovery.
CO3	Gain a foundational understanding of Generative AI and its various model types like GANs and VAEs.
CO4	Explain AI-generated content such as text, images, or music and evaluate its quality.

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
CO1	2	2	1										1	
CO2	2	2	2											
CO3	2	2	1											
CO4	2	2	1										1	1

VI. Assessment Details (CIE & SEE)

General Rules: Refer Annexure-1 section 5

Continuous Internal Evaluation (CIE): Refer Annexure-1 section 5

Semester End Examination (SEE): Refer Annexure-1 section 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	Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms	Nikhil Buduma, Nicholas Locascio	2017 ISBN:9781491925614	O'Reilly
VII(b): Reference Books:				
1	Generative AI with Python and TensorFlow 2	Joseph Babcock and Raghav Bali	2023 ISBN: 9781119732920	John Wiley & Sons
VII(c): Web links and Video Lectures (e-Resources):				
• https://www.coursera.org/learn/build-basic-generative-adversarial-networks-gans • https://www.deeplearning.ai/courses/generative-ai-for-everyone/ • https://www.cloudskillsboost.google/course_templates/536				
VIII: Activity Based Learning / Practical Based Learning/Experiential learning:				
Assignments, Quizzes and Seminar, Presentations, Group Discussions, Mini Projects				

Semester:	V	**Course Type:**	AEC		
Course Title: Data Security & Privacy					
Course Code:	**23ISAE52**		**Credits:**		1
Teaching Hours/Week (L: T: P: O)			1:0:0:0	**Total Hours:**	15
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	2

Pre-requisite: Basic understanding of computer networks, cryptography, and cybersecurity concepts. Familiarity with programming and fundamental encryption techniques is recommended.

I. Course Objectives:

- Explain standard algorithms used to provide confidentiality, integrity and authenticity for data.
- Distinguish key distribution and management schemes.
- Deploy encryption techniques to secure data in transit across data networks.
- Implement security applications in the field of Information technology. Illustrate data privacy.

II. Teaching-Learning Process (General Instructions):

The following are some of the strategies that teachers can employ to facilitate the achievement of various course outcomes:

1. **Diverse Teaching Methods**: Instead of relying solely on traditional lecture methods, can explore alternative and effective teaching approaches. These might include interactive discussions, hands-on activities, or multimedia presentations.
2. **Visual Aids**: Utilize videos and animations to elucidate complex concepts. Visual representations enhance understanding and engagement among students.
3. **Collaborative Learning**: Encourage group learning within the classroom. Collaborative activities foster teamwork, communication, and a deeper grasp of subject matter.
4. **Higher Order Thinking (HOT) Questions**: Pose at least three thought-provoking questions during class. These questions stimulate critical thinking and encourage students to analyze and evaluate information.
5. **Problem-Based Learning (PBL):** Implement PBL, which nurtures analytical skills. PBL goes beyond rote memorization by challenging students to design solutions, evaluate evidence, and think critically.
6. **Multiple Representations**: Introduce topics using various representations. Visuals, diagrams, and real-world examples cater to diverse learning styles.
7. **Creative Problem Solving**: Present different approaches to solving the same problem. Encourage students to think outside the box and devise their own innovative solutions.
8. **Real-World Application**: Discuss how each concept relates to practical scenarios. Connecting theoretical knowledge to real-world contexts enhances students' comprehension and retention.

□ Chalk & Talk □ Stud. Assignment □ Web Resources □ LCD/Smart Boards □ Stud. Seminars

III. Course Content

Module-1: Classical Encryption Techniques	3 Hrs
Classical Encryption Techniques: Symmetric Cipher Model, Cryptography, Cryptanalysis and Brute-Force Attack, Substitution Techniques, Caesar Cipher, Monoalphabetic Cipher, Playfair Cipher, Hill Cipher, Poly alphabetic Cipher, One Time Pad. **Text Book1: Chapter 3, Chapter 4**	
RBT Levels: L1, L2, L3	
Module-2: Block Ciphers and the data encryption standard	3 Hrs
Block Ciphers and thedata encryption standard: Traditional block Cipher structure, stream Ciphers and block Ciphers, Motivation for the feistel Cipher structure, the feistily Cipher, The data encryption standard, DES encryption, DES decryption **Text Book1: Chapter 3, Chapter 4**	
RBT Levels: L1, L2,L3	
Module-3: Public-Key Cryptography and RSA	3 Hrs
Public-Key Cryptography and RSA: Principles of public-key cryptosystems. Public-key cryptosystems. Applications for public-key cryptosystems, requirements for publickey cryptosystems. Public-key cryptanalysis. The RSA algorithm, description of the algorithm, computational aspects, the security of RSA. **Textbook 1: Chapter 9, Chapter 10**	
RBT Levels: L1, L2, L3	
Module-4: An Introduction to privacy preserving data mining	3 Hrs
An Introduction to privacy preserving data mining: Privacy-Preserving Data Mining Algorithms, The Randomization Method, Group Based Anonymization. **Textbook 2: Chapter 1 -1.1 Chapter 2 - 2.2**	
RBT Levels: L1, L2, L3	
Module-5: Distributed Privacy	3 Hrs
Distributed Privacy: Preserving Data Mining, Privacy-Preservation of Application Results, Limitations of Privacy: The Curse of Dimensionality, Applications of PrivacyPreserving Data Mining **Textbook 2: Chapter 2 - 2.4, 2.5**	
RBT Levels: L1, L2, L3	

IV. Course Outcomes

CO1	Analyze the vulnerabilities in any computing system and hence be able to design a securitysolution.
CO2	Identify the security issues in the network and resolve it
CO3	Evaluate security mechanisms using rigorous approaches, including theoretical.
CO4	Describe importance of data privacy, limitations and 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
CO1		2		2									1	
CO2	3													
CO3		1	1	2										
CO4	3												1	1

VI. Assessment Details (CIE & SEE)

General Rules: Refer Annexure-1 section 5

Continuous Internal Evaluation (CIE): Refer Annexure-1 section 5

Semester End Examination (SEE): Refer Annexure-1 section 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	Cryptography and Network Security	William Stallings	7th edition	Pearson
2	Privacy Preserving Data Mining: Models and Algorithms	Charu C. Aggarwal, Philip S Yu, Kluwer	2008, ISBN 978-0-387-70991-8, DOI 10.1007/978-0-387- 70992-5	Academic Publishers,

VII(b): Reference Books:

1	Cryptography and Network Security	Atul Kahate,	4th Edition	McGraw Hill Education
2	Cryptography and Information Security	V K Pachghare	2nd edition	PHI

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

- https://crypto.stanford.edu/
- https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-857-computer-and-network-security-fall-2014/
- https://www.coursera.org/learn/data-privacy
- https://www.coursera.org/learn/data-privacy
- https://www.youtube.com/watch?v=ZDnShu5V99s

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

Assignments, Quizzes and Seminar, Presentations, Group Discussions, Mini Projects

Semester:	**V**	**Course Type:**	**AEC**		
Course Title: UI/UX					
Course Code:	**23ISAE53**		**Credits:**		**1**
Teaching Hours/Week (L:T:P:O)			**1:0:0:0**	**Total Hours:**	**15**
CIE Marks:	**50**	**SEE Marks:**	**50**	**Total Marks:**	**100**
SEE Type:	**Theory**			**Exam Hours:**	**2**

Pre-requisite: Basic knowledge of design principles, human-computer interaction, and user research methods. Familiarity with prototyping tools and design thinking concepts is recommended.

I. Course Objectives:

- To study the concept of menus, windows, interfaces
- To study about business functions
- To study the characteristics and components of windows and the various controls for the windows.
- To study about various problems in windows design with colour, text, graphics
- To study the testing methods

II. Teaching-Learning Process (General Instructions):

These are sample Strategies, which teacher 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), whi ch 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.

□ Chalk & Talk □ Stud. Assignment □ Web Resources □ LCD/Smart Boards □ Stud. Seminars

III. Course Content	
Module-1	3 Hrs
The User Interface-Introduction, Overview, The importance of user interface Defining the user interface, The importance of Good design, Characteristics of graphical and web user interfaces, Principles of user interface design **Textbook: Ch.1,2**	
RBT Levels:L1,L2	
Module-2	3 Hrs
The User Interface Design process- Obstacles, Usability, Human characteristics in Design, Human Interaction speeds, Business functions-Business definition and requirement analysis, **Textbook: Part 2**	
RBT Levels: L1,L2	
Module-3	3 Hrs
System menus and navigation schemes- Structures of menus, Functions of menus, Contents of menus, Formatting of menus, Phrasing the menu, Selecting menu choices,Kinds of graphical menus. **Textbook:Part 2**	
RBT Levels: L1,L2,L3	
Module-4	3 Hrs
Windows - Characteristics, Components of window, Window presentation styles, Types of window, Window management, Organizing window functions, Window operations **Textbook: Part 2**	
RBT Levels: L1,L2,L3	
Module-5	3 Hrs
Screen based controls- Operable control, Text control, Selection control, Custom control, kinds of tests. **Textbook: Part 2**	
RBT Levels: L1,L2,L3	

IV. Course Outcomes	
CO1	Understand importance and characteristics of user interface design
CO2	Apply user interface design process on business functions
CO3	Demonstrate system menus, navigation schemes and windows characteristics
CO4	Analyse screen-based controls and device-based controls
CO5	Design the prototypes and test plans of 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
CO1	3	2	1										1	
CO2	2	3	3	2	1								1	
CO3	2	3	2	3	2	1							1	
CO4	3	3	3	2	2								1	
CO5	3	3	3	3	3	2	1						1	

VI. Assessment Details (CIE & SEE)

General Rules: Refer Annexure 1: Section 5

Continuous Internal Evaluation (CIE): Refer Annexure 1: Section 5

Semester End Examination (SEE): Refer Annexure 1: Section 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.	"The Essential Guide to User Interface Design"	Wilbert O, Galitz	Third Edition 2007	Wiley Publishing,Inc.
VII(b): Reference Books:				
1.	"Design the User Interface"	Ben Sheiderman	1998	Pearson Education
2.	" The Essential of User Interface Design"	Alan Cooper	2002	Wiley-Dream Tech Ltd
VII(c): Web links and Video Lectures (e-Resources):				
1. https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-ar10/ 2. https://www.vtupulse.com/cbcs-cse-notes/17cs832-user-interface-design-uid-notes/ 3. https://www.brainkart.com/subject/User-Interface-Design_145/ 4. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-831-userinterface-design-and-implementation-spring-2011/lecture-notes/ 5. https://lecturenotes.in/download/material/21405-user-interface-design				
VIII: Activity Based Learning / Practical Based Learning/Experiential learning:				
Assignments, quiz, self-study activities, group discussions, etc				

Semester:	**V**	**Course Type:**	AEC		
Course Title: Capacity Planning For IT					
Course Code:	**23ISAE54**		**Credits:**		**1**
Teaching Hours/Week (L:T:P:O)			**1:0:0:0**	**Total Hours:**	**15**
CIE Marks:	**50**	**SEE Marks:**	**50**	**Total Marks:**	**100**
SEE Type:	Theory			**Exam Hours:**	**2**

Pre-requisite: Students should have basic knowledge of computer systems, networking, and operating systems. Familiarity with cloud computing, virtualization, and system performance monitoring is recommended.

I. Course Objectives:

- Understand requirement and measurements for capacity planning, measurement and monitoring.
- Measurement of data for prediction towards the planning process.
- Understand concepts related to deployment, installation, configuration, and management.
- Role of virtualization and cloud services in capacity planning.

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 the 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 Case study Based Learning (CBL), which fosters students' analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyse information rather than simply recall it.

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

□ Chalk & Talk □ Stud. Assignment □ Web Resources □ LCD/Smart Boards □ Stud. Seminars

III. Course Content

Module-1:	3 Hrs

Goals, Issues, and Processes: capacity planning, Quick and Dirty Math, Predicting When Your Systems Will Fail, Make Your System Stats Tell Stories, Buying Stuff: Procurement Is a Process, Performance and Capacity: Two Different Animals, The Effects of Social Websites and Open

APIs. **Setting Goals for Capacity**: Different Kinds of Requirements and Measurements, Architecture Decisions **Textbook: Ch.1,2**
RBT Levels:L1,L2
Module-2: 3 Hrs
Measurement: Units of Capacity: Aspects of Capacity Tracking Tools, Applications of Monitoring. **Textbook:Ch.3.1,3.2**
RBT Levels: L1,L2
Module-3: 3 Hrs
Measurement: API Usage and Its Effect on Capacity, Examples and Reality. **Predicting Trends**: Riding Your Waves. **Textbook:Ch.3.3,3.4,Ch.4.1**
RBT Levels: L1,L2,L3
Module-4: 3 Hrs
Predicting Trends: Procurement, The Effects of Increasing Capacity, Long-Term Trends, Iteration and Calibration. **Deployment:** Automated Deployment Philosophies, Automated Installation Tools, Automated Configuration. **Textbook:Ch.4.2,4.3,4.4,4.5,Ch.5**
RBT Levels: L1,L2,L3
Module-5: 3 Hrs
Virtualization and Cloud Computing: Virtualization, Cloud Computing, Computing Resource Evolutions, Mixed Definitions, Cloud Capacity, Use it or lose it (your wallet),Measuring the clouds, Cloud Case Studies, Cloud Use Case: Anonymous Desktop Software Company **Textbook**: Appendix A
RBT Levels: L1,L2,L3

IV. Course Outcomes

CO1	Identify the requirement and measurements for capacity planning by considering the goal, issues, and processes.
CO2	Explain capacity measurement and monitoring
CO3	Make use of measurement data for prediction towards overall planning process.
CO4	Explain the concepts related to deployment, installation, configuration, and management
CO5	Demonstrate how the virtualization and cloud services fit into a capacity plan.

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
CO1	3	3	2	2	2	1				1		1	2	
CO2	3	3	2	2	3	1				1		1	2	
CO3	3	3	3	3	3	2	1			1		2	2	
CO4	3	3	2	2	3	1				1		1	2	
CO5	3	3	3	3	3	2	1			1		2	2	

VI. Assessment Details (CIE & SEE)				
General Rules: Refer Annexure 1 Section 5				
Continuous Internal Evaluation (CIE): Refer Annexure 1 Section 5				
Semester End Examination (SEE): Refer Annexure 1 Section 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.	The Art of Capacity Planning	John Allspaw	2008	O'Reilly
VII(b): Reference Books:				
1.	Maynard's Industrial and Systems Engineering Handbook	Bopaya M. Bidanda	6th Edition,2023	McGraw Hill
VII(c): Web links and Video Lectures (e-Resources):				
1. https://www.youtube.com/watch?v=w0cD26CLBA0 2. https://www.youtube.com/watch?v=5-hhfBXykec 3. https://www.youtube.com/watch?v=9e4IohiFmZ8&t=63s 4. https://www.youtube.com/watch?v=qj4ziswxupE 5. https://www.youtube.com/watch?v=jTW79ofC6Go 6. https://www.youtube.com/watch?v=_pPlanX5wQY				
VIII: Activity Based Learning / Practical Based Learning/Experiential learning:				
Tool demonstration, Assignments, quiz, self-study activities, group discussions, etc				

6th Semester

Semester:	VI	**Course Type:**	PCC		
Course Title: Machine Learning					
Course Code:	**23IST601**			**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

Pre-requisite: A solid foundation in Mathematics (Linear Algebra, Probability and Statistics) and Programming skills (especially Python or R).

I. Course Objectives

Students Will be able to:

- Define machine learning and understand the basic theory underlying machine learning.
- Differentiate supervised, unsupervised and reinforcement learning.
- Apply the knowledge of machine learning algorithms such as Regression, Decision Trees, Bayesian Models and Clustering.
- Model and evaluate machine learning solutions for different types of problems.

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 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 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.

III. COURSE CONTENT

Module-1	**8Hrs**

Introduction: Need for Machine Learning, Machine Learning Explained, Machine Learning in Relation to other Fields, Types of Machine Learning, Challenges of Machine Learning, Machine Learning Process, Machine Learning Applications.

Understanding Data – 1: Big Data Analysis Framework, Descriptive Statistics, Univariate Data Analysis and Visualization.

Textbook 1: Chapter 1, Chapter 2: Sections: 2.3 – 2.5

RBT Level: L1, L2, L3

Module-2	8 Hrs
Understanding Data – 2: Bivariate Data and Multivariate Data, Multivariate Statistics, Essential Mathematics for Multivariate Data. **Basic Learning Theory**: Design of Learning System, Introduction to Concept of Learning.	
Textbook 1: Chapter 2: Sections: 2.6. – 2.8, Chapter 3: Sections: 3.3,3.4	
RBT Level: L1, L2, L3	
Module-3	**8 Hrs**
Similarity-based Learning: Nearest-Neighbour Learning, Weighted K-Nearest-Neighbor Algorithm, Nearest Centroid Classifier, Locally Weighted Regression (LWR). **Regression Analysis**: Introduction to Regression, Introduction to Linearity, Correlation and Causation, Introduction to Linear Regression, Multiple Linear Regression, Polynomial Regression, Logistic Regression.	
Textbook 1: Chapter 4: Sections: 4.2 – 4.5, Chapter 5: Sections: 5.1 – 5.3, 5.5 – 5.7	
RBT Level: L1, L2, L3	
Module-4	**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, Naïve Bayes Algorithm for Continuous Attributes.	
Textbook 1: Chapter 6: Sections: 6.1, 6.2, Chapter 8: Sections: 8.1 – 8.4	
RBT Level: L1, L2, L3	
Module-5	**8 Hrs**
Clustering Algorithms: Introduction to Clustering Approaches, Proximity Measures, Hierarchical Clustering Algorithms, Partitional Clustering Algorithm, Density-based Methods, Grid-based Approach.	
Textbook 1: Chapter 13: Sections: 13.1-13.6	
RBT Level: L1, L2, L3	

IV. COURSE OUTCOMES

CO1	Describe the machine learning techniques, their types and data analysis framework.
CO2	Demonstrate Mathematical Competence for Multivariate Data.
CO3	Develop similarity-based learning models and regression models for solving classification and prediction tasks.
CO4	Build probabilistic learning models.
CO5	Apply various clustering approaches to group data effectively.

V. CO-PO-PSO MAPPING

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

VI. Assessment Details (CIE & SEE)				
General Rules: Refer Annexure-1 , Section 1				
Continuous Internal Evaluation (CIE): Refer Annexure-1 , Section 1				
Semester End Examination (SEE): Refer Annexure-1 , 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	Machine Learning	S Sridhar, M Vijayalakshmi	2021, First Edition	OXFORD University Press 2021
VII(b): Reference Books				
1	Machine Learning	Murty, M. N., and V. S. Ananthanarayana	2024	Universities Press
2	Machine Learning	T. M. Mitchell	1997	McGraw Hill
VII(c): Web links and Video Lectures (e-Resources):				
• 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				
VIII: Activity Based Learning / Practical Based Learning/Experiential learning:				
• Student presentation, Interactive Quiz and Group discussion.				

Semester:	**VI**	**Course Type:**	IPCC		
Course Title: Software Testing & Automation					
Course Code:	**23ISI602**		**Credits:**		4
Teaching Hours/Week (L: T: P: O)			3:0:2: 0	**Total Hours:**	40 + 10 to 12 Lab Slots
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	03

Pre-requisite: Understand the software development process and methodology, Different types of testing and the purposes, Different types of tools and technologies.

I. Course Objectives:

- Explain different testing techniques.
- Differentiate the various testing techniques.
- Apply suitable technique for designing flow graphs.
- Analyze the problem and derive suitable test cases.

II. Teaching-Learning Process (General Instructions):

The following are some of the strategies that teachers can employ to facilitate the achievement of various course outcomes:

1. **Diverse Teaching Methods**: Instead of relying solely on traditional lecture methods, can explore alternative and effective teaching approaches. These might include interactive discussions, hands-on activities, or multimedia presentations.
2. **Visual Aids**: Utilize videos and animations to elucidate complex concepts. Visual representations enhance understanding and engagement among students.
3. **Collaborative Learning**: Encourage group learning within the classroom. Collaborative activities foster teamwork, communication, and a deeper grasp of subject matter.
4. **Higher Order Thinking (HOT) Questions**: Pose at least three thought-provoking questions during class. These questions stimulate critical thinking and encourage students to analyze and evaluate information.
5. **Problem-Based Learning (PBL):** Implement PBL, which nurtures analytical skills. PBL goes beyond rote memorization by challenging students to design solutions, evaluate evidence, and think critically.
6. **Multiple Representations**: Introduce topics using various representations. Visuals, diagrams, and real-world examples cater to diverse learning styles.
7. **Creative Problem Solving**: Present different approaches to solving the same problem. Encourage students to think outside the box and devise their own innovative solutions.
8. **Real-World Application**: Discuss how each concept relates to practical scenarios. Connecting theoretical knowledge to real-world contexts enhances students' comprehension and retention.

□ Chalk & Talk □ Stud. Assignment □ Web Resources □ LCD/Smart Boards □ Stud. Seminars

III. Course Content	
III (a). THEORY PART	
Module-1: Basics of Software Testing	8 Hrs
Basics of Software Testing: Basic definitions, Software Quality, Requirements Behavior and Correctness, Correctness versus Reliability, Testing and Debugging, Test Cases, Insights from a Venn Diagram, Identifying Test Cases, Test-generation Strategies, Test Metrics, Error and fault taxonomies, Levels of testing, Testing and Verification, Static Testing.	
Textbook 3: Chapter 1:1.2 - 1.5, 3; Textbook 1: Chapter 1	
RBT Levels: L1, L2, L3	
Module-2: Problem Statements	8 Hrs
Problem Statements: Generalized pseudocode, the Triangle problem, the NextDate function, the Commission problem, the SATM (Simple Automatic Teller Machine) problem, the Currency converter, Saturn windshield wiper. **Functional Testing:** Boundary value analysis, Robustness testing, Worst-case testing, Robust Worst testing for triangle problem, NextDate problem and commission problem, Equivalence classes, Equivalence test cases for the triangle problem, NextDate function, and the commission problem, Guidelines and observations, Decision tables, Test cases for the triangle problem, NextDate function, and the commission problem, Guidelines and observations. Special Value Testing, Examples, Random Testing, Guidelines.	
Textbook1: Chapter 2,5,6,7, Textbook2: Chapter 3	
RBT Levels: L1, L2,L3	
Module-3: Fault Based Testing	8 Hrs
Fault Based Testing: Overview, Assumptions in fault-based testing, Mutation analysis, Fault-based adequacy criteria, Variations on mutation analysis. **Structural Testing:** Overview, Statement testing, Branch testing, Condition testing, Path testing: DD paths, Test coverage metrics, Basis path testing, guidelines and observations, Dataflow testing: Definition-Use testing, Slice based testing, Guidelines and observations.	
Textbook2:Chapter 16,12 Textbook1:Chapter 9,10	
RBT Levels: L1, L2, L3	
Module-4: Test Execution	8 Hrs
Test Execution: Overview of test execution, from test case specification to test cases, Scaffolding, Generic versus specific scaffolding, Test oracles, Self-checks as oracles, Capture and Replay. **Process Framework:** Basic principles: Sensitivity, redundancy, restriction, partition, visibility, Feedback, the quality process, Planning and monitoring, Quality goals, Dependability properties, Analysis Testing, Improving the process, Organizational factors. **Planning and Monitoring the Process:** Quality and process, Test and analysis strategies and plans, Risk planning, monitoring the process, Improving the process, the quality team.	
Textbook2: Chapter 17,20	
RBT Levels: L1, L2, L3	
Module-5: Integration and Component-Based Software Testing	8 Hrs
Integration and Component-Based Software Testing: Overview, Integration testing strategies, Testing components and assemblies. System, Acceptance and Regression Testing: Overview, System testing, Acceptance testing, Usability, Regression testing, Regression test selection techniques, Test case prioritization and selective execution. **Levels of Testing, Integration Testing:** Traditional view of testing levels, Alternative life-cycle models, The SATM system, Separating integration and system testing, A closer look at the SATM system, Decomposition-based, call graph-based, Path-based integrations.	

Textbook2: Chapter 21,22, Textbook1 : Chapter 12,13

RBT Levels: L1, L2, L3

III(b). Practical Part

Sl. No.	Programs
1.	Design and develop a program in a language of your choice to solve the triangle problem defined as follows: Accept three integers which are supposed to be the three sides of a triangle and determine if the three values represent an equilateral triangle, isosceles triangle, scalene triangle, or they do not form a triangle at all. Assume that the upper limit for the size of any side is 10. Derive test cases for your program based on boundary-value analysis, equivalence class partitioning and decision-table approach and execute the test cases and discuss the results.
2.	Design, develop, code and run the program in any suitable language to implement the NextDate function. Analyze it from the perspective of equivalence class value testing, derive different test cases, execute these test cases and discuss the test results.
3.	Design, develop, code and run the program in any suitable language to solve the commission problem. Analyze it from the perspective of boundary value testing & decision table-based testing, derive different test cases, execute these test cases and discuss the test results.
4.	Design, develop, code and run the program in any suitable language to solve the commission problem. Analyze it from the perspective of dataflow testing, derive different test cases, execute these test cases and discuss the test results.
5.	Design, develop, code and run the program in any suitable language to implement the binary search algorithm. Determine the basis paths and using them derive different test cases, execute these test cases and discuss the test results.

III. Course Outcomes

CO1	Identify test cases for any given problem.
CO2	Compare the different testing techniques.
CO3	Classify the problems according to a suitable testing model
CO4	Apply the appropriate technique for the design of flow graph.
CO5	Create appropriate document for the software artifact.

IV. 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
CO1	1	1											1	
CO2	2	1	2		2								2	
CO3	2	2											2	
CO4	3	1							1	1			2	
CO5	2	1												

V. Assessment Details (CIE & SEE)

General Rules: Refer Annexure-1 section 2

Continuous Internal Evaluation (CIE): Refer Annexure-1 section 2

Semester End Examination (SEE): Refer Annexure-1 section 2

VI. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Software Testing, A Craftsman‟s Approach	Paul C. Jorgensen	Auerbach Publications	3rd Edition 2008.
2	Software Testing and Analysis -Process, Principles and Techniques	Mauro Pezze, Michal Young	Wiley India	2009.
3	Foundations of Software Testing	Aditya P Mathur	Pearson Education	2008.

VII(b): Reference Books:

1	Software testing Principles and Practices	Gopalaswamy Ramesh, Srinivasan Desikan	Pearson	2nd Edition 2007.
2	Software Testing	Ron Patton	Pearson Education	2004.
3	The Craft of Software Testing	Brian Marrick	Pearson Education	1995.
4	Software Quality Assurance, Testing and Metrics	Anirban Basu	PHI	2015.
5	Software Testing	Naresh Chauhan	Oxford University press.	-

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

1. https://nptel.ac.in/courses/106/105/106105150/
2. https://onlinecourses.nptel.ac.in/noc19_cs71/preview
3. https://www.youtube.com/watch?v=OGImfxO2TEU&t=10s
4. https://www.youtube.com/watch?v=Q50ZyydS7pI
5. VTU e-Shikshana Program
6. VTU EDUSAT Program

Tutorial Link:

1. https:// www.javatpoint.com/selenium-tutorial
2. Introduction to Selenium - https://www.youtube.com/watch?v=FRn5J31eAMw

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

1. Flip class
2. Role play/Team Demonstration/Collaborative Activity
3. Mini Project
4. Case study
5. Learn by Doing

Semester:	VI	**Course Type:**	PCCL		
Course Title: Machine Learning Lab					
Course Code:	**23ISL603**			**Credits:**	1
Teaching Hours/Week (L:T:P:O)			0:0:2:0	**Total Hours:**	10 to 12 Lab Slots
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Practical			**Exam Hours:**	3

Pre-requisite: A solid foundation in Mathematics (Linear Algebra, Probability and Statistics) and Programming skills (especially Python or R).

I. Course Objectives:

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

- Visualize univariate, bivariate, and multivariate data using statistical techniques and dimensionality reduction.
- Understand various machine learning algorithms such as similarity-based learning, regression, decision trees, and clustering.
- Build probability-based models and develop the skills required for decision-making in dynamic environments.

II. Teaching-Learning Process (General Instructions):

- List of problems for which students should develop and execute programs in the laboratory using Python.
- Encourage collaborative (Group Learning) Learning in the Lab.
- Show the different ways to solve the same problem with different logic and encourage the students to come up with their own creative ways to solve them.

III. Practical Part

Sl. No.	Experiments
1	Develop a program to create histograms for all numerical features and analyse 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 pairwise 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 Find-S algorithm to output a description of the set of all hypotheses consistent with the training examples.
4	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. 1. Label the first 50 points {x1,……,x50} as follows: if (xi ≤ 0.5), then xi ∈ Class1,

	else xi ∈ Class1 2. Classify the remaining points, x51,……,x100 using KNN. Perform this for k=1,2,3,4,5,20,30
5	Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs
6	Develop a program to demonstrate the working of Linear Regression. Use Boston Housing Dataset for Linear Regression.
7	Develop a program to demonstrate the working of Polynomial Regression. Use Auto MPG Dataset (for vehicle fuel efficiency prediction).
8	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.
9	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
10	Develop a program to implement k-means clustering using Wisconsin Breast Cancer data set and visualize the clustering result.

Instructions for conduction of practical part:

- **LAB Activities**:Conduct laboratory exercise ,prepare lab reports, observation and analyze results, perform lab tests, and work on design and implementation tasks
- **Experimental Learning**: Students will be evaluated based on their creativity and practical problem- solving skills.This includes program-specific requirements and video-based seminars, presentations.

IV. Course Outcomes

CO1	Implement Basic Python Functions
CO2	Develop decision trees for classification and regression problems, and Bayesian models for probabilistic learning.
CO3	Create similarity-based learning methods and perform regression analysis
CO4	Apply the clustering algorithms to share computing resources.

V.CO-PO-PSO Mapping

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

VI. Assessment Details (CIE & SEE)

General Rules: Refer Annexure 1 - Section 4

Continuous Internal Evaluation (CIE): Refer Annexure – 1 Section 4

Semester End Examination (SEE): Refer Annexure - 1 Section 4

VII. Learning Resources

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

- https://www.universitiespress.com/resources?id=9789393330697)
- https://www.w3schools.com/python/python_ml_getting_started.asp
- https://www.geeksforgeeks.org/machine-learning/

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

- For the above experiments, the following pedagogical approaches can be considered: Problem-based learning and MOOCs.

Professional Elective Course-2

Semester:	VI	**Course Type:**	PEC		
Course Title: File Structures					
Course Code:	**23ISP621**		**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

Pre prerequisite: A basic understanding of file operations, including reading, writing, and managing files in different formats, is essential. Familiarity with data structures such as arrays, linked lists, trees (B-Trees, B+ Trees), and hashing techniques is required. Additionally, knowledge of file organization methods, indexing techniques, collision resolution in hashing, and concepts like sequential and multi-level indexing will be beneficial.

I.Course Objectives:

- Explain the fundamentals of file structures and their management.
- Measure the performance of different file structures.
- Organize different file structures in the memory.
- Demonstrate hashing and indexing techniques.

II.Teaching-LearningProcess (General Instructions):

- Assignments and quizzes, anddocumentingstudents' progress
- Encouragethestudents forgrouplearningtoimprovetheircreativeandanalytical skills.
- Showshortvideo lecturesinthefollowingways:
  - Asanintroductionto newtopics (pre-lectureactivity).
  - Asarevision oftopics (post-lecture activity).
- Supportand guidethestudentsforself–study.

III.Course Content

Module-1: 8 Hours

Introduction: Fundamental File Operations: Physical Files and Logical Files, Opening Files, Closing Files, Reading and Writing, Seeking, Special Characters, The Unix Directory Structure, Physical devices and Logical Files, File-related Header Files, UNIX file System Commands; Secondary Storage and System Software: Disks, Magnetic Tape, Disk versus Tape; CD-ROM: Introduction, A journey of a Byte, Buffer Management, Input /Output in UNIX.
Fundamental File StructureConcepts, Managing Files of Records: Field and RecordOrganization, Using Classes to Manipulate Buffers, Using Inheritance for Record BufferClasses, Managing Fixed Length, Fixed Field Buffers, An Object-Oriented Class for RecordFiles, Record Access, More about Record Structures, File Access and File Organization.

Textbook: Textbook-1, Chapter: 1, 2 and 3

RBT Levels: L1, L2 and L3

Module-2:	8 Hours
Organization of Files for Performance, Indexing: Data Compression, Reclaiming Space in files, Internal Sorting and Binary Searching, Key sorting; What is an Index? A Simple Index for Entry-Sequenced File, Object-Oriented support for Indexed, Entry-Sequenced Files of Data Objects, Indexes that are too large to hold in Memory, indexing to provide access by Multiple keys, Retrieval Using Combinations of Secondary Keys, Improving the Secondary Index structure: Inverted Lists, Selective indexes, Binding.	
Textbook: Textbook-1, Chapter:6 and 7	
RBT Levels: L1, L2 and L3	
Module-3:	8 Hours
Consequential Processing and the Sorting of Large Files: A Model for ImplementingConsequential Processes, Application of the Model to a General Ledger Program, Extension ofthe Model to include Multiway Merging, A Second Look at Sorting in Memory, Merging as aWay of Sorting Large Files on Disk. **Multi-Level Indexing and B-Trees**: The invention of B-Tree, Statement of the problem,Indexing with Binary Search Trees; Multi-Level Indexing, B-Trees, Example of Creating aB-Tree, An Object-Oriented Representation of B-Trees, B-Tree Methods; Nomenclature,Formal Definition of B-Tree Properties, Worst-case Search Depth, Deletion, Merging and Redistribution, Redistribution during insertion; B* Trees, Buffering of pages; Virtual B-Trees; Variable-length Records and keys.	
Textbook: Textbook-1, Chapter:8 and 9	
RBT Levels: L1, L2 and L3	
Module-4:	8 Hours
Indexed Sequential File Access and Prefix B + Trees: Indexed Sequential Access, Maintaining a Sequence Set, Adding a Simple Index to the Sequence Set, The Content of the Index: Separators Instead of Keys, The Simple Prefix B+ Tree and its maintenance, Index Set Block Size, Internal Structure of Index Set Blocks: A Variable-order B- Tree, Loading a Simple Prefix B+ Trees, B-Trees, B+ Trees and Simple Prefix B+ Trees in Perspective.	
Textbook: Textbooks-1, Chapter:10	
RBT Levels: L1, L2and L3	
Module-5:	8 Hours
Hashing: Introduction, A Simple Hashing Algorithm, Hashing Functions and Record Distribution, how much Extra Memory should be used? Collision resolution by progressive overflow, Buckets, Making deletions, other collision resolution techniques, Patterns of record access.	
Textbook: Textbook-1, Chapter:11	
RBTLevels: L1, L2and L3	

IV. CourseOutcomes

CO1	Describe fundamental concept of file structure.
CO2	Identify the various ways of organization & manipulation of data on secondary storage.
CO3	Analyze the reclaiming techniques, conceptual processing & sorting of large files for performance.
CO4	Develop Indexing techniques such as AVL, B-Tree, B+ Tree.
CO5	Design and develop programs for solving various file structure management 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
CO1	2	2												
CO2	2	2											1	
CO3	2	2											1	
CO4			2				1						1	
CO5		2	2		2			2	2	2		2	2	

VI. Assessment Details (CIE&SEE)

General Rules: Refer Annexure1 Section-1

Continuous Internal Evaluation (CIE): Refer Annexure 1Section1

Semester End Examination (SEE): Refer Annexure 1 Section1

VII. Learning Resources

VII(a): Textbooks

Sl. No.	Title ofthe Book	Name of the author	Name of the publisher	Edition and Year
1	File Structures-An Object-Oriented Approach with C++	Michael J. Folk, Bill Zoellick, Greg Riccardi	Pearson Education	3rd Edition,2006

VII(b): ReferenceBooks

1	Database Management Systems	Raghu Ramakrishan and Johannes Gehrke	McGraw Hill	3rdEdition,2003

VIII:ActivityBased Learning

Quiz, Presentation and Group discussion

Semester:	**VI**	**Course Type:**	PEC		
Course Title: Cloud Computing and Applications					
Course Code:	**23ISP622**		**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

Pre-requisites : Knowledge of programming Networking, Operating systems**.**

I. Course Objectives:

- Introduce the rationale behind the cloud computing revolution and the business drivers
- Introducing various models of cloud computing
- Introduction on how to design cloud native applications, the necessary tools and the design tradeoffs.
- Realize the importance of Cloud Virtualization, Abstraction`s and Enabling Technologies and cloud 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. Chalk and board, power point presentations
2. Online material (Tutorials) and video lectures.

III. Course Content

Module-1:Introduction	**8 Hours**
Introduction: Introduction, Cloud Computing at a Glance, Historical Developments, Building Cloud Computing Environments, Amazon Web Services (AWS), Google AppEngine, Microsoft Azure, Hadoop, Force.com and Salesforce.com, Manjorasoft Aneka.	
Textbook 1: Chapter 1: Sections1.1,1.2 and 1.3	
RBT Levels: L1,L2	
Module-2: Virtualization	**8 Hours**
Virtualization: Introduction, Characteristics of Virtualized, Environments Taxonomy of Virtualization Techniques, Execution Virtualization, Other Types of Virtualization, Virtualization and Cloud Computing, Pros and Cons of Virtualization, Technology Examples.	
Textbook 1: Chapter 3: Sections3.1 to 3.6	
RBT Levels: L1,L2	
Module-3: Cloud Computing Architecture	**8 Hours**
Cloud Computing Architecture: Introduction, Cloud Reference Model, Types of Clouds, Economics of the Cloud, Open Challenges.	
Textbook 1: Chapter 4: Sections4.1 to 4.5	
RBT Levels: L1,L2	

Module-4: Cloud Security	**8 Hours**
Cloud Security: Risks, Top concern for cloud users, privacy impact assessment, trust, OS security, VM Security, Security Risks posed by shared images and management OS.	
Textbook 2: Chapter 9: Sections9.1 to 9.6, 9.8, 9.9	
RBT Levels: L1,L2	
Module-5: Cloud Platforms in Industry Amazon web services and Cloud Applications	**8 Hours**
Cloud Platforms in Industry Amazon web services: - Compute services, Storage services, Communication services, Additional services. Google AppEngine: - Architecture and core concepts, Application life cycle, Cost model, Observations. **Cloud Applications**: Scientific applications: - HealthCare: ECG analysis in the cloud, Biology: gene expression data analysis for cancer diagnosis, Geoscience: satellite image processing. Business and consumer applications: CRM and ERP, Social networking, media applications.	
Textbook 1: Chapter 9: Sections 9.1 to 9.2, Chapter 10: Sections10.1 to 10.2.	
RBT Levels: L1, L2, L3.	

IV. Course Outcomes

Students will be able to

CO1	Comprehend and analyze various cloud computing platforms and service provider.
CO2	Illustrate various virtualization concepts.
CO3	Identify the architecture, infrastructure and delivery models of cloud computing.
CO4	Analyze the Security aspects of CLOUD.
CO5	Define platforms for development of cloud 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
CO1	3	2											3	
CO2	3	2		1									3	
CO3	3	3		2									3	
CO4	3	2		2		1		2					3	
CO5	3	2		2						1			3	

VI. Assessment Details (CIE & SEE)

General Rules: Refer Annexure 1-Section 1

Continuous Internal Evaluation (CIE): Refer Annexure 1 - Section 1

Semester End Examination (SEE): Refer Annexure 1 -Section 1

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Name of the publisher	Edition and Year
1	Mastering Cloud Computing	RajkumarBuyya, Christian Vecchiola, and ThamraiSelvi	McGraw Hill Education.	1ST Edition, 2013
2	Cloud Computing Theory and Practice	Dan C. Marinescu	Morgan Kaufmann, Elsevier	2013

VII(b): Reference Books:

1	Cloud Computing: A Practical Approach	Toby Velte, Anthony Velte	McGraw-Hill Osborne Media	2017
2	Cloud Application Architectures: Building Applications and Infrastructure in the Cloud	George Reese	O'Reilly Publication	2011
3	Cloud Computing Explained: Implementation Handbook for Enterprises	John Rhoton	Recursive Press	2010

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

1. https://www.youtube.com/watch?v=1N3oqYhzHv4
2. https://www.youtube.com/watch?v=RWgW-CgdIk0

VIII: Activity Based Learning

- Assignments.
- Mini Projects.
- Presentations.
- Group Discussion.
- Guest Talk.

Semester:	**VI**	**Course Type:**	PEC		
Course Title: Compiler Design					
Course Code:	**23ISP623**		**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
Prerequisite: Basic knowledge of programming languages and data structures and Automata theory					

I. Course Objectives:

- This course introduces compiler design, covering essential components like lexical analysis, parsing, intermediate code generation, and code optimization.
- Students will learn the differences between compilers, interpreters, and assemblers, and explore the phases of a compiler.
- The course addresses intermediate code generation, optimization techniques, and the basics of code generation.

II. Teaching-Learning Process (General Instructions):

. The following are some of the strategies that teachers can employ to facilitate the achievement of various course outcomes:

1. **Diverse Teaching Methods**: Instead of relying solely on traditional lecture methods, can explore alternative and effective teaching approaches. These might include interactive discussions, hands-on activities, or multimedia presentations.
2. **Visual Aids**: Utilize videos and animations to elucidate complex concepts. Visual representations enhance understanding and engagement among students.
3. **Collaborative Learning**: Encourage group learning within the classroom. Collaborative activities foster teamwork, communication, and a deeper grasp of subject matter.
4. **Higher Order Thinking (HOT) Questions**: Pose at least three thought-provoking questions during class. These questions stimulate critical thinking and encourage students to analyse and evaluate information.
5. **Problem-Based Learning (PBL):** Implement PBL, which nurtures analytical skills. PBL goes beyond rote memorization by challenging students to design solutions, evaluate evidence, and think critically.
6. **Multiple Representations**: Introduce topics using various representations. Visuals, diagrams, and real-world examples cater to diverse learning styles.
7. **Creative Problem Solving**: Present different approaches to solving the same problem. Encourage students to think outside the box and devise their own innovative solutions.
8. **Real-World Application**: Discuss how each concept relates to practical scenarios. Connecting theoretical knowledge to real-world contexts enhances students' comprehension and retention.

□ Chalk & Talk □ Student Assignment □ Web Resources □ LCD/Smart Boards □ Student Seminar

III. Course Content

Module-1:Introduction	8 Hrs
Introduction, Language Processors, The structure of Compiler, Evolution of ProgrammingLanguages, Applications of Compiler Technology. Lexical Analysis- The Role of LexicalAnalyzer, Input Buffering, Specifications of Tokens, Recognition of Tokens. **Textbook1:Chapter1: Section 1.1 to 1.3 ,1.5Chapter3: Section 3.1 to 3.4**	
RBT Levels: RBT Levels: L1, L2, L3	
Module-2:Syntax Analysis	8 Hrs
Introduction, Context-free Grammars, Writing a Grammar, Top-down Parsing, Bottom-up Parsing, Introduction to LR Parsing: Simple LR, most powerful LR parsers (Excluding efficient constructionand compaction of parsing tables) **Textbook 1`:Chapter4:Section 4.1 to 4.7**	
RBT Levels: RBT Levels: L1, L2, L3	
Module-3:Syntax Directed Translation	8 Hrs
Lexical –Analyzer and Parser generators Lexical –Analyzer generator Lex, The parser generator YACC **Syntax-Directed Translation** Syntax-Directed Definitions, Evaluation Orders of SDDs, Applications ofSyntax directedTranslation, Syntax directed Translation schemes. **Textbook1: Chapter 3:Section 3.5 Chapter 4: Section 4.9 Chapter5:Section 5.1 to 5.4**	
RBT Levels: RBT Levels: L1, L2, L3	
Module-4:Intermediate Code Generation	8 Hrs
INTERMEDIATE CODE GENERATION: Variants of Syntax Trees, Three-address Code; Types and declarations, Translation of expressions, Type checking; Control flow. **Textbook1:Chapter 6:section 6.1 to 6.6**	
RBT Levels: RBT Levels: L1, L2, L3	
Module-5: Code Generation	8 Hrs
Code Generation: Issues in the Design of a Code Generator, The Target Language, Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks. **Textbook1:Chapter 8:sections 8.1 to 8.5**	
RBT Levels: RBT Levels: L1, L2, L3	

IV. Course Outcomes

CO1	Explain the key concepts of compiler design, including lexical analysis, parsing, and code generation
CO2	Create a lexical analyzer and parser for a simple programming language
CO3	Apply optimization techniques to improve intermediate code.
CO4	Generate intermediate code and perform type checking.
CO5	Implement code generation strategies for efficient machine-level code.

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
CO1	3	2											2	
CO2	3		1		3								2	
CO3	3	2		2	2								2	
CO4	3		3	2	2								2	
CO5	3		2		2						2		2	

VI. Assessment Details (CIE & SEE)

General Rules: Refer Annexure1- section 1

Continuous Internal Evaluation (CIE): Refer Annexure 1 –Section 1

Semester End Examination (SEE): Refer Annexure 1 –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	Compilers- Principles, Techniques and Tools	Alfred V Aho, Monica S. Lam, Ravi Sethi, Jeffrey D Ullman	2nd Edition	Addison-Wesley

VII(b): Reference Books:

1	Crafting a Compiler with C	Charles N. Fischer, Richard J. leBlanc, Jr.,	1991	Pearson Education,
2	Modern Compiler Implementation in C	Andrew W	1997	Apple Cambridge University Press
3	Compiler Construction Principles & Practice	Kenneth C Louden	1997	Thomson Education

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

- https://www.geeksforgeeks.org/compiler-design/
- https://www.youtube.com/watch?v=O3IHF7TZhT4
- https://www.coursera.org/learn/compilers
- https://www.youtube.com/watch?v=F3Ue_LM_Jq0
- https://www.cs.princeton.edu/~appel/modern/c/

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

Assignments, Quizzes and Seminar Presentation, mini projects, group discussions, etc.

Semester:	VI	**Course Type:**	PEC		
Course Title: Mobile Application Development					
Course Code:	**23ISP624**		**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

Prerequisites :
Basic knowledge of programming concepts and familiarity with object-oriented programming principles are required. Android Developer Fundamentals is intended for new developers who already have Java programming experience and now want to learn to build Android apps.

I. Course Objectives:

1. Learn to set upan Android application development environment
2. Illustrate user interfaces for interacting with apps and triggering actions
3. Interpret tasks used in handling multiple activities
4. Identify options to save persistent application data
5. Appraise the role of security and performance in Android applications

II. Teaching-Learning Process (General Instructions)

Teacherscanusethefollowingstrategiestoacceleratetheattainment of the various course outcomes.

1. Lecturer methods(L)need not tobeonlytraditionallecturemethod,butalternativeeffectiveteachingmethods couldbeadopted to attaintheoutcomes.
2. UseofVideo/Animationtoexplainfunctioningofvariousconcepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, developsdesign thinking skills such as the ability to design, evaluate, generalize, and analyze information ratherthan simply recall it.
5. Role play for process scheduling.
6. DemonstratetheinstallationofanyoneLinuxOSonVMware/Virtual Box

III. Course Content

Module-1: **8 Hours**

Build your first app: Introduction to Android, Create Your First Android App, Layouts, Views and Resources, Text and Scrolling Views,Activities: Understanding Activities and Intents, The Activity Lifecycle and Managing State, Activities and Implicit Intents, Testing, debugging and using support libraries.

Textbook 1 : Lesson 1,2,3

RBT Levels:L1, L2, L3

Module-2: **8 Hours**

The Android Studio Debugger, testing your App, The Android Support Library,User experience: User interaction, User Input Controls, Menus, Screen Navigation, Recycler View, Delightful user experience:Drawable, Styles, and Themes, Material Design, Providing Resources for Adaptive Layouts Testing your UI: Testing the User Interface

Textbook 1: Lesson 4,5,6	
RBT Levels: L1, L2, L3	
Module-3:	**8 Hours**
Working in the background: Background Tasks, Async Task and Async Task Loader, connect to the Internet, BroadcastReceivers, ServicesTriggering, Scheduling and optimizing background tasks: Notifications, Scheduling Alarms,	
Textbook 1: Lesson 7,8	
RBT Levels: L1, L2, L3	
Module-4:	**8 Hours**
Transferring Data Efficiently:Alldata, Preferences and Settings: Storing Data, SharedPreferences, App Settings,storing data using SQLite: SQLite Primer, SQLiteDatabase Sharing data with content providers: Share Data Through Content Providers Loading data using loaders: Loaders	
Textbook 1: Lesson 9,10,11,12	
RBT Levels: L1, L2, L3	
Module-5:	**8 Hours**
Permissions, Performance and Security, Firebase and Ad Mob, Firebase and Ad Mob, Publish.	
Textbook 1: Lesson 13,14,15	
RBT Levels: L1, L2, L3	

IV. Course Outcomes

CO1	Build an application using Android development environment.
CO2	Experiment with the method of storing, sharing and retrieving the data in Android Applications.
CO3	Examine responsive user interface across a wide range of devices.
CO4	Create a mobile Application by using various components like activity, views, services, content providers and receivers.

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
CO1	3		3		2							1	2	
CO2	1	3			2							1	2	
CO3	1	3	1		2							1	2	
CO4	1		3		2							1	2	

VI. Assessment Details (CIE & SEE)

General Rules: Continuous Internal Evaluation (CIE): Refer Annexure 1 - Section 1

Continuous Internal Evaluation (CIE): Refer Annexure 1 - Section 1

Semester End Examination (SEE): Refer Annexure 1 -Section 1

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Name of the publisher	Edition and Year
1	Google Developer Training, "Android Developer Fundamentals Course – Concept Reference",	Google Developer Training Team	https://www.gitbook.com/book/googledeveloper-training/android-developer-fundamentals-course-concepts/details (Download pdf file from the above link)	**2017**

VII(b): Reference Books:

1	Android Programming – Pushing the Limits	Erik Hellman	Wiley India Pvt Ltd	1st Edition, 2014
2	Headfirst Android Development	Dawn Griffiths and David Griffiths	O'Reilly SPD Publishers	1st Edition, 2015
3	Beginning Android Programming with Android Studio	J F DiMarzio	Wiley India Pvt Ltd	4th Edition ,2016
4	Composing Mobile Apps with Android	Anubhav Pradhan, Anil V Deshpande	Wiley	1st Edition, 2014

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

- https://www.geeksforgeeks.org/android-tutorial/
- https://developer.android.com/
- https://www.tutorialspoint.com/android
- https://www.w3schools.blog/android-tutorial

VIII: Activity Based Learning

1. Assignments, Quizzes and Seminar.

Open Elective Course- 1

Semester:	**VI**	**Course Type:**	OEC		
Course Title: Introduction to Network Security					
Course Code:	**23ISO611**		**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

Pre-requisites (Self Learning): Basic computer knowledge, Network Fundamentals and Basic knowledge of Security.

I. Course Objectives:

- Describes Network Security Services and Mechanisms.
- Understand Transport Level Security and Secure Socket Layer.
- Knows about Security concerns on Internet Protocol Security.
- Discuss about Intruders, Intrusion detection and Malicious Software.
- Discuss about Firewalls, Firewall characteristics, Biasing and Configuration

II. Teaching-Learning Process (General Instructions):

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

1. Lecturer method (L) does not mean only traditional lecture method, but different type of teaching methods may be adopted to develop the outcomes.
2. Show Video/animation films to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOTS (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyse information rather than simply recall it.
6. Topics will be introduced in a multiple representation.
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 improve the students' understanding.

III. Course Content

Module-1: Attacks on Computers and Computer Security	8Hrs
Attacks on Computers and Computer Security: Computer security concepts, The OSI Architecture, Security Attacks, Security Services, Security Mechanism, A model for new Security **Textbook:1 Chapter:1 Section:1.1 to 1.6**	
RBT Levels: L1, L2	
Module-2:Transport Level Security	8Hrs
Transport Level Security: Web Security Considerations, Secure Sockets Layer, Transport	

Layer Security, HTTPS, Secure Shell (SSH)
Textbook:1 Chapter:16 Section:16.1 to 16.5

RBT Levels: L1, L2

Module-3:IP Security	8Hrs

IP Security: IP Security Overview, IP Security Policy, Encapsulation Security Payload, Internet Key Exchange
Textbook:1 Chapter:19 Section:19.1 to 19.3, 19.5

RBT Levels: L1, L2, L3

Module-4:Intruders	8Hrs

Intruders: Definition, Intruders, Intrusion Detection.
Malicious Software: Types of Malicious Software, Viruses and Related Threats, Virus Counter measures.
Textbook:1 Chapter:20,21 Section:20.1 to 20.2 ,21.1 to 21.3

RBT Levels: L1, L2, L3

Module-5: Firewalls	8Hrs

Firewalls: The Need for firewalls, Firewall Characteristics, Types of Firewalls, Firewall Basing, Firewall location and configuration
Textbook:1 Chapter:22 Section:22.1 to 22.5

RBT Levels: L1, L2, L3

IV. Course Outcomes

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

CO1	Explain network security services and mechanisms and explain security concepts
CO2	Analyse the concept of Transport Level Security and Secure Socket Layer
CO3	Explain Security concerns in Internet Protocol security
CO4	Explain Intruders, Intrusion detection and Malicious Software
CO5	Describe Firewalls, Firewall Characteristics, Biasing and Configuration

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

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

VI. Assessment Details (CIE & SEE)

General Rules: Refer Annexure 1 -section1

Continuous Internal Evaluation(CIE): Refer Annexure 1-section 1

SemesterEnd Examination(SEE): Refer Annexure 1- section1

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 Principles and Practice	Pearson Education	5th Edition,2014	William Stallings

VII(b): Reference Books:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Cryptography and Network Security	Behrouz A. Forouz.an	2007	TMH
2	Cryptography and Network Security	AtulKahate	2003	TMH

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

- https://www.coursera.org/learn/introduction-to-network-security
- https://www.youtube.com/watch?v=NQ1cvwEvh44&list=PLEiEAq2VkUUIvo-xr1mDV2r00MarxeLx1&index=11

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

- Group Discussion
- Presentation
- Hands-on Labs & Simulations
- Secure Communication Exercises like SSH Key Authentication, TLS Handshake Analysis
- Real-World Cyber security Scenarios like Phishing Attack Awareness, incident Response Drill

Semester:	**VI**	**Course Type:**	OEC		
Course Title: Introduction To Cloud Computing					
Course Code:	**23ISO612**		**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

Pre-Requisites: Students should have a fundamental understanding of fundamental concepts of information technology, including hardware, software, and networking, Familiarity with networking concepts such as IP addressing, DNS, and basic networking protocols (TCP/IP), Knowledge of different operating systems, particularly Linux and Windows, as they are commonly used in cloud environments.

I. Course Objectives:

- To understand the concepts in Cloud Computing and its Security
- To understand the evolving computer model canned cloud computing.
- To introduce the various levels of services that can be achieved by cloud.

II. Teaching-Learning Process (General Instructions):

- Teachers can use the following strategies to accelerate the attainment of the various course outcomes.
- Lecturer methods(L)need not to be only traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
- Use of Video/Animation to explain functioning of various concepts.
- Encourage collaborative (Group Learning) Learning in the class.
- 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.

III. COURSE CONTENT

Module-1: Cloud Computing Foundation-1	8 Hrs.
Introduction to Cloud Computing – Cloud computing basics, History of Cloud Computing, Importance of Cloud Computing in the Current Era, Characteristics of Cloud Computing, What Cloud Computing Really Is? **Move To Cloud Computing** – Pros and Cons of Cloud Computing, Nature of the Cloud, Technologies in Cloud Computing, Migrating into the Cloud, Seven-Step Model. **Textbook: 1 Chapter 1,2 sections:1.1 to1.4,2.1 to 2.5**	
RBT Levels: L1, L2, L3	
Module-2: Cloud Computing Foundation-2	8 Hrs.
Types of cloud- Public and Private Cloud, Loud Infrastructure, Cloud Application	

Architecture.
Working of Cloud Computing- Trends in Computing, Cloud Service Models, Cloud Deployment Models, Cloud Computing and Services: Pros and Cons.
Textbook 1: Chapter 3,4: sections:3.1 to 3.3,4.1 to 4.5

RBT Levels: L1, L2, L3

Module-3: Cloud Computing Architecture-1	8 Hrs.

Cloud Computing Technology-Cloud Lifecycle Model, Role of Cloud Model Ling and Architecture, Reference Model for Cloud Computing, Cloud Industry Standard.
Cloud Architecture: Cloud Computing Logical Architecture, Developing Holistic Cloud Computing Reference Model, Cloud System Architecture, Cloud Deployment Model
Textbook: 1Chapter 5,6: sections 5.1 to 5.4,6.1 to 6.4.

RBT Levels: L1, L2, L3

Module-4: Cloud Computing Architecture-2, Virtualization-1	8 Hrs.

Cloud Modelling and Design- Cloud Computing: Basic Principles, Model for Federated Cloud Computing, Cloud Ecosystem Model, Cloud Governance.
Foundations: Definition Of Virtualization, Adopting Virtualization, Types of Virtualizations, Virtualization Architecture and Software, Virtual Clustering, Virtualization Application, Pitfalls of Virtualization.
Grid, cloud and Virtualization – Virtualization in Grid, Virtualization in cloud, Virtualization and cloud security.
Textbook 1: Chapter 7,8 ,9: sections ,7.1 to 7.4,8.1 to 8.7, 9.1 to 9.3.

RBT Levels: L1, L2, L3

Module-5: Virtualization-2, Data Storage	8 Hrs.

Virtualization and cloud computing – Anatomy of cloud infrastructures, Virtual Infrastructures, CPU Virtualizations, Network and Storage Virtualization.
Data Storage: Introduction to Enterprise data storage, Data storage management, File Systems, Cloud Data stores, Using Grids for Data storage.
Cloud Storage: What is cloud storage, Overview of cloud storage, Data management for cloud storage, Provisioning for cloud storage, Data intensive technology for cloud computing
Cloud storage from LAN s to WAN s: Introduction, Cloud Characteristics, Distributed Data storage, Applications utilizing cloud storage.
Textbook 1: Chapter 10,11,12,13: sections: 10.1 to 10.4,11.1 to 11.5,12.1 to 12.5,13.1 to 13.4

RBT Levels: RBT Levels: L1, L2, L3

IV. Course Outcomes

CO1	Explain and apply levels of services of Cloud
CO2	Illustrate the Virtualization Significance
CO3	Describe the Storage in cloud
CO4	Identify cloud architecture and delivery models

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

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

VI. Assessment Details (CIE & SEE)

General Rules: Refer Annexure 1–Section 1

Continuous Internal Evaluation (CIE): Refer Annexure 1- Section 1

Semester End Examination (SEE): Refer Annexure 1- 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	, "Cloud Computing – A Practical Approach for Learning and Implementation"	**A.** Srinivasan and J. Suresh	**2014**	Pearson India
VII(b): Reference Books:				
1	Cloud Computing: Principles and Paradigms	RajkumarBuyya , James Broberg, Andrzej	**2021**	Wiley India Publications
2	"Cloud Computing – A Hands-on Approach"	ArshdeepBahga and Vijay Madisetti	**2014**	Universities Press (India) Pvt Ltd
VII(c): Web links and Video Lectures (e-Resources):				
https://freevideolectures.com/course/4639/nptel-cloud-computing/1. 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/ https://www.javatpoint.com/cloud-service-provider-companies				
VIII: Activity Based Learning / Practical Based Learning/Experiential learning:				
Seminars, Group discussions and Case Study.				

Semester:	**VI**	**Course Type:**	OEC		
Course Title: Programming in Java					
Course Code:	**23ISO613**		**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

Pre-requisite:A basic understanding of programming concepts and familiarity with general computer science principles is recommended.

I. Course Objectives:

- This course aims to provide students with a solid foundation in object-oriented programming (OOP) using Java.
- Students will be able to understand and apply fundamental OOP features and Java syntax.
- Students will explore how to work with packages and handle exceptions in Java, enhancing their coding efficiency.
- The course emphasizes the importance of string handling in Java and its integration with object-oriented principles to solve real-world problems

II. Teaching-Learning Process (General Instructions):

The following are some of the strategies that teachers can employ to facilitate the achievement of various course outcomes:

1. **Diverse Teaching Methods**: Instead of relying solely on traditional lecture methods, can explore alternative and effective teaching approaches. These might include interactive discussions, hands-on activities, or multimedia presentations.
2. **Visual Aids**: Utilize videos and animations to elucidate complex concepts. Visual representations enhance understanding and engagement among students.
3. **Collaborative Learning**: Encourage group learning within the classroom. Collaborative activities foster teamwork, communication, and a deeper grasp of subject matter.
4. **Higher Order Thinking (HOT) Questions**: Pose at least three thought-provoking questions during class. These questions stimulate critical thinking and encourage students to analyze and evaluate information.
5. **Problem-Based Learning (PBL):** Implement PBL, which nurtures analytical skills. PBL goes beyond rote memorization by challenging students to design solutions, evaluate evidence, and think critically.
6. **Multiple Representations**: Introduce topics using various representations. Visuals, diagrams, and real-world examples cater to diverse learning styles.
7. **Creative Problem Solving**: Present different approaches to solving the same problem. Encourage students to think outside the box and devise their own innovative solutions.
8. **Real-World Application**: Discuss how each concept relates to practical scenarios. Connecting theoretical knowledge to real-world contexts enhances students' comprehension and retention.

□ Chalk & Talk □ Stud. Assignment □ Web Resources □ LCD/Smart Boards □ Stud. Seminars

III. Course Content

Module-1	8 Hrs
An Overview of Java: Object-Oriented Programming, A First Simple Program, A Second Short Program, Two Control Statements, Using Blocks of Code, Lexical Issues, The Java Class Libraries. Data Types, Variables, and Arrays: Java Is a Strongly Typed Language, The Primitive Types, Integers, Floating-Point Types, Characters, Booleans, A Closer Look at Literals, Variables, Type Conversion and Casting, Automatic Type Promotion in Expressions, Arrays, A Few Words About Strings **Textbook 1: Ch 2, Ch 3**	
RBT Levels: L1, L2, L3	
Module-2	8 Hrs
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: Ch4, Ch 5**	
RBT Levels: L1, L2, L3	
Module-3	8 Hrs
Introducing Classes: Class Fundamentals, Declaring Objects, Assigning Object Reference Variables, Introducing Methods, Constructors, This Keyword, Garbage Collection, the finalize () Method, A Stack Class. A Closer Look at Methods and Classes: Overloading Methods, Using Objects as Parameters, A Closer Look at Argument Passing, Returning Objects, Recursion, Introducing Access Control, understanding statistic, introducing final, Arrays Revisited. Inheritance: Inheritance, using super, creating a Multilevel Hierarchy, When Constructors Are Called, Method Overriding. **Textbook 1: Ch 6, Ch 7.1-7.9, Ch 8.1-8.5**	
RBT Levels: L1, L2, L3	
Module-4	8 Hrs
Packages and Interfaces: Packages, Access Protection, Importing Packages, Interfaces. Exception Handling: 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, Using Exceptions **Textbook 1: Ch 9, Ch 10.**	
RBT Levels: L1, L2, L3	
Module-5	8 Hrs
Enumerations: Enumerations, Type Wrappers. String Handling: The String Constructors, 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 , Additional String Methods, String Buffer, StringBuilder. **Textbook 1: Ch 12.1,12.2, Ch 15**	
RBT Levels: L1, L2, L3	

IV. Course Outcomes:

CO1	Develop Java programs by applying object-oriented programming principles and ensuring proper program structure.
CO2	Create Java programs that utilize packages, inheritance, and interfaces to design efficient, reusable code.
CO3	Implement error handling techniques in Java by effectively using exception handling mechanisms.
CO4	Demonstrate proficiency in string handling concepts and manipulation in Java.
CO5	Apply object-oriented programming concepts to solve real-world problems using Java effectively.

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
CO1	1	1	3											
CO2	1	1	2											
CO3	1	1	3											
CO4	2	1												
CO5	1	2	3											

VI. Assessment Details (CIE & SEE)

General Rules: Refer Annexure-1 section 1

Continuous Internal Evaluation (CIE): Refer Annexure-1section 1

Semester End Examination (SEE): Refer Annexure-1 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	Java The Complete Reference	Herbert Schildt	7th Edition, 2007	Tata McGraw Hill,

VII(b): Reference Books:

1	Object oriented Programming with java	RajkumarBuyya,STharamasiselvi, xingchenchu,	2020	Tata McGraw Hill
2	Programming with Java A primer	E Balagurusamy	2019	Tata McGraw Hill

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

- https://docs.oracle.com/en/java/
- https://www.tutorialspoint.com/java/index.htm
- https://www.javacodegeeks.com/
- https://www.youtube.com/playlist?list=PLS1QulWo1RIYsQ2SrpK9HgAfp21aP3bvx
- https://www.youtube.com/playlist?list=PLBlnK6fEyqRiDh-jzVg5ODR9Tx9HJ9I-B
- https://www.youtube.com/watch?v=Qgl81fPcLc8
- https://www.coursera.org/courses?query=java

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

Assignments, Quizzes and Seminar, Presentation, Group Discussions

Semester:	VI	**Course Type:**	OEC		
Course Title: Introduction to Operating systems					
Course Code:	**23ISO614**		**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
Pre-requisite: A basic understanding of computer architecture and programming concepts is required.					

I. Course Objectives:

- The course aims to provide a comprehensive understanding of operating systems (OS)
- To Demonstrate the need for OS and different types of OS
- To discuss suitable techniques for management of different resources
- To demonstrate different APIs/Commands related to processor, memory, storage and file system management.

II. Teaching-Learning Process (General Instructions):

The following are some of the strategies that teachers can employ to facilitate the achievement of various course outcomes:

1. **Diverse Teaching Methods**: Instead of relying solely on traditional lecture methods, can explore alternative and effective teaching approaches. These might include interactive discussions, hands-on activities, or multimedia presentations.
2. **Visual Aids**: Utilize videos and animations to elucidate complex concepts. Visual representations enhance understanding and engagement among students.
3. **Collaborative Learning**: Encourage group learning within the classroom. Collaborative activities foster teamwork, communication, and a deeper grasp of subject matter.
4. **Higher Order Thinking (HOT) Questions**: Pose at least three thought-provoking questions during class. These questions stimulate critical thinking and encourage students to analyze and evaluate information.
5. **Problem-Based Learning (PBL):** Implement PBL, which nurtures analytical skills. PBL goes beyond rote memorization by challenging students to design solutions, evaluate evidence, and think critically.
6. **Multiple Representations**: Introduce topics using various representations. Visuals, diagrams, and real-world examples cater to diverse learning styles.
7. **Creative Problem Solving**: Present different approaches to solving the same problem. Encourage students to think outside the box and devise their own innovative solutions.
8. **Real-World Application**: Discuss how each concept relates to practical scenarios. Connecting theoretical knowledge to real-world contexts enhances students' comprehension and retention.

□ Chalk & Talk □ Stud. Assignment □ Web Resources □ LCD/Smart Boards □ Stud. Seminars

III. Course Content	
Theory	
Module-1:Introduction to operating systems	8 Hrs
Introduction to operating systems, System structures: What operating systems do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Process management; Memory management; Storage management; Protection and Security; Distributed system; Special-purpose systems; Computing environments. Operating System Services: User - Operating System interface; System calls; Types of system calls; System programs; Operating system design and implementation; Operating System structure; Virtual machines; Operating System debugging, Operating System generation; System boot. **Textbook 1: Chapter – 1 (1.1-1.12), 2 (2.2-2.11)**	
RBT Levels: L1, L2, L3	
Module-2:Process Management	8 Hrs
Process Management: Process concept; Process scheduling; Operations on processes; Inter process communication Multi-threaded Programming: Overview; Multithreading models; Thread Libraries; Threading issues. Process Scheduling: Basic concepts; Scheduling Criteria; Scheduling Algorithms; Thread scheduling; Multiple-processor scheduling, **Textbook 1: Chapter – 3 (3.1-3.4), 4 (4.1-4.4), 5 (5.1 -5.5)**	
RBT Levels: L1, L2,L3	
Module-3:Process Synchronization	8 Hrs
Process Synchronization: Synchronization: The critical section problem; Peterson's solution; Synchronization hardware; Semaphores; Classical problems of synchronization; Deadlocks: System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock. **Textbook 1: Chapter – 6 (6.1-6.6), 7 (7.1 -7.7)**	
RBT Levels: L1, L2, L3	
Module-4:Memory Management	8 Hrs
Memory Management: Memory management strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation. Virtual Memory Management: Background; Demand paging; Copy-on-write; Page replacement; Allocation of frames; Thrashing. **Textbook 1: Chapter -8 (8.1-8.6), 9 (9.1-9.6)**	
RBT Levels: L1, L2, L3	
Module-5:File System, Implementation of File System	8 Hrs
File System, Implementation of File System: File system: File concept; Access methods; Directory and Disk structure; File system mounting; File sharing; Implementing File system: File system structure; File system implementation; Directory implementation; Allocation methods; Free space management. Secondary Storage Structure, Protection: Mass storage structures; Disk structure; Disk attachment; Disk scheduling; Disk management; Protection: Goals of protection, Principles of protection, Domain of protection, Access matrix. **Textbook 1: Chapter – 10 (10.1-10.5) ,11 (11.1-11.5),12 (12.1-12.5), 14 (14.1-14.4)**	
RBT Levels: L1, L2, L3	

IV. Course Outcomes	
CO1	Explain the structure and functionality of an operating system.
CO2	Apply appropriate CPU scheduling algorithms and memory management techniques.
CO3	Analyze techniques for process synchronization and deadlock handling.
CO4	Explain file and secondary storage management strategies.
CO5	Describe the need for information protection mechanisms.

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

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

VI. Assessment Details (CIE & SEE)

General Rules: Refer Annexure-1 section 1

Continuous Internal Evaluation (CIE): Refer Annexure-1section 1

Semester End Examination (SEE): Refer Annexure-1 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	Operating System Principles 8th edition,	Abraham Silberschatz, Peter Baer Galvin, Greg Gagne,	2015	Wiley-India

VII(b): Reference Books:

1	Operating Systems: A Concept Based Approach	D.M Dhamdhere	3rd Ed, 2013.	McGraw- Hill,

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

- https://youtu.be/mXw9ruZaxzQ
- https://youtu.be/vBURTt97EkA
- https://www.youtube.com/watch?v=783KABtuE4&list=PLIemF3uozcAKTgsCIj82voMK3TMR0YE_f 4.

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

Assignments, Quizzes and Seminar.

Emerging Technology Course-4

Semester:	**VI**	**Course Type:**	ETC		
Course Title: Distributed Systems					
Course Code:	**23ISE641**		**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

Pre-requisites: Students should have a fundamental understanding Computer Networks, Network Topologies,OSI Model (Open Systems Interconnection),IP Addressing and Subnetting, Routing and Switching ,Transmission Control Protocol (TCP),User Datagram Protocol (UDP),Hypertext Transfer Protocol (HTTP), types of networks, Network Performance and Optimization.

I. Course Objectives:

- Understand the goals and challenges of distributed systems
- Describe the architecture of RPC/RMI, distributed file systems and name services
- Learn clock synchronization algorithms to monitor and order the events, mutual exclusion, election and consensus algorithms.
- Study the fundamental concepts and algorithms related to distributed transactions and replication.

II. Teaching-Learning Process (General Instructions):

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

III. Course Content

Module-1:Characterization Of Distributed Systems and Remote Invocation	8 Hrs

CHARACTERIZATION OF DISTRIBUTED SYSTEMS: Introduction, Focus on resource sharing, Challenges**.**

REMOTE INVOCATION: Introduction, Request-reply to protocols, Remote procedure call, Introduction to Remote Method Invocation.

Textbook: Chapter- 1.1,1.4,1.5, 5.1-5.5

RBT Levels: L1,L2

Module-2:Distributed File Systems and Name Services	8 Hrs
DISTRIBUTED FILE SYSTEMS: Introduction, File service architecture**.** **NAME SERVICES:** Introduction, Name services and the Domain Name System, Directory services. **Textbook: Chapter- 12.1,12.2, 13.1-13.3**	
RBT Levels: L1, L2	
Module-3: Time And Global States	8 Hrs
TIME AND GLOBAL STATES: Introduction, Clocks, events and process states, Synchronizing Physical clocks, Logical time and logical clocks, Global states **Textbook: Chapter- 14.1-14.5**	
RBT Levels: L1, L2	
Module-4:Coordination And Agreement	8 Hrs
COORDINATION AND AGREEMENT: Introduction, Distributed mutual exclusion, Elections, Coordination and agreement in group communication, Consensus and related problems**.** **Textbook: Chapter -15.1-15.5**	
RBT Levels: L1, L2	
Module-5:Distributed Transactions and Replication	8 Hrs
DISTRIBUTED TRANSACTIONS: Introduction, Flat and nested distributed transactions, atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. **REPLICATION:** Introduction**,** System model and the role of group communication, Fault tolerant services. **Textbook: Chapter -17.1-17.6, 18.1.18.2,18.3**	
RBT Levels: L1, L2	

IV. Course Outcomes

CO1	Identify the goals and challenges of distributed systems
CO2	Demonstrate the remote invocation techniques for communication
CO3	Describe the architecture of distributed file systems and name services
CO4	Apply clock synchronization algorithms to monitor and order the events
CO5	Analyze the performance of mutual exclusion, election and consensus algorithms.

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

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

VI. Assessment Details (CIE & SEE)

General Rules: Refer Annexure 1- Section 1

Continuous Internal Evaluation (CIE): Refer Annexure 1- Section1

Semester End Examination (SEE): Refer Annexure 1- 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	Distributed Systems Concepts and Design.	George Coulouris, Jean Dollimore and Tim Kindberg	Fifth Edition	Pearson Education, 2012
VII(b): Reference Books:				
1	Distributed Systems - Principles and Paradigms	Andrew S. Tanenbaum	Second Edition	Pearson Education
VII(c): Web links and Video Lectures (e-Resources):				
https://www.youtube.com/watch?v=Azyizl9w2xo&list=PLrjkTql3jnm9FEOXHA_qjRTMODlaIk-Wks of online resources, video materials, etc.				
VIII: Activity Based Learning:				
• Literature Review/ Case Studies • Certification course • Programming Assignment				

Semester:	**VI**	**Course Type:**	ETC		
Course Title: Big Data Analytics					
Course Code:	**23ISE642**		**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

Prerequisites: A basic understanding of database management systems (DBMS), including relational databases, is essential. Familiarity with data visualization tools and techniques helps in analysing and interpreting big data effectively.

I. Course Objectives:

- Understand fundamentals of Big Data analytics Explore the Hadoop framework and Hadoop Distributed File system
- 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.

II. Teaching-Learning Process (General Instructions):

The following are some of the strategies that teachers can employ to facilitate the achievement of various course outcomes:

1. **Diverse Teaching Methods**: Instead of relying solely on traditional lecture methods, can explore alternative and effective teaching approaches. These might include interactive discussions, hands-on activities, or multimedia presentations.
2. **Visual Aids**: Utilize videos and animations to elucidate complex concepts. Visual representations enhance understanding and engagement among students.
3. **Collaborative Learning**: Encourage group learning within the classroom. Collaborative activities foster teamwork, communication, and a deeper grasp of subject matter.
4. **Higher Order Thinking (HOT) Questions**: Pose at least three thought-provoking questions during class. These questions stimulate critical thinking and encourage students to analyse and evaluate information.
5. **Problem-Based Learning (PBL):** Implement PBL, which nurtures analytical skills. PBL goes beyond rote memorization by challenging students to design solutions, evaluate evidence, and think critically.
6. **Multiple Representations**: Introduce topics using various representations. Visuals, diagrams, and real-world examples cater to diverse learning styles.
7. **Creative Problem Solving**: Present different approaches to solving the same problem. Encourage students to think outside the box and devise their own innovative solutions.
8. **Real-World Application**: Discuss how each concept relates to practical scenarios. Connecting theoretical knowledge to real-world contexts enhances students' comprehension and retention.

Chalk &Talk, Web Resources LCD/Smart Boards

III. Course Content	
Module-1: Introduction to Big Data Analytics	8 Hrs
Introduction, Big Data, Scalability and Parallel Processing, Designing Data Architecture, Data Sources, Quality, Pre-Processing and Storing, Data Storage and Analysis, Big Data Analytics Applications and Case Studies. **Textbook 1: Chapter 1: 1.1 -1.7**	
RBT Levels:L1, L2, L3	
Module-2: Introduction to Hadoop	8 Hrs
Introduction, Hadoop and its Ecosystem, Hadoop Distributed File System, MapReduce Framework and Programming Model, Hadoop Yarn **Textbook 1: Chapter 2 :2.1-2.5**	
RBT Levels:L1 – Remembering, L2 – Understanding, L3 – Applying	
Module-3:NoSQL Big Data Management, MongoDB and Cassandra	8 Hrs
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**	
RBT Levels: L2 , L3	
Module-4 : MapReduce, Hive and Pig	8Hrs
Introduction, MapReduce Map Tasks, Reduce Tasks and MapReduce Execution, Hive, HiveQL, Pig. **Textbook 1: Chapter 4: 4.1,4.2, 4.4,4.6**	
RBT Levels: L2, L3	
Module-5: Machine Learning Algorithms for Big Data Analytics	8 Hrs
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. **Textbook 1: Chapter 6: 6.1 to 6.6**	
RBT Levels: L2 ,L3,L4	

IV. Course Outcomes	
CO1	Explain the fundamental concepts of Big Data, scalability, parallel processing, data architecture, and Big Data analytics applications.
CO2	Interpret the Hadoop ecosystem, Hadoop Distributed File System (HDFS), and the Map Reduce programming model.
CO3	Describe different NoSQL databases and their role in Big Data management using MongoDB and Cassandra.
CO4	Illustratethe Machine Learning Algorithms for Big Data Analytics.

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
CO1	3	2	1	1	1								1	
CO2	3	3	2	2	2								1	
CO3	3	3	2	2	3								1	
CO4	2	2	2	1	2								1	

VI. Assessment Details (CIE & SEE)
General Rules: Refer Annexure-1 section 1
Continuous Internal Evaluation (CIE): Refer Annexure-1section 1
Semester End Examination (SEE): Refer Annexure-1 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 Machine-Learning"	Raj Kamal and Preeti Saxena,	1st Edition, 2018, ISBN: 9789353164966, 9353164966	McGraw Hill Education
VII(b): Reference Books:				
1	Hadoop 2 Quick-Start Guide: Learn the Essentials of Big Data Computing in the Apache Hadoop 2 Ecosystem	Douglas Eadline	1stEdition, 2016. ISBN-13: 978-9332570351	Pearson Education
2	Hadoop: The Definitive Guide",	Tom White	4th Edition, 2015. ISBN-13: 978-9352130672	O'Reilly Media
3	Professional Hadoop Solutions	Boris Lublinsky, Kevin T Smith	1stEdition, 2014 ISBN-13: 978-8126551071	Wrox Press
VII(c): Web links and Video Lectures (e-Resources):				
1. https://www.kaggle.com/datasets/grouplens/movielens-20m-dataset 2. https://www.youtube.com/watch?v=bAyrObl7TYE&list=PLEiEAq2VkUUJqp1k-g5W1mo37urJQOdCZ 3. https://www.youtube.com/watch?v=VmO0QgPCbZY&list=PLEiEAq2VkUUJqp1k-g5W1mo37urJQOdCZ&index=4 4. https://www.youtube.com/watch?v=GG-VRm6XnNk				
VIII: Activity Based Learning / Practical Based Learning/Experiential learning:				
Case studies and Group discussions.				

Semester:	**VI**	**Course Type:**	ETC		
Course Title: Deep Learning					
Course Code:	**23ISE643**		**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

Pre-requisites (Self Learning): Fundamentals of machine learning, Linear algebra, Fundamentals of artificial intelligence, Basic knowledge of neuron, Perceptron design principles, Delta rule, Matrix arithmetic, Data transformation, Q-Learning, Quadrant principles.

I. Course Objectives:

- Understand the fundamentals of deep learning.
- Know the theory behind Convolutional Neural Networks, Autoencoders, RNN.
- Illustrate the strength and weaknesses of many popular deep learning approaches.
- Introduce major deep learning algorithms, the problem settings, and their applications to solve real world problems.
- Learn the open issues in deep learning, and have a grasp of the current research directions

II. Teaching-Learning Process (General Instructions):

- The following are some of the strategies that teachers can employ to facilitate the achievement of various course outcomes:
- **Diverse Teaching Methods**: Instead of relying solely on traditional lecture methods, can explore alternative and effective teaching approaches. These might include interactive discussions, hands-on activities, or multimedia presentations.
- **Visual Aids**: Utilize videos and animations to elucidate complex concepts. Visual representations enhance understanding and engagement among students.
- **Collaborative Learning**: Encourage group learning within the classroom. Collaborative activities foster teamwork, communication, and a deeper grasp of subject matter.
- **Higher Order Thinking (HOT) Questions**: Pose at least three thought-provoking questions during class. These questions stimulate critical thinking and encourage students to analyze and evaluate information.
- **Problem-Based Learning (PBL):** Implement PBL, which nurtures analytical skills. PBL goes beyond rote memorization by challenging students to design solutions, evaluate evidence, and think critically.
- **Multiple Representations**: Introduce topics using various representations. Visuals, diagrams, and real-world examples cater to diverse learning styles.
- **Creative Problem Solving**: Present different approaches to solving the same problem. Encourage students to think outside the box and devise their own innovative solutions.
- **Real-World Application**: Discuss how each concept relates to practical scenarios.

Connecting theoretical knowledge to real-world context enhances students' comprehension and retention. ▫ Chalk & Talk ▫ Stud. Assignment ▫ Web Resources ▫ Lcd/Smart Boards ▫ Stud. Seminars

III. Course Content

Module-1: Introduction to deep learning	8 Hrs
Introduction to Deep Learning: Introduction, Deep learning Model, Historical Trends in Deep Learning, Learning Algorithm, Capacity-Overfitting-Underfitting, Hyperparameters and Validation Sets, Estimator-Bias-Variance, Maximum Likelihood Estimation **Textbook 1: Chapter1 – 1.1, 1.2, 5.1-5.5.**	
RBT Levels: L1, L2	
Module-2: Feed Forward Networks & Regularization	8 Hrs
Feedforward Networks: Introduction to feedforward neural networks, Gradient-Based Learning, Back-Propagation and Other Differentiation Algorithms. Regularization for Deep Learning **Textbook 1: Chapter 6, 7**	
RBT Levels: L1, L2	
Module-3: Optimization	8 Hrs
Optimization for Training Deep Models: Empirical Risk Minimization, Challenges in Neural Network Optimization, Basic Algorithms: Stochastic Gradient Descent, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates: The AdaGrad algorithm, The RMSProp algorithm, Choosing the Right Optimization Algorithm. **Textbook 1: Chapter: 8.1-8.5**	
RBT Levels: L1, L2	
Module-4: Convolution Neural Networks	8 Hrs
Convolutional Networks: The Convolution Operation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features- LeNet, AlexNet. **Textbook 1: Chapter: 9.1-9.9.**	
RBT Levels: L1, L2	
Module-5: Reinforcement Learning	8 Hrs
Deep Reinforcement Learning: Introduction, Stateless Algorithms: Multi-Armed Bandits, The Basic Framework of Reinforcement Learning, case studies. **Textbook – 2: Chapter 9: 9.1,9.2,9.3, 9.7**	
RBT Levels: L1, L2,L3	

IV. Course Outcomes

CO1	Understand the fundamental issues and challenges of deep learning data, model selection, model complexity etc.,
CO2	Describe various knowledge on deep learning and algorithms
CO3	Apply CNN and RNN model for real time applications
CO4	Identify various challenges involved in designing and implementing deep learning algorithms.
CO5	Relate the deep learning algorithms for the given types of learning tasks in varied domain

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
CO1	2	1				1		1					1	
CO2	2	1											1	
CO3	2	2											2	
CO4	2	1											1	
CO5	2	1				1		1				1	1	

VI. Assessment Details (CIE & SEE)

General Rules: Refer Annexure-1 section 1

Continuous Internal Evaluation (CIE): Refer Annexure-1 section 1

Semester End Examination (SEE): Refer Annexure-1 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	Deep Learning	Ian Goodfellow, Yoshua Bengio, Aaron Courville,	2016	MIT Press
2	Neural Networks and Deep Learning	Charu C. Aggarwal	2018	Springer

VII(b): Reference Books:

1	Learning deep architectures for AI. Foundations and trends in Machine Learning	Bengio, Yoshua	2009.	IEEE
2	Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms	Nikhil Buduma	2010	O'Reilly publications

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

1. https://faculty.iitmandi.ac.in/~aditya/cs671/index.html
2. https://nptel.ac.in/courses/106/106/106106184/
3. https://www.youtube.com/watch?v=7x2YZhEj9Dw

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

- Presentation
- Quiz
- Mini projects
- Literature survey

Semester:	**VI**	**Course Type:**	ETC		
Course Title: Block Chain and Distributed Ledgers					
Course Code:	**23ISE644**		**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

Pre-requisites: Basic programming concerns, Data structures and algorithms, Networking fundamentals

I. Course Objectives:

- Differentiate between various types of blockchain and DLT architectures. Students will be able to distinguish between public, private, and consortium Blockchains, as well as other DLT variations like Directed Acyclic Graphs (DAGs).
- Explore diverse use cases of blockchain and DLT across various industries. This includes finance, supply chain management, healthcare, government, and potentially specific applications relevant to the Indian context, such as land records, digital identity, and agricultural supply chains.
- Comprehend the legal, ethical, and regulatory implications of blockchain technology. Students will be aware of the challenges and opportunities associated with the adoption and regulation of blockchain.
- Develop a foundational understanding of smart contract development and deployment. Students will gain practical knowledge of how to create and implement basic smart contracts.
- Critically assess the current state of blockchain adoption and future trends. Students will be able to analyse the evolving landscape of blockchain technology and its potential impact on society.

II. Teaching-Learning Process (General Instructions):

1.The following are some of the strategies that teachers can employ to facilitate the achievement of various course outcomes:
2. Diverse Teaching Methods: Instead of relying solely on traditional lecture methods, can explore alternative and effective teaching approaches. These might include interactive discussions, hands-on activities, or multimedia presentations.
3. Visual Aids: Utilize videos and animations to elucidate complex concepts. Visual representations enhance understanding and engagement among students.
4. Collaborative Learning: Encourage group learning within the classroom. Collaborative activities foster teamwork, communication, and a deeper grasp of subject matter.
5. Higher Order Thinking (HOT) Questions: Pose at least three thought-provoking questions during class. These questions stimulate critical thinking and encourage students to analyse and evaluate information.
6. Problem-Based Learning (PBL): Implement PBL, which nurtures analytical skills. PBL goes

beyond rote memorization by challenging students to design solutions, evaluate evidence, and think critically.
7. Real-World Application: Discuss how each concept relates to practical scenarios. Connecting theoretical knowledge to real-world contexts enhances students' comprehension and retention.

III. Course Content

Module-1:Blockchain and Crypto currencies	8 Hrs
Introduction ,Crypto currencies, Network Architecture Basics,The Blockchain, DataIntegrity, Types of Blockchain,Miners,Coins and Tokens .Market Makers/Exchanges, Wallets **Textbook:1 Chapter:1 and 2 , Sections : 1.1 to 1.6 and 2.1 to 2.5**	
RBT Levels: L1 & L2	
Module-2:Consensus Mechanisms and Smart Contracts	8 Hrs
Introduction , The CAP Theorem , Byzantine Fault,Common Consensus Protocols,Ethereum—An Alternative to Bitcoin , Solidity Programming Language, Oracles, Decentralized Applications,Turing Completeness,Legal Perspective **Textbook: 1 Chapter: 3 & 4 , Sections : 3.1 to 3.4 and 4.1 to 4.7**	
RBT Levels: L2 & L3	
Module-3:Privacy and Anonymity	8 Hrs
Introduction ,De-anonymization,The Onion Router (TOR) Network,Mixing Models,Decentralized Mixing,Zero-Knowledge Proofs,Privacy and Security Protocols,Privacy Coins **Textbook: 1 Chapter: 5 , Sections : 5.1 to 5.8**	
RBT Levels: L2 & L3	
Module-4:Blockchain Cryptography: Part 1	8 Hrs
Introduction , Classic Ciphers, Modern Cryptographic Algorithms,Hashing,Secure Hash Algorithm (SHA),Symmetric Encryption **Textbook: 1 Chapter: 6 Sections : 6.1 to 6.6**	
RBT Levels: L3 & L4	
Module-5:Blockchain Cryptography: Part 2	8 Hrs
Asymmetric Key Schemes, Diffie-Hellman-Merkle Key Agreement. Rivest, Shamir, and Adelman (RSA) .Digital Signatures, Quantum Resistance **Textbook: 1 Chapter: 7 Sections: 7.1 to 7.5**	
RBT Levels: L3 & L4	

IV. Course Outcomes

CO1	Explain the fundamental concepts of blockchain technology and distributed ledger technology (DLT)
CO2	Analyse the key components of a blockchain, including blocks, transactions, consensus mechanisms, and cryptography.
CO3	Apply the security and privacy considerations associated with blockchain technology.
CO4	Identify the scalability challenges of blockchain technology and potential solutions

V. CO-PO-PSOMapping(H=3; M=2; L=1)

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

VI. Assessment Details (CIE & SEE)				
General Rules: Refer Annexure-1 section 1				
Continuous Internal Evaluation (CIE): Refer Annexure-1 section 1				
Semester End Examination (SEE): Refer Annexure-1 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.	Build your own Blockchain	Daniel Hellwig , GoranKarlic , ArndHuchzermeier	1st edition,2020	Spriger
VII(b): Reference Books:				
1	Blockchain developers guide	Brenn Hill , Samanyu Chopra	Packt Publishing Limited	1st Edition , 2022
2	The Basics of Bitcoins Technology	Antony Lewis	Podium Publishing	2nd Edition 2021
VII(c): Web links and Video Lectures (e-Resources):				
• https://www.youtube.com/playlist?list=PLYwpaL_SFmcDFRupamGc-9zc-vQqvkQnn • https://www.youtube.com/watch?v=RZFjrI0oWyw&list=PLPIwNooIb9vgfXs-QkRYqqZbDXX-yLf59				
VIII: Activity Based Learning / Practical Based Learning/Experiential learning:				
• One day workshop by industry expertGroup discussion • Student presentation on relevant topic of blockchain applications				

Semester:	VI	**Course Type:**	AEC		
Course Title: Research Methodology & IPR					
Course Code:	**23RMAE61**		**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:

- 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

Module-1:Introduction	08 Hrs

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.

Textbook1: Chapter1: sections: 1.1,1.2,1.3,1.4
Textbook1: Chapter5: sections: 5.1,5.2,5.3

Self-Learning: Case Studies

RBT Levels: L2

Module-2:Literature Review and Technical Reading	08 Hrs

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	08 Hrs

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 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 Trademarks 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	08 Hrs

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 (H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3	S4
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 Annexure, Section 1

Continuous Internal Evaluation (CIE): Refer to Annexure, Section 1
Rubrics: Refer to Annexure, Section 1

Semester End Examination (SEE): Refer to - Annexure, Section 1
Rubrics: Refer to - 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	Engineering Research Methodology	DipankarDeb, RajeebDey, ValentinaE.Balas	ISSN1868- 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:**			1
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 -6

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-1

|| 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

Academic Dean 10/2/25

Principal 10.2.2025

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)
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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.

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Principal
Dr. K V Mahendra Prashanth

Academic Director
Dr. Puttaraju

Academic Dean

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Academic Director

|| Jai Sri Gurudev ||
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Program Outcomes (POs)- Graduate Attributes

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society**: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability**: Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

9. **Individual and teamwork**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

|| Jain Sri Gurudev ||

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Brand Performer: Atal Ranking

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