Detailed Scheme and Syllabus

ACADEMIC YEAR 2024-2025

III - IV (2023-2027 BATCH) (160Credits)

Dr. Ambedkar Institute of Technology
Bangalore

Department Of
Information Science and Engineering

Vision

1. To create **D**ynamic, **R**esourceful, **A**dept and **I**nnovative **T**echnical professionals to meet global challenges.

Mission

1. To offer state-of-the-art undergraduate, postgraduate and doctoral programmes in the fields of Engineering, Technology and Management.
2. To generate new knowledge by engaging faculty and students in research, development and innovation
3. To provide strong theoretical foundation to the students, supported by extensive practical training to meet industry requirements.
4. To install moral and ethical values with social and professional commitment.

DEPARTMENT VISION AND MISSION

Vision:

5. Imparting quality technical education and preparing professionals to meet Information Technological challenges globally.

Mission:

6. Prepare highly capable Information Science engineers through best practices.
7. Encourage students to pursue higher education for further growth in the learning process and to promote research in the frontier areas of Information Technology.

- Educate students to take up social and professional responsibilities with ethical values for the betterment of the society

PROGRAM SPECIFIC OUTCOMES(PSOS)

PSO1: Students should be able to develop and optimize solutions for information systems employing fundamentals of mathematics, Hardware, software, data storage, security and communication networks.

PSO2:Students should be able to understand, analyze and adopt principles of programming paradigms by using latest technologies such as Cloud computing, Big data analytics, AI ,Machine Learning and IoT based applications for solving real-world problems.

PSO3: Students should be able to acquire and demonstrate the team work, professional ethics, competence and communication skills while developing software products.

PROGRAMME OUTCOMES (POs)

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 the 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 the 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 the engineering practice.
9. Individual and team work: 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

Dr.Ambedkar Institute of Technology, Bengaluru-560056
Outcome Based Education(OBE) and Choice Based Credit System
B.E. in Information Science & Engineering
Scheme of Teaching and Examination effective from the Academic Year 2024-25

III SEMESTER

Sl. No	Course	Course Code	Course Title	Teaching Department (TD) and Question Paper Setting	Teaching Hours /Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Self study	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	BSC	22MAT301IS	Mathematics for Computer Science	Maths	3	2	0		03	50	50	100	4
2	IPCC	22 ISU302	Digital Design and Computer Organization	ISE	3	0	2		03	50	50	100	4
3	IPCC	22 ISU303	Operating Systems	ISE	3	0	2		03	50	50	100	4
4	PCC	22IST304	Data Structures using C/C++	ISE	3	0	0		03	50	50	100	3
5	PCCL	22ISL305	Data Structures Lab	ISE	0	0	2		03	50	50	100	1
6	ESC	22IST306x	ESC/ETC/PLC	ISE	3	0	0		03	50	50	100	3
7	UHV	22HSL307	Social Connect and Responsibility	Any Department	0	0	2		01	100	---	100	1
8	AEC/ SEC	22IST308x or 22ISL308x	Ability Enhancement Course/Skill Enhancement Course – III		If the course is a Theory: 1	0	0		01	50	50	100	1
					If a course is a laboratory: 0	0	2		02				
9	HS	22CDN309	Aptitude and Verbal Ability Skill-I	Placement Cell	2	0	0		--	50	--	50	PP/NP
10	MC	22NSN310	National Service Scheme (NSS)	NSS coordinator	0	0	2		--	100	---	100	PP/NP
		22PEN310	Physical Education (PE) (Sports and Athletics)	Physical Education Director									
		22YON310	Yoga	Yoga Teacher									
									Total	550	350	900	21

PCC: Professional Core Course, **PCCL**: Professional Core Course laboratory, **UHV**: Universal Human Value Course, **MC**: Mandatory Course (Non-credit), **AEC**: Ability Enhancement Course, **SEC**: Skill Enhancement Course, **L:** Lecture, **T**: Tutorial, **P**: Practical, S= Self-Study, **CIE**: Continuous Internal Evaluation, **SEE**:Semester End Evaluation. K: This letter in the course code indicates common to all the streams of Engineering. ESC: Engineering Science Course, ETC: Emerging Technology Course, PLC: Programming Language Course

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Engineering Science Course (ESC/ETC/PLC) 22XXT306x			
22IST306A	OOPs with Java	22IST306C	
22IST306B	OOPs with C++	22IST306D	
Ability Enhancement Course – III 22XXT308x **OR** 2XXL308x			
22ISL308A	Data analytics with excel	22IST308C	Version Controlling with GIT
22ISL308B	R Programming	22IST308D	Data Visualization with Python

Professional Core Course (IPCC): Refers to Professional Core Course Theory Integrated with practical of the same course. Credit for IPCC can be 04 and its Teaching– Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper.

National Service Scheme /Physical Education/Yoga: All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education(PE)(Sports and Athletics), and Yoga(YOG) with the concerned coordinator of the course during the first Week of III semesters. Activities shall be carried out between III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the Degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, and Yoga activities. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of Degree.

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Outcome Based Education(OBE) and Choice Based Credit System
B.E. in Information Science & Engineering
Scheme of Teaching and Examination effective from the Academic Year 2024-25

IV SEMESTER

Sl. No	Course and Course Code		Course Title	Teaching Department (TD)and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination				Credits
					Theory	Tutorial	Practical/ Drawing	Self - Study	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	PCC	22IST401	Analysis & Design of Algorithms	ISE	3	0	0		03	50	50	100	3
2	IPCC	22ISU402	Advanced Java	ISE	3	0	2		03	50	50	100	4
3	IPCC	22ISU403	Data Base Management Systems	ISE	3	0	2		03	50	50	100	4
4	PCCL	22ISL404	Analysis & Design of Algorithms Lab	ISE	0	0	2		03	50	50	100	1
5	ESC	22IST405x	ESC/ETC/PLC	ISE	3	0	0		03	50	50	100	3
6	AEC/ SEC	22IST406x or 22ISL406x	Ability Enhancement Course/Skill Enhancement Course- IV	TD and PSB: Concerned department	If the course is Theory				01	50	50	100	1
					1	0	0						
					If the course is a lab				02				
					0	0	2						
7	BSC	22BIT407	Biology For Engineers	TD / PSB: BT, CHE,	2	0	0		03	50	50	100	2
8	UHV	22HST408	Universal human values course	Any Department	1	0	0		01	50	50	100	1
9	HS	22CDN409	Aptitude and Verbal Ability Skill-II	Placement Cell	2	0	0		--	50	--	50	PP/ NP
10	MC	22NSN410	National Service Scheme (NSS)	NSS coordinator	0	0	2			100	---	100	PP/ NP
		22PEN410	Physical Education (PE) (Sports and Athletics)	Physical Education Director									
		22YON410	Yoga	Yoga Teacher									
								Total		500	400	900	19

PCC: Professional Core Course, PCCL: Professional Core Course laboratory, UHV: Universal Human Value Course, MC: Mandatory Course (Non-credit), AEC: Ability Enhancement Course, SEC: Skill Enhancement Course, L: Lecture, T: Tutorial, P: Practical, S= Self-Study, CIE: Continuous Internal Evaluation, SEE: Semester End Evaluation. K : This letter in the course code indicates common to all the stream of engineering.

Engineering Science Course (ESC/ETC/PLC) 22XXT405x OR 22XXL405x			
22IST405A	Discrete Mathematical Structure	22IST405E	Optimization Techniques
22IST405B	Unix Shell Programming	22IST405D	Graph Theory and Networks
Ability Enhancement Course / Skill Enhancement Course – IV 22XXT405x OR 22XXL406x			
22ISL406A	Green IT and Sustainability	22ISL406C	Technical writing using LATEX
22IST406B	UI/UX		

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not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the courses is mandatory for the award of Degree.

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024 -2025

III Semester

Course Title	**Mathematics-1II for Computer Science and Engineering stream/AIML Probability and Statistical Inference.**							
Course Code	**22MAT301B**							
Category	**ASC (Applied Science Course)**							
Scheme and Credits	Theory/Practical/Integrated					Total teaching hours	Lab slots	Credits
	L	T	P	SDA	Total			
	03	02	00	00	04	50	00	03
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks = 100**		**Duration of SEE: 03 Hours**			

COURSE LEARNING OBJECTIVES
This course is proposed to impart to the students the skills to identify and solve real life problems in their field of study involving the application of the concepts of probability, statistical inferences and ANOVA testing.

Unit	Syllabus content	No. of hours	
		Theory	Tutorial
I	**Probability Distributions:** Recap of Random Variables. Probability generating function, moment generating function, expectations. Discrete probability distributions-Binomial, Poisson and Geometric distributions; Continuous probability distributions-Exponential, Normal and Weibull distributions. **Self-study*:*** Gamma distributions. **Applications**: Transmission errors in noise media. (RBT levels: **L1, L2, L3, L4**)	04	04
II	**Two dimensional Random variables:** Joint probability mass function, Marginal probability function,conditional probability function. **Random Process:** Classification of random process, description of random process, stationary random process – first order, second order and Strict-sense stationary processes, Autocorrelation and Cross- correlation functions. **Self-study**: Joint density function, marginal density function, conditional probability density function, covariance, correlation coefficient. **Application**: Bayesian network. (RBT levels: **L1, L2, L3, L4**)	04	04
III	**Statistical Inference:** Introduction sampling distribution standard errors, level of significance, confidence limits for sampling of attributes, test of significance for large samples. Comparison of large samples, central limit theorem, confidence limit for unknown mean, testing of mean of large two samples, students *t*-distribution , chi-square distribution. **Self-study:** *F*-distribution. **Application:** Goodness of fitness	04	04

	(RBT levels: **L1, L2, L3, L4**)		
IV	**Markov Chain:** Introduction to Stochastic Process, Probability Vectors, Stochastic matrices, Markov chains, Higher transition probabilities, Stationary distribution of Regular Markov chains and absorbing states. **Self-study:** Regular stochastic matrices **Applications**: model the behaviour of stock prices, spread of a disease through a population, birth-death process. (RBT levels: **L1, L2, L3, L4**)	04	04
V	**Design of Experiments & ANOVA :** Principles of experimentation in design, Analysis of completely randomized design, randomized block design. The ANOVA Technique, basic principle of ANOVA, One way ANOVA, Two-way ANOVA. **Self-study**: latin-square design. **Applications**: to determine the best materials to use to build a product for a customer, to test effectiveness of different marketing strategies. (RBT levels: **L1, L2, L3, L4**)	04	04

COURSE OUTCOMES: On completion of the course, student should be able to:

CO1	**Learn** a mathematical tool to estimate the life time for a system and also time of failure.
CO2	**Predict** most suitable distributions, happening of favorable event**.**
CO3	**Analyze** the statistical inferences and the basics of Hypothesis testing with emphasis on some commonly encountered hypothesis.
CO4	**Employ** the knowledge of probability, joint probability distributions, Markov chain in pattern recognition.
CO5	**Apply ANOVA testing to determine significant effect of input on the system's response.**

TEACHING – LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos.

Assignment: Python programmers on in Units-I to V to be given as assignment using the Textbook indicated in item 5 below.

Ptoblm

TEXTBOOKS

(1) B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers 44th Ed., 2018.

(2) Kishore S. Trivedi, Probabilty and Statistics with Reliability, Queuing and Computer Science Applications, Wiely India publication, 2nd ED., 2008

(3) Sundaran Pillai, Probabililty, Statistics and Queuing theory, PHI, 2009.

(4) G. Haribaskaran, Prbabiltly Queuing Theory and Reliability Engineering, 2nd Ed., 2006.

(5) Peter Bruce, Andrew Bruce and Peter Gedeck, Practical Statistics for Data Scientists, O'REILLY, 2Ed., 2020.

REFERENCE BOOKS

1. V. Ramana, Higher Engineering Mathematics, McGraw–Hill Education, 11th Ed., 2017.
2. Srimanta Pal & Subodh C. Bhunia, Engineering Mathematics, Oxford University Press, 3rd Ed., 2016.
3. C. Ray Wylie, Louis C. Barrett**,** Advanced Engineering Mathematics, McGraw Hill Book Co., New York, 6th Ed., 2017.

4. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand Publication, 3rd Ed., 2014.

Web links and Video Lectures (e-Resources)

(6) http://nptel.ac.in/courses.php?disciplineID=111
(7) http://www.class-central.com/subject/math(MOOCs)
(8) http://academicearth.org/
(9) VTU e-Shikshana Program
(10) VTU EDUSAT Program

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1										
CO2	3	2										
CO3	2	3										
CO4	3	2										
CO5	2	3										
Strength of correlation: Low-1, Medium-2, High-3												

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024 -2025

Course Title	**DIGITAL DESIGN AND COMPUTER ORGANIZATION**						
Course Code	**22 ISU302**						
Category	Integrated Professional Core Course (IPCC)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	**00**	**02**	**00**	**05**	**60**	**04**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objectives:

1. To understand and apply minimization techniques for designing optimized digital
2. To analyze and design cost effective combinational and sequential circuits for given problems.
3. To understand basic structure of computer , instruction execution and addressing modes .
4. Gain knowledge of memory system

UNIT I **08 hours**

Boolean function Simplification : Karnaugh Map: Pairs, Quads, and Octets , Karnaugh Simplifications for 4 variables, Don't-care Conditions, Product-of-Sum, Product-of-sums Simplification, Quine McCluskey method .

Data-Processing Circuits: Multiplexers, Demultiplexers, 1-of-16 Decoder, Encoders, Magnitude Comparator.

Text book 1: Ch 3: 3.1 to 3.9. Ch 4:4.1,4.2,4.3,4.6,4.9,4.14

Laboratory Components:

1. Simplify given boolean function using K-Map method and verify the truth table.
2. Given any 4-variable logic expression, simplify using multiplexer IC and verify truth table.
3. Design full adder using 3-to-8 decoder IC and 4 input NAND gates and verify truth table.
4. Design 1 bit magnitude comparator and verify the truth table.

UNIT II **08 hours**

Flip-Flops: Flip-flops: RS FLIP-FLOPs, Gated FLIP-FLOPs ,Edge-triggered RS FLIP-FLOPs, Edge-triggered D FLIP-FLOPs,Edge-triggered JK FLIP-FLOPs, JK Master-slave FLIP-FLOPs; JK Master-slave

FLIP-FLOP, Various Representations of FLIP-FLOPs,Conversion of FLIP-FLOPs:A Synthesis Example, HDL Implementation of Flip-flops.

Text book 1:Ch 8:8.1 to8.8, 8.10,8.12

Registers: Types of Registers, Applications of Shift Registers and Implementation using VHDL.

Text book 1: Ch 9: 9.1,9.7

Laboratory Components

1. Write the VHDL code for D Flip-Flop with positive-edge triggering. Simulate and verify it's working.
2. Write the VHDL code for JK Flip-Flop with negative -edge triggering. Simulate and verify it's working
3. Design and implement a ring counter using 4-bit shift register IC 7495.
4. Write VHDL code for switched tail counter. Simulate and verify it's working.

UNIT III 08 hours

Counters: Asynchronous Counters ,Synchronous Counters, Decade Counters, Counter Design as a Synthesis problem.

T1:Ch10: 10.1,10.3,10.5,10.7,10.9

Laboratory Components:

1. Design and implement an asynchronous counter using decade counter IC 7490 to count up from 0 to 9 Display the count value on 7 segment LED display using BCD to 7 segment code converter IC.
2. Write VHDL code for mod-8 up counter. Simulate and verify it's working.

UNIT IV **08 hours**

Basic Structure of Computers: Computer Types, Functional Units, Basic Operational Concepts, Bus Structures, Instruction Set: CISC and RISC. Memory Location and Addresses, Memory Operations, Instructions and Instruction Sequencing, Addressing Modes, Assembly Language.

Text book 2:Chapter 1-1.1,1.2,1.3,1.4,1.6.5

Chapter 2- 2.2,2.3,2.4,2.5,2.6

Laboratory Component:

1. Demonstration of parts of computer.

UNIT V **07 hours**

Memory System: Basic Concepts, Semiconductor RAM Memories, Read Only Memories, Speed, Size, and Cost, Cache Memories – Mapping Functions, Replacement Algorithms, Performance Considerations, Virtual Memories, Secondary Storage.

Text book 2: Ch 5 – 5.1 to 5.7, 5.9.

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animatio videos

COURSE OUTCOMES: On completion of the course, student should be able to:

CO1: Apply K-map/Quine McClusky minimization methods to simplify Boolean functions .

CO2: Design and analyze working of combinational /data processing circuits.

CO3 : Design and analyze working of sequential circuits & their VHDL implementation.

CO4: Analyze functional units of a computer, its operational concepts, addressing modes, internal organization of a system through an assembly language.

CO5: Analyze memory unit including SRAM, DRAM, cache mapping techniques and basics of virtual memory.

TEXT BOOKS:

1.Donald P Leach, Albert Paul Malvino & Goutam Saha: DigitalPrinciples and Applications,7thEdition,Tata McGraw Hill, 2011

2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Computer Organization, 5th Edition,TataMcGrawHill, 2002

REFERENCE BOOKS:

1. Stephen Brown, ZvonkoVranesic:FundamentalsofDigital Logic Design with VHDL, 2nd Edition, Tata McGraw Hill, 2005.

2. Charles H.Roth: Fundamentals of Logic Design, Jr., 5th Edition,Thomson,2004

EBOOKS/ONLINE RESOURCES

1. http://www.nptel.ac.in
2. http://freevideolectures.com/Course/2277/Computer-Organization#

SCHEME FOR EXAMINATIONS:

The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE).However, questions from the practical part of IPCC shall be Included in these question paper.

MAPPING of COs with POs and PSOs

	PO1	PO	PO	PO4	PO5	PO6	PO	PO	PO9	PO10	PO1	PO1	PSO	PSO	PSO
CO	3	3	3										2		2
CO		3	3	3									2		2
CO		3	3	3			2						2	1	2
CO	3	3											2		
CO	2	3	3	3									2		
Strength of correlation: Low-1, Medium- 2, High-3															

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024 -2025

Course Title	**OPERATING SYSTEMS**						
Course Code	**22ISU303**						
Category	Integrated Professional Core Course (IPCC)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	**00**	**02**	**00**	**05**	**60**	**04**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objectives:

- To Demonstrate the need for OS and different types of OS
- To discuss suitable techniques for management of different resources
- To identify the various methods of causing deadlocks.
- To describe the techniques for main memory management.
- To analyze the file system interface, implementation and disk management.

UNIT I : **08 hours**

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.

Laboratory Component:

1. Develop a c program to implement the Process system calls (fork (), exec(), wait(), create process, terminate process)

Textbook 1: Chapter – 1 (1.1-1.12), 2 (2.2-2.11)

UNIT II **08 hours**

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,

Laboratory Component:

(i) Implement CPU scheduling algorithms to find turnaround time and waiting time FCFS and Priority.

Textbook 1: Chapter – 3 (3.1-3.4), 4 (4.1-4.4), 5 (5.1 -5.5)

UNIT III **07 hours**

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.

Laboratory Component:

(ii) Develop a C program to simulate producer-consumer problem using semaphores.

(iii) Develop a C program which demonstrates interposes communication between a reader process and a writer process. Use mkfifo, open, read, write and close APIs in your program.

(iv) Develop a C program to simulate Bankers Algorithm for Deadlock Avoidance.

Textbook 1: Chapter – 6 (6.1-6.6), 7 (7.1 -7.7)

UNIT IV **08 hours**

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.

Laboratory Component:

1. Develop a C program to simulate the following contiguous memory allocation Techniques: a) Worst f Best fit c) First fit.
2. Develop a C program to simulate page replacement algorithms: FIFO

Textbook 1: Chapter -8 (8.1-8.6), 9 (9.1-9.6)

UNIT V **08 hours**

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.

Laboratory Component:

1. Develop a program to implement File Organization Techniques
2. Develop a C program to simulate the Linked file allocation strategies.
3. Develop a C program to simulate SCAN disk scheduling algorithm.

Textbook 1: Chapter – 10 (10.1-10.5) ,11 (11.1-11.5),12 (12.1-12.5), 14 (14.1-14.4)

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos

COURSE OUTCOMES: On completion of the course, student should be able to:

CO1: Analyze the fundamental principles and concepts of operating systems.
CO2: Apply appropriate CPU scheduling algorithms for the given problem.
CO3: Identify, analyze various synchronization technique, deadlocks.
CO4: Identify, analyze, apply the various algorithms for memory management.
CO5: Analyze Storage Structures and Implement Customized Case study.
CO5: Apply various protection and security techniques.

TEXT BOOK:

(v) Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Principles 8th edition, Wiley-India, 2015.

(vi) REFERENCE BOOKS:

1. D.M Dhamdhere, Operating Systems: A Concept Based Approach 3rd Ed, McGraw- Hill, 2013.
3. P.C.P. Bhatt, An Introduction to Operating Systems: Concepts and Practice 4th Edition, PHI (EEE), 2014.
4. William Stallings Operating Systems: Internals and Design Principles, 6th Edition, Pearson.

SCHEME FOR EXAMINATIONS:

The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE).However, questions from the practical part of IPCC shall be Included in these question paper.

MAPPING of COs with POs and PSOs

	PO1	**PO**	**PO**	**PO4**	**PO5**	**PO6**	**PO**	**PO**	**PO9**	**PO10**	**PO1**	**PO1**
CO	2	2	2		2							2
CO	2	2	2		2	2						
CO			2		2	2						
CO	2	2	2	2	2							2
CO	2	2	2	2	2							2
Strength of correlation: Low-1, Medium- 2, High-3												

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024 -2025

Course Title	DATA STRUCTURES WITH C						
Course Code	**22IST304**						
Category	Professional Core Course (PCC)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	**00**	**00**	**00**	**03**	**39**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objectives:

1. To become familiar with the concept of pointers and its usage in dynamic memory allocation.
2. To study and understand the representation and implementation of linear data structures.
3. To classify and comprehend the consequences of using non linear data structures in implementing a system .
4. To identify the suitable data structure during application development.
5. To gain knowledge of sorting, searching and hashing techniques

UNIT I **7 hours**
Introduction: Data Structures, Classifications (Primitive & Non Primitive),Data structure Operations, Review of Arrays, Structures, Self-Referential Structures, and Unions. Pointers and Dynamic Memory Allocation Functions. Representation of Linear Arrays in Memory, Dynamically allocated arrays.**Array Operations**: Traversing, inserting, deleting, searching, and sorting.Multidimensional Arrays**T 1: Ch 1: 1.2, Ch 2: 2.2 - 2.7 T 2: Ch 1: 1.1 - 1.4, Ch 3 : 3.1 - 3.3, 3.5, 3.7 ,Ch 4: 4.1 - 4.9, 4.14**
UNIT II **7 hours**
Stacks: Definition, Stack Operations, Array Representation of Stacks, Stacks using Dynamic Arrays, Stack Applications: Polish notation, Infix to postfix conversion, evaluation of postfix expression. **Recursion** - Factorial, GCD, Fibonacci Sequence, Tower of Hanoi **Queues:** Definition, Array Representation, Queue Operations, Circular Queues, Circular queues using Dynamic arrays, Dequeues, Priority Queues. Programming Examples. **T 1: Ch 3: 3.1 -3.7 T 2: Ch 6: 6.1 -6.3, 6.5, 6.7-6.10, 6.12, 6.13**
UNIT III **9 hours**

Linked Lists: Definition, Representation of linked lists in Memory, Memory allocation; Linked list operations: Traversing, Searching, Insertion, and Deletion. Doubly Linked lists, Circular linked lists, and header linked lists. Linked Stacks and Queues.
Applications of Linked lists – Polynomials, Sparse matrix representation. Programming Examples.

T 1: Ch 4: 4.1 – 4.6, 4.8 T 2: Ch 5: 5.1 – 5.10

UNIT IV **8 hours**

Trees: Terminology, Binary Trees, Properties of Binary trees, Array and linked Representation of Binary Trees, Binary Tree Traversals - Inorder, postorder, preorder; Additional Binary tree operations,Threaded binary trees, Binary Search Trees – Definition, Insertion, Deletion, Traversal, Searching, Application of Trees- Evaluation of Expression , Programming Examples, AVL Trees, AVL rotations, overview of Red Black trees and Tournament Trees
T 1: Ch 5.1 –5.5, 5.7 T 2: Ch 7: 7.1 – 7.9

UNIT V **8 hours**

Graphs: Definitions, Terminologies, Matrix and Adjacency List Representation Of Graphs, Elementary Graph operations, Traversal methods: Breadth First Search and Depth First Search.
Sorting and Searching: Insertion Sort, Radix sort, Address Calculation Sort. Sorting and Searching: Insertion Sort, Radix sort, Address Calculation Sort.
Hashing: Hash Table organizations, Hashing Functions, Static and Dynamic Hashing.
T 1: Ch 7, Ch 8: 8.1,Ch 9: 9.1, 9.2, 9.3

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos

COURSE OUTCOMES:
CO1: Implement pointers in memory allocation , data structure functions.
CO2: Classify common data structures and implement them.
CO3: Apply appropriate algorithm for problem solving after identifying the appropriate linear data structure.
CO4: Design efficient programs by choosing the most apt non linear data structure.

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

REFERENCE BOOKS:
- Gilberg & Forouzan, Data Structures: A Pseudo-code approach with C, 2nd Ed, Cengage Learning,2014
- Reema Thareja, Data Structures using C, 3rd Ed, Oxford press, 2012.
- Jean-Paul Tremblay & Paul G. Sorenson, An Introduction to Data Structures with Applications, 2nd Ed, McGraw Hill, 2013
- A M Tenenbaum, Data Structures using C, PHI, 1989
- Robert Kruse, Data Structures and Program Design in C, 2nd Ed, PHI, 1996.

EBOOKS/ONLINE RESOURCES
1. http://www.nptel.ac.in
2. https://en.wikipedia.org

SCHEME FOR EXAMINATIONS:

Professional Core Course shall be evaluated both by CIE and SEE

MAPPING of COs with POs and PSOs

	PO	**PO**	**PO**	**PO4**	**PO5**	**PO6**	**PO**	**PO**	**PO9**	**PO10**	**PO1**	**PO1**	**PSO**	**PSO**	**PSO**
CO	3	3		3						3		3	3		
CO	3	3		3						3		3	3		
CO	3	3		3						3		3	3		
CO	3	3		3						3		3	3		
CO	3	3		3						3		3	3		
Strength of correlation: Low-1, Medium- 2, High-3															

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024 -2025

Course Title	DATA STRUCTURES LAB						
Course Code	**22ISL305**						
Category	Professional Core Course (PCCL)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	00	00	02	00	02	26	01
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

COURSE OBJECTIVE:

1. To understand design and implement the concept of stack using recursive techniques.
2. Implement the application of stacks in converting an expression from infix to postfix notation and evaluate postfix
3. Design common data structures and implement linear queue, circular queue, priority queue.
4. To understand the importance of implementing data structures like stacks using list, queues using linked list, doubly linked lists and circular linked list.
5. To traverse a non linear data structure like a Binary Search Tree.

○ LIST OF PROGRAMS

1 Design develop and implement menu driven C program to perform following set of operations on Stack of integers (using array of maximum size MAX) i) Push ii) Pop iii) Display iv) Exit. The program should print appropriate messages for stack overflow, stack underflow, and stack empty.

2. Design , develop and implement a program in C to convert and print a given valid parenthesized or parenthesize free infix expression to postfix expression. The expression consists of single character operands and the binary operators + (plus), - (minus), * (multiply) , / (divide), % (mod) and ^ (power) .

3. Design , develop and implement a program in C to evaluate a valid suffix/postfix expression using stack. Assume that the suffix/postfix expression is read as a single line consisting of positive single digit operands and binary arithmetic operators. The arithmetic operators are + (add), - (subtract), * (multiply) and / (divide), % (mod) and ^ (power) .

4. Design develop and implement menu driven C program to perform following set of operations on queue of integers using an array. i) Insert ii) Delete iii) Display iv) Exit. The program should print appropriate messages for queue overflow, queue underflow, and queue empty.

5. Design develop and implement menu driven C program to perform following set of operations on circular queue of integers using an array. i) Insert ii) Delete iii) Display iv) Exit. The program should print appropriate messages for circular queue overflow, circular queue underflow, and circular queue empty.

6. Design, Develop and Implement a menu driven program in C for the following operations on Singly Linked List (SLL) of Student Data with the fields: *USN, Name, Branch, Sem, PhNo*

- Create a SLL of N Students Data by using *front insertion*. i.
- Display the status of SLL and count the number of nodes in it
- Perform Insertion at End of SLL
- Perform Deletion at End of SLL
- Exit

The program should print appropriate messages for dynamic stack overflow, underflow andempty.

7. Design, Develop and Implement a menu driven program in C for the following operations on Singly Linked List (SLL) of Student Data with the fields: *USN, Name, Branch, Sem, PhNo*

i. Create a SLL of N Students Data by using *front insertion*.
ii. Display the status of SLL and count the number of nodes in it
iii.Perform Insertion at End of SLL
vi. Perform Deletion at front end of SLL
v. Exit

The program should print appropriate messages for dynamic queue overflow, underflow and empty

8. Design, Develop and Implement a menu driven Program in C for the following operationson Doubly Linked List (DLL) of Employee Data with the fields: *SSN, Name, Dept,Designation, Sal, PhNo*

- Create a DLL of N Employees Data by using *end insertion*.
- Display the status of DLL and count the number of nodes in it.
- Perform Insertion and Deletion at End of DLL.
- Perform Insertion and Deletion at Front of DLL.
- Exit

9. Design, Develop and Implement a menu driven Program in C for the following operationson Binary Search Tree (BST) of Integers .

- Create a BST of N Integers: 6, 9, 5, 2, 8, 15, 24, 14, 7, 8, 5, 2
- Traverse the BST in Inorder, Preorder and Post Order
- Search the BST for a given element (KEY) and report the appropriate message
- Exit

10. Design, Develop and Implement a Program in C for the following operations on Singly Circular Linked List (SCLL) with header nodes. Represent and Evaluate a Polynomial:

$P(x,y,z) = 6 x^2 y^2 z - 4 y z^5 + 3 x^3 y z + 2 x y^5 z - 2 x y z^3$

Note: Programs 2, 3, 6, 8, 9, 10 to be conducted with support of Virtual Lab .Weblink:

https://cse01-iiith.vlabs.ac.in/
https://ds1-iiith.vlabs.ac.in/data-structures-1/

- **OPEN ENDED QUESTIONS**

Design and implement a solution to the following in C.

1. Design, Develop and Implement a menu driven Program in C for the following array operations.
i. Creating an array of N Integer Elements
ii. Display of array Elements with Suitable Headings
iii. Inserting an Element (ELEM) at a given valid Position (POS)
iv. Deleting an Element at a given valid Position (POS)
v. Exit.

2. Design, Develop and Implement a Program in C for the following operations on Strings. i.Read a main String (STR), a Pattern String (PAT) and a Replace String (REP)
ii. Perform Pattern Matching Operation: Find and Replace all occurrences of PAT in iii.STR with REP if PAT exists in STR. Report suitable messages in case PAT does not exist in STR

3. Design, Develop and Implement a Program in C for the following operations on Singly Circular Linked List (SCLL) with header nodes
i. Represent a Polynomial P(x,y,z)
ii. Find the sum of two polynomials POLY1(x,y,z) and POLY2(x,y,z) and store the result in POLYSUM(x,y,z)
iii. Display the polynomial P (x,y,z)

NOTE:
1. Student is permitted to submit open ended solution to any other open ended question apart from the list above . But it has to be approved by the staff in charge.
2. In the examination each student picks one question from a lot of all 10 questions

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animatio videos

COURSE OUTCOMES:
CO1: Design and develop stack, an application providing solution to convert infix to postfix expression using stack and also design a solution to evaluate postfix expression.
CO2: Implement queues like linear queue, circular queue .
CO3: Design and develop solution to implement the following : singly linked list, stacks using linked list, queues using linked list, doubly linked list and circular linked list.
CO4: Design the solution to traverse a Non linear data structure like a Binary Search Tree.

SCHEME FOR EXAMINATIONS:
Professional Core Course shall be evaluated both by CIE and SEE

MAPPING of COs with POs and PSOs

	PO	PO	PO	PO4	PO5	PO6	PO	PO	PO9	PO10	PO1	PO1	PSO	PSO	PSO
CO	3	3		3						3		3	3		

CO	3	3		3						3		3	3		
CO	3	3		3						3		3	3		
CO	3	3		3						3		3	3		
CO	3	3		3						3		3	3		
Strength of correlation: Low-1, Medium- 2, High-3															

Dr Ambedkar Institute of Technology, Bengaluru-56

Department of Information Science and Engineering

Scheme and Syllabus - CBCS-2024 -2025

Course Title	**OOPs with Java**						
Course Code	**22IST306A**						
Category	**Engineering Science Course (ESC/ETC/PLC)**						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	**00**	**00**	**00**	**03**	**39**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objectives:

1. To understand the object oriented concepts.
2. To understand the concepts of java.
3. To understand the concept of inheritance and exception handling.
4. To understand the concept of event handling and threads.
5. To design and write a applet and swing programs.

UNIT I :

07 hours

Introduction to Java, Classes,: Java and Java applications; Java Development Kit (JDK); Java is interpreted, Byte Code, JVM; Object-oriented programming; Simple Java programs. Data types and other tokens: Boolean variables, int, long, char, operators, arrays, white spaces, literals, assigning values; Creating and destroying objects; Access specifiers. Operators and Expressions: Arithmetic Operators, Bitwise operators, Relational operators, The Assignment Operator, The.? Operator; Operator Precedence; Logical expression; Type casting; Strings Control Statements: Selection statements, iteration statements, Jump Statements. Classes: Classes fundamentals; Declaring objects **T1:Ch1,2,3,4,5,6**

UNIT II: **08 hours**

Classes: Constructors, this keyword, garbage collection.

Inheritance: inheritance basics, using super, creating multi-level hierarchy, method overriding. **Exception handling:** Exception handling in Java. **T1: T1 :Ch 6 , Ch 7, Ch 8 , Ch10**

UNIT III: **09 hours**

Packages and Interfaces, Multi-Threaded Programming:Packages, Access Protection, Importing Packages, Interfaces. Multi Threaded Programming: What are threads? How to make the classes threadable ; Extending threads; Implementing runnable; Synchronization; Changing state of the thread;read-write problem, producer consumer problems.**T1** : Ch 9 , Ch 11

UNIT IV: **07 hours**

Event Handling: Two event handling mechanisms; The delegation event model; Event classes; Sources of events; Event listener interfaces; Using the delegation event model; Adapter classes; classes.

Introducing the AWT: Working with Windows, Graphics, and Text: Introduction the AWT: Working with Windows, Graphics and Text AWT Classes, Window Fundamentals, Working with Fra Windows, Introducing Graphics, Working with Color **T1:**Ch 22 , Ch 23

UNIT V : **08 hours**

Swings: Swings: The origins of Swing; Two key Swing features; Components and Containers; The Swing Packages; A simple Swing Application; Create a Swing Applet; Jlabel and ImageIcon; JTextField;The Swing Buttons; JTabbedpane; JScrollPane; JList; JComboBox; JTable. **T1: Ch 29, Ch 30**

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, vide

COURSE OUTCOMES: On completion of the course, student should be able to:

CO1: To understand OOPs concepts/ principles in JAVA.
CO2: To identify java languge components & how they work together in application
CO3: To design and program stand alone java application .
CO4: To apply knowledge of AWT to develop UI.
CO5: To design graphical UI with JAVA swings .

TEXT BOOK:

1. Herbert Schildt: Java - The Complete Reference, 7th Edition, Tata McGraw Hill, 2007.

(Chapters 1, 2, 3, 4, 5, 6, 8, 10, 11, 21, 22, 29, 30, 31)

REFERENCE BOOKS

1) Mahesh Bhave and Sunil Patekar, "Programming with Java", First Edition, Pearson Education,2008, ISBN:9788131720806
2) Herbert Schildt, The Complete Reference C++, 4th Edition, Tata McGraw Hill, 2003.
3) Stanley B.Lippmann, JoseeLajore, C++ Primer, 4th Edition, Pearson Education, 2005.
4) RajkumarBuyya,SThamarasiselvi, xingchenchu, Object oriented Programming with java, Tata McGraw Hill education private limited.
5) Richard A Johnson, Introduction to Java Programming and OOAD, CENGAGE Learning.
6) E Balagurusamy, Programming with Java A primer, Tata McGraw Hill companies

SCHEME FOR EXAMINATIONS:

Engineering Science Course (ESC/ETC/PLC) shall be evaluated both by CIE and SEE

MAPPING of COs with POs and PSOs

	PO1	**PO**	**PO**	**PO4**	**PO5**	**PO6**	**PO**	**PO**	**PO9**	**PO10**	**PO1**	**PO1**	**PSO**	**PSO**	**PSO**
CO	2	2	2		2								2	2	
CO	2	2	2		2	2							2	2	
CO			2		2	2							2	2	
CO	2	2	2	2	2								2	2	
CO	2	2	2	2	2								2	2	
Strength of correlation: Low-1, Medium- 2, High-3															

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024 -2025

Course Title	**OOPs with C++**						
Course Code	22IST306B						
Category	**Engineering Science Course (ESC/ETC/PLC)**						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	**00**	**00**	**00**	**03**	**39**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objectives:

1. Understand concepts of Object Oriented Programming and design programs using classes and objects for C++ .
2. Construct applications to provide flexible options for the creation of new definitions for some of the operators.
3. Specifying mechanism of deriving a new class from older classes through inheritance.
4. Implement methods to select appropriate member function during run time.
5. Design programs using Templates, exceptions and handle file I/Os

UNIT I **08 hours**

Introduction: Overview of C++, Sample C++ program, Console I/O , variables in C++, statements, arrays and strings, pointers & user-defined types, Function Components, argument passing, inline functions, function overloading. **Classes & Objects**–I: Class Specification, Class Objects, Scope resolution operator, Access members, Defining member functions, Data hiding, Constructors, Destructors, Parameterized constructors, Static data members and static member Functions.**T1: Ch 11, Ch 12,Ch 14 (selective topics only)**

UNIT II **08 hours**

Classes & Objects –II: Friend functions, Passing objects as arguments, Returning objects, Arrays of objects, Dynamic objects, Pointers to objects, Copy constructors, Generic functions and classes,

Applications.**Operator overloading** : operator member functions to overload +, - , pre-increment, post-increment, pre-decrement, post decrement operators , friend operator function to overload << and >> operators T1: Ch 12 & Ch 13, Ch 15 , Ch 20 **(selective topics only)**

UNIT III **08 hours**

Inheritance-I: Base Class Access control , Inheritance and protected members, Protected base class inheritance, Inheriting multiple base classes, Constructors, Destructors and Inheritance, Passing parameters to base class constructors, Granting access, Virtual base classes.T1:Ch16

UNIT IV **08 hours**

Virtual functions: Virtual function, Calling a Virtual function through a base class reference, Virtual attribute is inherited, Virtual functions are hierarchical, Pure virtual functions, Abstract classes, Using virtual functions.**Polymorphism:** Early and late binding. T1:Ch17

UNIT V **07 hours**

Exception Handling: Exception handling fundamentals, Exception handling options.**C++ File I/O:** fstream and the File Classes, Opening and Closing a File, Reading and Writing Text Files, Unformatted and Binary I/O, Characters vs. Bytes, put( ) and get( ), read( ) and write( ), More get( ) Functions, getline( ) , Detecting EOF, The ignore( ) Function, peek( ) and putback( ), flush( ), Random Access, Obtaining the Current File Position , I/O Status, Customized I/O and Files.Introducing the Standard Template Library: An overview of STL : containers, vectors, lists, maps.T1: Ch 19, Ch 21,Ch 24(selective topics only)

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos

Course Outcomes:

After the completion of the above course students will be able to

CO1: Understand principles of Object Oriented Programming.
CO2: Identify classes and objects in real world applications.
CO3: Develop applications by providing new definitions for some of the operators/functions.
CO4: Design and develop applications through inheritance, Virtual Base classes and dynamic polymorphism.
CO5: Apply concepts of Templates, Exceptions and File handling in designing programs.

TEXT BOOKS:

Herbert Schildt: C++ The Complete Reference, 4th Edition, Tata McGraw Hill, 2014

REFERENCE BOOKS:

1. Stanley B.Lippmann, Josee Lajore: C++ Primer, 4th Edition, Addison Wesley, 2005.
2. Paul J Deitel, Harvey M Deitel: C++ for Programmers, Pearson Education, 2009.
3. K R Venugopal, Rajkumar Buyya, T Ravi Shankar: Mastering C++, Tata McGraw Hill, 1999.
4. Sourav Sahay: Object-Oriented Programming with C++, Oxford University Press, 2006.

EBOOKS/ONLINE RESOURCES

7) http://www.nptel.ac.in

SCHEME FOR EXAMINATIONS:

Engineering Science Course(ESC/ETC/PLC) shall be evaluated both by CIE and SEE

MAPPING of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3										2		2
CO2		3	3	3									2		2
CO3		3	3	3									2	1	2
CO4		3											2		
CO5		3	3	3									2		

Strength of correlation: Low-1, Medium- 2, High-3

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024 -2025

Course Title	**DATA ANALYTICS WITH EXCEL**
Course Code	**22IST308A**

Category	**Ability Enhancement Course -III(AEC)**						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	01	00	00	00	01	15	01
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 02 Hours**		

COURSE OBJECTIVE:

- Create flexible data aggregations using pivot tables.
- Represent data visually using pivot charts.
- Calculate margins and other common ratios using calculation on pivot table.
- Filter data using slicers in multiple pivot tables.
- Create aggregate reports using formula based techniques.

UNIT I	**3 hours**
Introduction to Excel: About Excel & Microsoft, Uses of Excel, Excel software, Spreadsheet window pane, Title Bar, Menu Bar, Standard Toolbar, Formatting Toolbar, the Ribbon, File Tab and Backstage View, Formula Bar, Workbook Window, Status Bar, Task Pane, Workbook & sheets **Columns & Rows:** Selecting Columns & Rows, Changing Column Width & Row Height, Autofitting Columns & Rows, Hiding/Unhiding Columns & Rows, Inserting & Deleting Columns & Rows, Cell, Address of a cell, Components of a cell – Format, value, formula, Use of paste and paste special	
UNIT II	**3 hours**
Functionality Using Ranges: Using Ranges, Selecting Ranges, Entering Information Into a Range, Using AutoFill **Creating Formulas:** Using Formulas, Formula Functions – Sum, Average, if, Count, max, min, Proper, Upper, Lower, Using AutoSum,	
UNIT III	**3 hours**
Advance Formulas : Concatenate, Vlookup, Hlookup, Match, Countif, Text, Trim **Spreadsheet Charts:** Creating Charts, Different types of chart, Formatting Chart Objects, Changing the Chart Type, Showing and Hiding the Legend, Showing and Hiding the Data Table	
UNIT IV	**3 hours**
Data Analysis: Sorting, Filter, Text to Column, Data Validation **PivotTables:** Creating PivotTables, Manipulating a PivotTable, Using the PivotTable Toolbar, Changing Data	

Field, Properties, Displaying a PivotChart, Setting PivotTable Options, . Adding Subtotals to PivotTables
UNIT V **3 hours** **Spreadsheet Tools:** Moving between Spreadsheets, Selecting Multiple Spreadsheets, Inserting and Deleting Spreadsheets Renaming Spreadsheets, Splitting the Screen, Freezing Panes, Copying and Pasting Data between Spreadsheets, Hiding , Protecting worksheets **Making Macros:** Recording Macros, Running Macros, Deleting Macros

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos

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

CO 1: Apply analytical excel skills and tools in business problem solving.
CO 2: Organize the data for effective analysis.
CO 3: Help in identifying and forecasting trends.
CO 4: Make graphical representation that provides real insight for taking decisions.
CO 5: Equip the students for better internship offers and self-employement.

TEXT BOOKS:

- A to Z of MS EXCEL: A book for learners and trainers kindle edition by Rinkoo Jain ASIN: B08WPMFWXM.

REFERENCE BOOKS:

- Excel 20019 All-in-one: Master the new features of Excel 2019/Office 365 paperback by Lokesh Lalwani BPB Publication.
  3. Microsoft Excel 2019: Data Analysis & Business Model Paperback by L Winston Wayner PHI.

EBOOKS/ONLINE RESOURCES

Weblinks and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=9AOHwmmq5ug&list=PLNLDEHOJTZSjcyfFIwPP1g31WLoJCyTPw
- https://www.youtube.com/watch?v=v2oNWja7M2E&list=PLmejDGrsgFyBCxF37lewZtX6c1kJXyLt3
- https://www.youtube.com/watch?v=OOWAk2aLEfk&pp=ygUbZGF0YSBhbmFseXRpY3MgdXNpbmcgZXhjZWwg
- **https://www.youtube.com/watch?v=s1v5UwM56yM&pp=ygUbZGF0YSBhbmFseXRpY3MgdXNpbmcgZXhjZWwg**

SCHEME FOR EXAMINATIONS:

Ability Enhancement Course shall be evaluated both by CIE and SEE

MAPPING of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	3	-	2	-	-	-	-	-	-	1	2	-	1
CO2	1	3	-	-	2	-	-	-	-	-	-	1	2	-	1
CO3	1	3	1	-	2	-	-	-	-	-	-	1	2	-	1
CO4	1	-	3	-	2	-	-	-	-	-	-	1	2	-	1
CO5	1	-	2	-	1	-	-	-	-	-	-	1	2	-	1

Strength of correlation: Low-1, Medium- 2, High-3

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024 -2025

Course Title	**R PROGRAMMING**						
Course Code	**22IST308B**						
Category	**Ability Enhancement Course-III(AEC)**						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	01	**00**	**00**	**00**	**01**	**15**	**01**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 02 Hours**		

COURSE OBJECTIVES:

1. Explore and understand how R and R Studio interactive environment.
2. To learn and practice programming techniques using R programming.
3. Read Structured Data into R from various sources.
4. Understand the different data Structures, data types in R.
5. To develop small applications using R Programming

UNIT I **3 hours**

Setting up :Installing R, Starting R, Working directory, Writing scripts. R as a calculating Environment, Arithmetic, Variables, Functions, Vectors, Expressions and assignments, Logical expressions, Matrices

UNITII	**3 hours**
Basic programming: Introduction, Branching with if, Looping with for, Looping with while, Vector-based programming, Input and output:Text ,Input from a file, Input from the keyboard, Output to a file ,Plotting,	
UNITIII	**3 hours**
Programming with functions, Functions, Scope and its consequences, Arguments, Vector-based programming using functions, Recursive programming. Sophisticated data structures: Factors, Dataframes ,Lists, The apply family	
UNITIV	**3 hours**
Better graphics: Introduction, Graphics parameters, Graphical augmentation, Mathematical typesetting, Permanence, Grouped graphs:lattice,3D plots.	
UNITV	**3 hours**
Pointers to further programming techniques: Packages, Frames and environments, Debugging again, Identifying bottlenecks, Object-oriented programming, Manipulation of data, Compiled code	

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animatio videos

COURSE OUTCOMES: On completion of the course, student should be able to:

CO1: Understand the fundamental syntax of R through readings, practice exercises.

CO2: Demonstrate, and write R code.

CO3: Apply critical programming language concepts such as data types, iteration,

CO4: Explore control structures, functions, and Boolean operators by writing R rograms and through examples

CO5: Design and Develop Solutions to problems using R programming

TEXT BOOKS

1. Jones, O., Maillardet. R. and Robinson, A. (2014). Introduction to Scientific Programming and Simulation Using R. Chapman & Hall/CRC, The R Series.

REFERENCE BOOKS

1. Michael J. Crawley, “Statistics: An Introduction using R”, Second edition, Wiley,2015

ONLINE RESOURCES

1. Wickham, H. & Grolemund, G. (2018). for Data Science. O’Reilly: New York. Available for free at http://r4ds.had.co.nz

SCHEME FOR EXAMINATIONS:

Ability Enhancement Course shall be evaluated both by CIE and SEE

MAPPING of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	2		2	-	-	-	-	-	-	-	1	1	1
CO2	3	3	3	2	3	-	-	-	-	-	-	-	1	1	1
CO3	3	2	2	3	3	-	-	-	-	-	-	-	1	1	-
CO4	3	2	2	3	-	-	-	-	-	-	-	-	1	1	1
CO5	3	3	3	2	3	-	-	-	-	-	-	-	1	1	1

Strength of correlation: Low-1, Medium- 2, High-3

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024 -2025

Course Title	Version Controlling with GIT
Course Code	**22IST308C**

Category	Ability Enhancement Course -III(AEC)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	01	**00**	**00**	**00**	**01**	**15**	**01**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 02 Hours**		

COURSE OBJECTIVE:

1) Understand the use of basic GiT Commands and File systems
2) Use of Commits, Diffs , Branches and Altering commands.
3) Use of create a local repository, create a commit, create a remote repository and push commits to aremote repository.
4) Understand to write effective commit messages

UNIT I **3 hours**
Introduction: Basic GiT concepts: Basic Concepts, Repositories, Git Object Types ,Index ,Content Addressable Names ,Git Tracks Content ,Pathname Versus Content Object Store Pictures , Git Concepts at Work Object Store Pictures, Git Concepts at Work: git directory ,Objects, Hashes, and Files and Trees
UNIT II **3 hours**
File management and the Index: File Classifications in Git: Using git add, Using git rm ,Using git mv, A Detailed View of Git's Object Model and Files.**Commits:** Identifying Commits: Absolute Commit Names ,refs and symrefs ,Relative Commit Names, Commit History: Viewing Old Commits, Commit Graphs ,Commit Ranges, Finding Commits: Using git bisect , Using git blame , Using Pickaxe
UNIT III **3 hours**
Branches: Branch Names, Using Branches, Creating Branches, Listing Branch Names ,Viewing Branches ,Checking Out Branches, Deleting Branches. **Diffs:** Forms of the git diff Command, examples, Simple git diff Example, git diff and Commit Ranges ,git diffwith Path Limiting , Comparing How Subversion and Git Derive diffs.
UNIT IV **3 hours**
Merges: Merge Examples, Working with Merge Conflicts, Merge Strategies. **Altering Commits:** Caution About Altering History: Using git reset ,Using git cherry-pick ,Using git revert,reset, revert, and checkout, Rebasing Commits :Using git rebase -i , rebase Versus merge.
UNIT V **3 hours**

Repository Management: Repository Structure, Living with Distributed Development, Knowing YourPlace, Working with Multiple Repositories.
Patches: Why Use Patches? , Generating Patches., Mailing Patches ,Applying Patches ,Bad Patches , Patching Versus Merging,

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animatio videos

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

CO1. Illustrate how to use Git for real-world development scenarios
CO2. Gain insight into Git's common use cases, initial tasks, and basic functions.
CO3. Apply how to manage merges, conflicts, patches, and diffs.
CO4: Gain insight into merging and commit altering
CO5:Manage Repository

TEXT BOOKS

Version Control with Git, Prem Kumar Ponuthorai, Jon Loeliger, Publisher(s): O'Reilly Media,Inc. 3rd Edition,2022. ISBN: 9781492091196

REFERENCE BOOKS

1. Version Control with Git, 2nd Edition by Jon Loeliger, Matthew McCullough

ONLINE RESOURCES

1. http://elearning.vtu.ac.in/econtent/courses/video/
2. https://nptel.ac.in/courses/106/101/106101060/.
3. http://cse01-iiith.vlabs.ac.in/

SCHEME FOR EXAMINATIONS:

Ability Enhancement Course shall be evaluated both by CIE and SEE

MAPPING of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-	-	-	-	-	-	-	1	2	
CO2	3	2	2	-	-	-	-	-	-	-	-	-	1	2	
CO3	3	2	2	-	-	-	-	-	-	-	-	-	1	2	
CO4	3	2	2	-	-	-	-	-	-	-	-	-	1	2	
CO5	3	2	2	-	-	-	-	-	-	-	-	-	1	2	
Strength of correlation: Low-1, Medium- 2, High-3															

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024 -2025

Course Title	**DATA VISUALIZATION WITH PYTHON**						
Course Code	22IST308D						
Category	Ability Enhancement Course-III (AEC)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	01	00	00	00	01	15	01
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 02 Hours**		

COURSE OBJECTIVE:

1. Use data analysis tools in the pandas library

2. Load, clean, transform, merge and reshape data.

3. Handle external files as well as exceptions.

4. Analyze and manipulate time series data.

5. Solve real world data analysis problems.

UNIT I	**3 hours**
Introduction: Introduction to Data Science, Exploratory Data Analysis and Data Science Process. Motivation for using Python for Data Analysis, Introduction of Python shell iPython and Jupyter Notebook. **Essential Python Libraries**: NumPy, pandas, matplotlib, SciPy, scikit-learn, statsmodels.	
UNIT II	**3 hours**
Getting Started with Pandas: Arrays and vectorized conputation, Introduction to pandas Data Structures, Essential Functionality, Summarizing and Computing Descriptive Statistics.Data Loading, Storage and File Formats.Reading and Writing Data in Text Format, Web Scraping, Binary Data Formats, Interacting with Web APIs, Interacting with Databases Data Cleaning and Preparation. Handling Missing Data, Data Transformation, String Manipulation	
UNIT III	**3 hours**
Data Wrangling: Hierarchical Indexing, Combining and Merging Data Sets Reshaping and Pivoting.**Data Visualization matplotlib**: Basics of matplotlib, plotting with pandas and seaborn, other python visualization tools.	
UNIT IV	**3 hours**
Data Aggregation and Group operations: Group by Mechanics, Data aggregation, General split-apply-combine, Pivot tables and cross tabulation.**Time Series Data Analysis**: Date and Time Data Types and Tools, Time series Basics, date Ranges, Frequencies and Shifting, Time Zone Handling, Periods and Periods Arithmetic, Resampling and Frequency conversion, Moving Window Functions.	
UNIT V	**3 hours**
Advanced Pandas: Categorical Data, Advanced GroupBy Use, Techniques for Method Chaining.	

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos

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

CO 1: Comprehend the importance of the exploratory data analysis paradigm
CO 2: Understand the fundamental design principles and different types of data visualization
CO 3: Select appropriate data visualization technique for given data
CO 4: Design visualizations for presenting stories from data
CO 5: Apply the fundamental concepts of data visualization to define a project in your field of

study

TEXT BOOKS:

1. McKinney, W.(2019). Python for Data Analysis: Data Wrangling with Pandas, NumPy and IPython. 2nd edition. O'Reilly Media
2. 2.O'Neil, C., & Schutt, R. (2021). Doing Data Science: Straight Talk from the Frontline
O'Reilly Media

REFERENCE BOOKS:

1. Allen Downey ,Jeffrey Elkner ,Chris Meyers,: Learning with Python, Dreamtech Press
2. David Taieb ,"Data Analysis with Python: A Modern Approach " 1st Edition, Packt Publishing

EBOOKS/ONLINE RESOURCES

Weblinks and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=MiiANxRHSv4
- **https://www.youtube.com/watch?v=_YWwU-gJI5U**
- **https://www.youtube.com/shorts/NH8Yk3ChI3Q**
- **https://www.youtube.com/watch?v=5Zg-C8AAIGg**
- **https://www.youtube.com/watch?v=YaGqOPxHFkc**
- **https://www.youtube.com/watch?v=3JWK5gRI9p0**

SCHEME FOR EXAMINATIONS:

Ability Enhancement Course shall be evaluated both by CIE and SEE

MAPPING of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1			1		1									1	
CO2	1		1		1								1	3	
CO3	1	3			3										
CO4	3	3	3		3	1							3		
CO5		1		2	3										1
Strength of correlation: Low-1, Medium- 2, High-3															

Detailed Scheme and Syllabus

ACADEMIC YEAR 2024-2025

III - IV (2023-2027 BATCH) (160Credits)

Dr. Ambedkar Institute of Technology
Bangalore

Department Of
Information Science and Engineering

Vision

3. To create **D**ynamic, **R**esourceful, **A**dept and**I**nnovative **T**echnical professionals to meet global challenges.

Mission

4. To offer state-of-the-art undergraduate, postgraduate and doctoral programmes in the fields of Engineering, Technology and Management.
5. To generate new knowledge by engaging faculty and students in research, development and innovation
6. To provide strong theoretical foundation to the students, supported by extensive practical training to meet industry requirements.
7. To install moral and ethical values with social and professional commitment.

DEPARTMENT VISION AND MISSION

Vision:

8. Imparting quality technical education and preparing professionals to meet Information Technological challenges globally.

Mission:

9. Prepare highly capable Information Science engineers through best practices.
10. Encourage students to pursue higher education for further growth in the learning process and to promote research in the frontier areas of Information Technology.

- Educate students to take up social and professional responsibilities with ethical values for the betterment of the society

PROGRAM SPECIFIC OUTCOMES(PSOS)

PSO1: Students should be able to develop and optimize solutions for information systems employing fundamentals of mathematics, Hardware, software, data storage, security and communication networks.

PSO2:Students should be able to understand, analyze and adopt principles of programming paradigms by using latest technologies such as Cloud computing, Big data analytics, AI ,Machine Learning and IoT based applications for solving real-world problems.

PSO3: Students should be able to acquire and demonstrate the team work, professional ethics, competence and communication skills while developing software products.

PROGRAMME OUTCOMES (POs)

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 the 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 the 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 the engineering practice.
9. Individual and team work: 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

Dr.Ambedkar Institute of Technology, Bengaluru-560056
Outcome Based Education(OBE) and Choice Based Credit System
B.E. in Information Science & Engineering
Scheme of Teaching and Examination effective from the Academic Year 2024-25

III SEMESTER

Sl. No	Course	Course Code	Course Title	Teaching Department (TD) and Question Paper Setting	Teaching Hours /Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Self study	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	BSC	22MAT301IS	Mathematics for Computer Science	Maths	3	2	0		03	50	50	100	4
2	IPCC	22 ISU302	Digital Design and Computer Organization	ISE	3	0	2		03	50	50	100	4
3	IPCC	22 ISU303	Operating Systems	ISE	3	0	2		03	50	50	100	4
4	PCC	22IST304	Data Structures using C/C++	ISE	3	0	0		03	50	50	100	3
5	PCCL	22ISL305	Data Structures Lab	ISE	0	0	2		03	50	50	100	1
6	ESC	22IST306x	ESC/ETC/PLC	ISE	3	0	0		03	50	50	100	3
7	UHV	22HSL307	Social Connect and Responsibility	Any Department	0	0	2		01	100	---	100	1
8	AEC/ SEC	22IST308x or 22ISL308x	Ability Enhancement Course/Skill Enhancement Course – III		If the course is a Theory: 1	0	0		01	50	50	100	1
					If a course is a laboratory: 0	0	2		02				
9	HS	22CDN309	Aptitude and Verbal Ability Skill-I	Placement Cell	2	0	0		--	50	--	50	PP/NP
10	MC	22NSN310	National Service Scheme (NSS)	NSS coordinator	0	0	2		--	100	---	100	PP/NP
		22PEN310	Physical Education (PE) (Sports and Athletics)	Physical Education Director									
		22YON310	Yoga	Yoga Teacher									
									Total	550	350	900	21

PCC: Professional Core Course, **PCCL**: Professional Core Course laboratory, **UHV**: Universal Human Value Course, **MC**: Mandatory Course (Non-credit), **AEC**: Ability Enhancement Course, **SEC**: Skill Enhancement Course, **L:** Lecture, **T**: Tutorial, **P**: Practical, S= Self-Study, **CIE**: Continuous Internal Evaluation, **SEE**:Semester End Evaluation. K: This letter in the course code indicates common to all the streams of Engineering. ESC: Engineering Science Course, ETC: Emerging Technology Course, PLC: Programming Language Course

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Engineering Science Course (ESC/ETC/PLC) 22XXT306x			
22IST306A	OOPs with Java	22IST306C	
22IST306B	OOPs with C++	22IST306D	
Ability Enhancement Course – III 22XXT308x **OR** 2XXL308x			
22ISL308A	Data analytics with excel	22IST308C	Version Controlling with GIT
22ISL308B	R Programming	22IST308D	Data Visualization with Python

Professional Core Course (IPCC): Refers to Professional Core Course Theory Integrated with practical of the same course. Credit for IPCC can be 04 and its Teaching– Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper.

National Service Scheme /Physical Education/Yoga: All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education(PE)(Sports and Athletics), and Yoga(YOG) with the concerned coordinator of the course during the first Week of III semesters. Activities shall be carried out between III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the Degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, and Yoga activities. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of Degree.

Dr.Ambedkar Institute of Technology, Bengaluru-560056
Outcome Based Education(OBE) and Choice Based Credit System
B.E. in Information Science & Engineering
Scheme of Teaching and Examination effective from the Academic Year 2024-25

IV SEMESTER

Sl. No	Course and Course Code		Course Title	Teaching Department (TD)and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination				Credits
					Theory	Tutorial	Practical/ Drawing	Self - Study	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	PCC	22IST401	Analysis & Design of Algorithms	ISE	3	0	0		03	50	50	100	3
2	IPCC	22ISU402	Advanced Java	ISE	3	0	2		03	50	50	100	4
3	IPCC	22ISU403	Data Base Management Systems	ISE	3	0	2		03	50	50	100	4
4	PCCL	22ISL404	Analysis & Design of Algorithms Lab	ISE	0	0	2		03	50	50	100	1
5	ESC	22IST405x	ESC/ETC/PLC	ISE	3	0	0		03	50	50	100	3
6	AEC/ SEC	22IST406x or 22ISL406x	Ability Enhancement Course/Skill Enhancement Course- IV	TD and PSB: Concerned department	If the course is Theory				01	50	50	100	1
					1	0	0						
					If the course is a lab				02				
					0	0	2						
7	BSC	22BIT407	Biology For Engineers	TD / PSB: BT, CHE,	2	0	0		03	50	50	100	2
8	UHV	22HST408	Universal human values course	Any Department	1	0	0		01	50	50	100	1
9	HS	22CDN409	Aptitude and Verbal Ability Skill-II	Placement Cell	2	0	0		--	50	--	50	PP/ NP
10	MC	22NSN410	National Service Scheme (NSS)	NSS coordinator	0	0	2			100	---	100	PP/ NP
		22PEN410	Physical Education (PE) (Sports and Athletics)	Physical Education Director									
		22YON410	Yoga	Yoga Teacher									
								Total		500	400	900	19

PCC: Professional Core Course, PCCL: Professional Core Course laboratory, UHV: Universal Human Value Course, MC: Mandatory Course (Non-credit), AEC: Ability Enhancement Course, SEC: Skill Enhancement Course, L: Lecture, T: Tutorial, P: Practical, S= Self-Study, CIE: Continuous Internal Evaluation, SEE: Semester End Evaluation. K : This letter in the course code indicates common to all the stream of engineering.

Engineering Science Course (ESC/ETC/PLC) 22XXT405x OR 22XXL405x			
22IST405A	Discrete Mathematical Structure	22IST405E	Optimization Techniques
22IST405B	Unix Shell Programming	22IST405D	Graph Theory and Networks
Ability Enhancement Course / Skill Enhancement Course – IV 22XXT405x OR 22XXL406x			
22ISL406A	Green IT and Sustainability	22ISL406C	Technical writing using LATEX
22IST406B	UI/UX	22XXX406D	

Professional Core Course (IPCC): Refers to Professional Core Course Theory Integrated with practical of the same course. Credit for IPCC can be 04 and its Teaching– Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper.

National Service Scheme /Physical Education/Yoga: All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education(PE)(Sports and Athletics), and Yoga(YOG) with the concerned coordinator of the course during the first Week of III semesters. Activities shall be carried out between III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the Degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, and Yoga activities. These courses shall

not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the courses is mandatory for the award of Degree.

IV SEMESTER

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024 -2025

Course Title	**ANALYSIS & DESIGN OF ALGORITHMS**						
Course Code	**22IST401**						
Category	Professional Core Course (PCC)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	**00**	**00**	**00**	**03**	**39**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

COURSE OBJECTIVE:

- To introduce the concept of an algorithm and understand the methods for analysis.
- To represent algorithmic time efficiency using different asymptotic notations.
- Explore the various algorithm design techniques, the process of its design and analysis.
- To solve problems using appropriate design techniques.
- Understand concepts of space-time trade offs.

UNIT I **07 hours**

Introduction: Notion of Algorithm, Methods of specifying algorithm, Important problem types:Sorting searching string processing, graph problems,combinatorial problems,, Asymptotic Notations and Basic efficiency classes: Informal introduction ,O- notation, Ω-notation ,Θ- notation, Basic efficiency classes, Mathematical Analysis of Non-Recursive and RecursiveAlgorithms

Brute Force:Introduction, Bubble Sort, Sequential search

Text Book 1:Chapter 1: 1.1,1.3 Chapter 2:2.2,2.3.2.4, Chapter 3:3.1,3.2

UNIT II **08 hours**

Divide and conquer: General Method, Binary search,Recurrence equation for DAC, Finding Minimum and maximum,Merge Sort, Quick Sort

Decrease-and-conquer: Introduction, Depth First Search,Breadth First Search,Topological Sorting.

Text Book 1 : Chapter 4, 4.1,4.2,4.3 Chapter 5:5.2,5.

UNIT III **09 hours**

Greedy method: The General Method, Knapsack Problem, Minimum cost spanning trees : Prim's Algorithm, Kruskal'sAlgorithm, Single Source Shortest Paths: Dijikstras Algorithm, Huffman trees

Transform and Conquer: Heaps and Heapsort

Text Book 2: Chapter 4 :4.1,4.2,4.4; Text Book 1: Chapter 9 : 9.1,9.2,9.3,9.4 Chapter 6 : 6.4

UNIT IV **07 hours**

Dynamic Programming: Computing binomial coefficient**,**Warshall's and Floyds algorithms, Knapsack problem, Travelling Sales person problem

Backtracking:N-Queen problem, sum of Subset Problem

Text Book 1:Chapter 8 : 8.1,8.2,8.4, Ch 12:12.1 Text Book 2: Chapter 5: 5.9

UNIT V **08 hours**

Branch-and-Bound: Assignment Problem, Traveling Sales man Problem

Space and Time Tradeoffs: Sorting by Counting : Comparison Counting sort ,Distribution Counting

Horspool's algorithm **NP-Complete and NP Hard problems**: P and NP problems,NP complete problems
Text Book 1: Chapter 11: 11.2 , Chapter 7:7.1,7.2 Chapter 10: 10.3

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animatio videos

COURSE OUTCOMES: On completion of the course, student should be able to:

CO1: Determine performance of recursive and non- recursive algorithms.

CO2: Develop and analyze algorithms to solve problems using various design techniques.

CO3: Apply different design techniques to solve problems.

CO4: Determine solutions to optimization problems by applying suitable algorithm.

CO5: Solve problems associated with space–time tradeoffs

TEXT BOOK:

- Anany Levitin: Introduction to the Design and Analysis of Algorithms, Second Edition,Pearson Education, 2009.
- Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran: Computer Algorithms/ C++, 2nd Edition, University press, 2014

REFERENCE BOOKS:

- Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein: Introduction toAlgorithms, 2nd Edition, PHI, 2006.
- Design and Analysis of Algorithms , S. Sridhar, Oxford (Higher Education

EBOOKS/ONLINE RESOURCES:

https://onlinecourses.nptel.ac.in/

SCHEME FOR EXAMINATIONS:

PCC shall be evaluated both by CIE and SEE. Both Assigment and Group Activity are evaluated for 5 Marks each.Two CIE are conducted each for 25 marks. Total CIE theory test marks of 50 is reduced to 40 Marks and Assignment & Group Activity Marks are added to get final CIE Marks . SEE Theory exam is conducted for 100 marks and then reduced to 50 Marks.

MAPPING of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3											2	1	
CO2	3	3	2	3									2	1	
CO3	3	3	2	3									2	1	
CO4	3	3	2	3									2	1	
CO5	3	3	2	3									2	1	

Strength of correlation: Low-1, Medium- 2, High-3

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024 -2025

Course Title	**Advanced Java**						
Course Code	**22ISU402**						
Category	Integrated Professional Core Course (IPCC)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	**00**	**02**	**00**	**05**	**60**	**04**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objectives:

1. Identify the need for advanced Java concepts like Enumerations and Collections
2. Construct client-server applications using Java socket API
3. Make use of JDBC to access database through Java Programs
4. Adapt servlets to build server side programs
5. Demonstrate the use of JavaBeans to develop component-based Java software

UNIT I **08 hours**

Enumerations, Autoboxing and Annotations(metadata): Enumerations, Enumeration fundamentals, the values() and valueOf() Methods, java enumerations are class types,enumerations Inherits Enum, example, type wrappers, Autoboxing, Autoboxing and 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 1: ch- 12

Lab Components:

1.Write Java Program to illustrate the usage of enumerations.

UNIT II **08 hours**

The collections and Framework: Collections Overview, Recent Changes to Collections,The Collection Interfaces, The Collection Classes, Accessing a collection Via an Iterator,Storing User Defined Classes in Collections, The Random Access Interface, Working With Maps, Comparators, The Collection Algorithms, Why Generic Collections?, The legacy Classes and Interfaces, Parting Thoughts on Collections.Text Book 1: Ch.17

Lab Components:

1. Write Java Programs to illustrate the collection interface

UNIT III **08 hours**

String Handling :The String Constructors, String Length, Special String Operations, String Literals, String Concatenation, String Concatenation with Other Data Types, String Conversion and toString( ) Character Extraction, charAt( ), getChars( ), getBytes( ) toCharArray(), String Comparison, equals( ) and equalsIgnoreCase( ), regionMatches( ) startsWith( ) and endsWith( ), equals( ) Versus == , compareTo( ) Searching Strings, Modifying a String, substring( ), concat( ), replace( ), trim( ), Data Conversion Using valueOf( ), Changing the Case of Characters Within a String, Additional String Methods, StringBuffer , StringBuffer Constructors, length( ) and capacity( ), ensureCapacity( ), setLength( ), charAt( ) and setCharAt( ), getChars( ),append( ), insert( ), reverse( ), delete( ) and deleteCharAt( ), replace( ), substring( ), Additional StringBuffer Methods, StringBuilder Text Book 1: Ch 15

Lab Components:

1. Write Java Programs to illustrate string handling

UNIT IV **08 hours**

Background; The Life Cycle of a Servlet; Using Tomcat for Servlet Development; A simple Servlet; The Servlet API; The Javax.servlet Package; Reading Servlet Parameter; The 08 Javax.servlet.http package; Handling HTTP Requests and Responses; Using Cookies; Session Tracking. Java Server Pages (JSP): JSP, JSP Tags, Tomcat, Request String, User Sessions, Cookies, Session Objects Text Book 1: Ch 31 Text Book 2: Ch 11

Lab Components:

Write Java Programs to illustrate servlet

UNIT V **07 hours**

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; ResultSet; Transaction Processing; Metadata, Data types; Exceptions. Text Book 2: Ch 06

Lab Components:

Write Java Programs to illustrate JDBC connectivity

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos

COURSE OUTCOMES: On completion of the course, student should be able to:

CO1: Interpret the need for advanced Java concepts like enumerations and collections in developing modular and efficient programs.

CO2:Build client-server applications and TCP/IP socket programs

CO3:Illustrate database access and details for managing information using the JDBC API

CO4:Describe how servlets fit into Java-based web application architecture

CO5:Develop reusable software components using Java Beans

TEXT BOOKS:

1. Herbert Schildt: JAVA the Complete Reference, 7th/9th Edition, Tata McGraw Hill, 2007.

2. Jim Keogh: J2EE-TheCompleteReference, McGraw Hill, 2007.

REFERENCE BOOKS:

1. Y. Daniel Liang: Introduction to JAVA Programming, 7thEdition, Pearson Education, 2007.
2. Stephanie Bodoff et al: The J2EE Tutorial, 2nd Edition, Pearson Education,2004
3. Uttam K Roy, Advanced JAVA programming, Oxford University press, 2015.

EBOOKS/ONLINE RESOURCES

4. https://www.javatpoint.com/what-is-advance-java

SCHEME FOR EXAMINATIONS

The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE).However, questions from the practical part of IPCC shall be Included in these question paper.

MAPPING of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2		2									2	
CO2	2	2	2		2									2	
CO3	2	2	2		2									2	
CO4	2	2	2		2									2	
CO5	2	2	2		2									2	
Strength of correlation: Low-1, Medium- 2, High-3															

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024 -2025

Course Title	**DATABASE MANAGEMENT SYSTEMS**						
Course Code	**22ISU403**						
Category	Integrated Professional Core Course (IPCC)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	**00**	**02**	**00**	**05**	**60**	**04**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objectives:

1. To analyze the basic concepts and architecture of DBMS.
2. To understand the conceptual and relational models to design databases
3. To Create and manipulate a relational database using SQL..
4. To understand the normalization steps in database design and removal of data anomalies.
5. To acquire the knowledge of transaction processing, NoSQL and MongoDB concepts

UNIT I : **08 hours**

Introduction: Introduction; Characteristics of Database approach; Actors on the screen; Workers behind the scene; Advantages of using DBMS approach; A when not to use a DBMS. Data models, schemas and instances; Three-schema architecture and data independence; Database languages and interfaces; The database system environment; Classification of Database Management systems**.**

Entity-Relationship Model: Using High-Level Conceptual Data Models for Database Design; An Example Database Application; Entity Types, Entity Sets, Attributes and Keys; Relationship types, Relationship Sets, Roles and Structural Constraints; Weak Entity Types; Refining the ER Design; ER Diagrams, Naming Conventions and Design Issues; Relationship types of degree higher than two.

T1:Ch1,2,7

UNIT II **07 hours**

Relational Model and Relational Algebra: Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; Update Operations, Transactions and dealing with constraint violations; Unary Relational Operations: SELECT and PROJECT; Relational Algebra Operations from Set Theory; Binary Relational Operations : JOIN and DIVISION; Additional Relational Operations; Examples of Queries in Relational Algebra. Relational Database Design Using ER-to-Relational Mapping**T1: Ch 3 , Ch 6.1-6.5 9.1**

UNIT III **09 hours**

SQL :Schema Definition, Basic Constraints and Queries: SQL Data Definition and Data Types; Specifying basi constraints in SQL; Schema change statements in SQL; Basic queries in SQL; More complex SQL Queries. Ins Delete and Update statements in SQL; Specifying constraints as Assertion and Trigger; Views (Virtual Tables) SQL**T1:ch4, ch5**

UNIT IV **07 hours**

Database Design: Functional Dependencies and Normalization: Informal Design Guidelines for Relation Schemas; Functional Dependencies; Normal Forms Based on Primary Keys; General Definitions of Second and Third Normal Forms; Boyce-Codd Normal Form. Relational Database Schema Design Algorithms and further Dependencies: Properties of Relational Decompositions; Multi valued Dependencies and Fourth Normal Form; Join Dependencies and Fifth Normal Form

T1: Ch15, ch16

UNIT V **08 hours**

Introduction to Transaction Processing Concepts and Theory:

Introduction to Transaction Processing, Transaction and System Concepts, Desirable Properties of Transactions, Characterizing Schedules Based on Recoverability, Characterizing Schedules Based on Serializability, Transaction Support in SQL

Concurrency Control Techniques: Two-Phase Locking Techniques for Concurrency Control, Two-Phase Locking Techniques for Concurrency Control, Multiversion Concurrency Control Techniques, Validation (Optimistic) Concurrency Control Techniques, Granularity of Data Items and Multiple Granularity Locking

T1: Ch 21, Ch 22

Introduction to NoSQL and MongoDB: What is NoSQL? Why NoSQL? Benefit over RDBMS, Types of NoSQL Database, and NoSQL vs. SQL Comparison. What is MongoDB? Overview of MongoDB, Design Goals for MongoDB Server and Database, MongoDB Tools, MongoDB CRUD Concepts, MongoDB Datatypes

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos

Lab Component:

8) Consider the customer-sale scenario given below. The primary keys are underlined and the data types are specified:

CUSTOMER(Cust id : integer, cust_name: string)
ITEM(item_id: integer, item_name: string, price: integer)
SALE(bill_no: integer, bill_data: date, cust_id: integer, item_id: integer, qty_sold: integer)

For the above schema, perform the following:

a) Create the tables with the appropriate integrity constraints
b) Insert around 10 records in each of the tables
c) List all the bills for the current date with the customer names and item numbers
d) List the total Bill details with the quantity sold, price of the item and the final amount
e) List the details of the customer who have bought a product which has a price>200
f) Give a count of how many products have been bought by each customer
g) Give a list of products bought by a customer having cust_id as 5
h) List the item details which are sold as of today
i) Create a view which lists out the bill_no, bill_date, cust_id, item_id, price, qty_sold, amount

2. 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

9) Retrieve details of all books in the library – id, title, name of publisher, authors, number of copies in each Programme, etc.

10) Get the particulars of borrowers who have borrowed more than 3 books, but from Jan 2019 to Jun 2019

11) Delete a book in BOOK table. Update the contents of other tables to reflect this data manipulation operation.

12) Partition the BOOK table based on year of publication. Demonstrate its working with a simple query.

13) Create a view of all books and its number of copies that are currently available in the Library.

3. Consider the Employee-pay scenario given below. The primary keys are underlined and the data types are specified:
EMPLOYEE(emp_id : integer, emp_name: string)
DEPARTMENT(dept_id: integer, dept_name:string)
PAYDETAILS(emp_id : integer, dept_id: integer, basic: integer, deductions: integer, additions: integer, DOJ: date)
PAYROLL(emp_id : integer, pay_date: date)
For the above schema, perform the following:
a) Create the tables with the appropriate integrity constraints
b) Insert around 10 records in each of the tables
c) List the employee details department wise
d) List all the employee names who joined after particular date
e) List the details of employees whose basic salary is between 10,000 and 20,000
f) Give a count of how many employees are working in each department
g) Give a names of the employees whose netsalary>10,000
h) List the details for an employee_id=5
i) Create a view which lists out the emp_name, department, ba basic, dedeuctions, netsalary
j) Create a view which lists the emp_name and his netsalary

4. Consider the following relational schema for the Office of the Controller of Examinations Application.
Student (Rollno, Name, Dob, Gender, Doa, Bcode);
Implement a check constraint for Gender
Branch (Bcode, Bname, Dno);
Department (Dno, Dname);
Course (Ccode, Cname, Credits, Dno);
Branch_Course (Bcode, Ccode, Semester);
Enrolls (Rollno, Ccode, Sess, Grade);
For Example, SESS can take values **'MAY2019', 'DEC2019'** Implement a check constraint for grade Value Set **('S', 'A', 'B', 'C', 'D', 'E', 'U');** Students are admitted to Branches and they are offered by Departments. A branch is offered by only one department. Each branch has a set of Courses (Subjects). Each student must enroll during a semester. Courses are offered by Departments. A course is offered only by one department. If a student is unsuccessful in a course he/she must enroll for the course during next session. A student has successfully completed a course if the grade obtained by is from the list **(A, B, C, D, and E).** A student is unsuccessful if he/she have grade **'U'** in a course.Develop a SQL query to

14) list details of Departments that offer more than 3 branches.

15) list the details of Departments that offer more than 6 courses.
16) list the details of courses that are common for more than 3 branches.
17) list students who got 'S' in more than 2 courses during single enrollment.
18) Create a view that will keep track of the roll number, name and number of courses, a student has completed successfully.

5. Consider the schema for Movie Database:
ACTOR (Act_id, Act_Name, Act_Gender)
DIRECTOR (Dir_id, Dir_Name, Dir_Phone)
MOVIES (Mov_id, Mov_Title, Mov_Year, Mov_Lang, Dir_id)
MOVIE_CAST (Act_id, Mov_id, Role)
RATING (Mov_id, Rev_Stars)
Write SQL queries to
1. List the titles of all movies directed by 'Hitchcock'.
2. Find the movie names where one or more actors acted in two or more movies.
3. List all actors who acted in a movie before 2000 and also in a movie after 2015 (use JOIN operation).
4. Find the title of movies and number of stars for each movie that has at least one rating and find the highest number of stars that movie received. Sort the result by movie title.
5. Update rating of all movies directed by 'Steven Spielberg' to 5.

6) Demonstrate the CRUD operations on Mongodb database.

II.OPEN ENDED QUESTIONS

1. Develop the Database applications for any of the following:
   1. customer-sales
   2. Student Library
   3. Employee-payroll
   4. Video Library
   5. Any Application
2. NO SQL Examples

COURSE OUTCOMES: On completion of the course, student should be able to:

CO1: Analyze the database concepts, data models and design the ER model for real world applications
CO2: Design a database schema for database application and perform manipulation operations.
CO3: Develop complex queries using SQL to retrieve the information required from the database.
CO4: Apply normalization techniques to database.
CO5: Analyze the concepts of transaction processing, NoSQL and MongoDB

TEXT BOOK:

1. Elmasri and Navathe: Fundamentals of Database Systems, 6th Edition, Pearson Education, 2011.

REFERENCE BOOKS

1. Raghu Ramakrishna and Johannes Gehrke: Database Management Systems, 3rd Edition, McGraw-Hill, 2003.
2. Silberschatz, Korth and Sudharshan: Data base System Concepts, 5th Edition, Mc-GrawHill, 2006.
3. C.J. Date, A. Kannan, S. Swamynatham: A Introduction to Database Systems, 8th Edition, Pearson education, 2006.
4. www.w3resources.com

SCHEME FOR EXAMINATIONS:

The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE).However, questions from the practical part of IPCC shall be Included in these question paper.

MAPPING of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3		2								1	2	
CO2	2		2		2								1	1	
CO3		3	3		2				1				2	2	
CO4	2	1	2										1	1	
CO5	2	1	2		2								2	2	
Strength of correlation: Low-1, Medium- 2, High-3															

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024 -2025

Course Title	**ANALYSIS & DESIGN OF ALGORITHMS Lab**						
Course Code	**22ISL404**						
Category	Professional Core Course Lab (PCCL)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	00	**00**	**02**	**00**	**02**	**26**	**01**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objectives:

- To introduce various algorithm design techniques.
- To design algorithms with specific technique and implement these algorithms using the appropriate technique.
- To enhance the skill to debug programs.

- **LIST OF PROGRAMS**

Implement the following using C/C++/ GO Language :

1 Design and implement an algorithm to Sort a given set of elements using DAC merge sort method and determine the time required to sort the elements. Repeat the experiment for different values of n and analyze the time complexity.

2 Print all the nodes reachable from a given starting node in a digraph using BFS method.

3	Obtain the topological ordering of vertices in a given graph using DFS method/ Source removal method
4	From a given vertex in a weighted connected graph, find shortest paths to other verticesusing Dijkstra's algorithm.
5	Apply Prim's algorithm to undirected graph and obtain minimum cost Spanning Tree.
6	Design and implement Heap Sort algorithm to arrange elements in desired order
7	Design and implement an algorithm to solve 0/1 Knapsack problem using dynamicprogramming.
8	Design and Implement Floyd's algorithm for the All-Pairs- Shortest-Paths problem.
9	Design and implement an algorithm to solve N-Queen's problem using Back Tracking.
10	Design and implement Horspool's algorithm.

Note: In the examination each student picks one question from the lot of all 10 questions.

OPEN ENDED QUESTIONS
Develop / Simulate Following

Game Applications:

1. Knapsack
2. Spanning Trees
3. Sum of Subset
4. Travelling Sales Person etc.

NOTE:

1. STUDENT IS PERMITED TO SUBMIT OPEN ENDED SOLUTION TO ANY OTHER OPEN ENDED QUESTION APART FROM THE LIST ABOVE. BUT IT HAS TO BE APPROVED BY THE STAFF IN CHARGE.
2. IN THE EXAMINATION EACH STUDENT PICKS ONE QUESTION FROM A LOT OF ALL 10QUESTIONS

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos

COURSE OUTCOMES: On completion of the course, student should be able to:

CO1: Develop algorithms using different design techniques.

CO2: Implement the algorithms using C/C++.

CO3: Analyze the time complexity of algorithms.

CO4: Solve optimization problems by implementing suitable algorithm.

MAPPING of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3											2		
CO2	3	3	2	3									2		
CO3	3	3	2	3									2		
CO4	3	3	2	3									2		
Strength of correlation: Low-1, Medium- 2, High-3															

Dr Ambedkar Institute of Technology, Bengaluru-56

Department of Information Science and Engineering

Scheme and Syllabus - CBCS-2024 -2025

Course Title	**DISCRETE MATHEMATAL STRUCTURES**							
Course Code	**22IST405A**							
Category	**ESC**							
Scheme and Credits	Theory/Practical/Integrated					Total teaching hours	Lab slots	Credits
	L	T	P	SDA	Total			
	02	02	00	00	04	40	00	03

CIE Marks: 50	SEE Marks: 50	Total Max. marks = 100	Duration of SEE: 03 Hours

COURSE LEARNING OBJECTIVES

This course is proposed to enhance the student's ability to think logically, mathematically and algorithmically and use the concepts of discrete mathematical structures to solve problems connected to computer and information science & engineering.

Unit	Syllabus content	No. of hours	
		Theory	Tutorial
I	**Fundamentals of Logic:** Propositions-Logical Connectives, Tautologies, Contradictions. Logical Equivalence–The Laws of Logic, Inverse, Converse and Contrapositive. Logical Implication – Rules of Inference. Quantifiers and Types of Quantifiers. **Self-study:** Proofs of theorems - Method of direct and indirect proofs. **Applications:** Applications to Switching Networks. (RBT levels: **L1, L2, L3, L4**)	04	04
II	**Set Theory and Mathematical Induction:** Sets, subsets, set operations, laws of set theory, counting and venn diagram. The well ordering principle, principle of mathematical induction, alternative form of mathematical induction. **Self-study:** Axioms of probability, **Applications:** Applications to recursive relations. (RBT levels: **L1, L2, L3, L4**)	04	04
III	**Relations and Functions:** Cartesian product, relations, Equivalence relation and partition. Partial order, Poset, Hasse diagram. Functions, one-one and onto functions, composition of a function and inverse functions. **Self study:** Pigonhole principle**,** Stirling numbers. **Applications:** Computer recognition-zero-one matrices and directed graphs. (RBT levels: **L1, L2, L3, L4**)	04	04
IV	**Introduction to Graph Theory:** Definition of a graph and examples. Degree of a vertex and degree sequence- Hakim's theorem(no proof). Standard graphs - complete graph, regular graph, Peterson graph, bipartite graph, complete	04	04

	bipartite graph. Compliment of a graph, self-complimentary graphs. Graph isomorphism. Sub graph- proper sub graph, spanning sub graph, induced sub graph. Walk, trial, path, cycle, connectedness, Euler and Hamiltonian graph. **Self-study:** Operation on graphs - union, intersection, ring sum, Cartesian product, deletion & addition of edge/vertex. **Applications:** Konigsberg bridge problem, Seating arrangement problem. (RBT levels: **L1, L2, L3, L4**)		
V	**Trees and Cut-sets:** Trees, Properties, Rooted Tree, Binary tree, Spanning Tree, Minimal Spanning Tree - Prism Algorithm Kruskal's Algorithm, Dijikstra's shortest path algorithm for directed and undirected graph. **Self-study:** Cut Set, Network Flow, Maximum Flow and Minimum cut Theorem. **Applications:** Prefix code: David Huffman Algorithm. (RBT levels: **L1, L2, L3, L4**)	04	04

COURSE OUTCOMES: On completion of the course, student should be able to:

CO1	**Demonstrate** the knowledge of fundamental concepts in discrete mathematics and graph theory.
CO2	**Apply** the concepts of logics, mathematical induction and set theory to solve domain specific problems.
CO3	**Analyze** the given problem to find the solution by suitable discrete mathematical concepts.
CO4	**Examine** the given concepts related to mapping and graph theory.
CO5	**Develop a variety of algorithms using appropriate technology.**

TEACHING – LEARNING PROCESS: Chalk and Talk, power point presentation,

TEXTBOOKS

Ralph P. Grimaldi: Discrete and Combinatorial Mathematics, 5th Edition, Pearson Education, 2004.

J. P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science",Tata McGraw-Hill.
Introduction to graph theory by Gary Chartrand and Ping Zang, Tata McGraw-Hill addition 2006.

REFERENCE BOOKS

Narsingh Deo, Graph theory with applications to engineering and computer Science, PHI, 1979.
C L Lium& D P Mohapatra, Elements of Discrete Mathematics, A Computer Oriented Approach, The McGraw-Hill Companies.
Kenneth H. Rosen: Discrete Mathematics and its Applications, 6th Edition, McGraw Hill, 2007.
Graph theory with applications to engineering and computer Science by Narsingh Deo

Web links and Video Lectures (e-Resources)

1. https://onlinecourses.nptel.ac.in/noc20_cs82/preview
2. https://nptel.ac.in/courses/106108227
3. https://archive.nptel.ac.in/courses/111/106/111106102/
4. https://www.youtube.com/watch?v=sWsXBY19o8I
5. https://youtu.be/ZiojZJfQYh0

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1										
CO2	3	2										
CO3	2	3										
CO4	3	2										
CO5	2	3										
Strength of correlation: Low-1, Medium-2, High-3												

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024 -2025

Course Title	**UNIX AND SHELL PROGRAMMING**						
Course Code	**22IST405B**						
Category	Engineering Science Course(ESC/ETC/PLC)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	**00**	**00**	**00**	**03**	**39**	**03**

CIE Marks: 50	SEE Marks: 50	Total Max. marks=100	Duration of SEE: 03 Hours

COURSE OBJECTIVE:

1. To provide introduction to UNIX operating system and its File System.
2. Understand and execute the different types of UNIX commands related to files, processes and security.
3. Develop shell programs using command substitution, positional parameters and control structures.
4. Implementation of SED and AWK commands.
5. Develop simple programs using PERL and AWK scripts.

UNIT I

07 hours

Introduction: The UNIX operating system, UNIX architecture, Features of UNIX, Command usage:- locating commands, internal and external commands, Man Browsing the manual pages ,Understanding the man documentation. **File system**: - The file, what is in a file name?, The parent child relationship ,The HOME variable: the Home directory, PWD: checking your current directory, CD: changing the current directory, mkdir : making directories, rmdir: removing current directories, absolute pathnames, relative pathnames, ls :listing directory contents, Unix file system. **Basic file attributes:** ls –l: listing file attributes, the –d option: listing directory attributes, file ownership, file permission , chmod: changing file permission, Directory permission, changing file ownership, chown, chgrp. **The vi editor:** vi basics, three modes of vi editor ,Input mode –entering and replacing text, Saving text and quitting –the ex mode, navigation, editing text, undoing last editing instructions, repeating the last command, searching for a pattern substitution. **The shell**: The shells interpretive cycle, shell offering, pattern matching. Escaping and quoting: Redirection: the three standard files,/dev/null and dev/tty: two special files, pipe, tee: creating a tee, Command substitution, Shell variables

Text Book1:Ch 1, Ch 2, Ch 3, Ch 4, Ch 5, Ch 6, Ch 7, Ch 8

UNIT II

08 hours

The process: process basics, ps: process status, system process, mechanism of process creation, Internal and external commands, process states and zombies, running jobs in background, nice: job

executing with low priority, killing processes with signals, Job control, at and batch: execute later, cron: running jobs periodically, time: timing processes. **Customizing the environment:** The shell, environmental variables, the common environmental variables, aliases, in-line command editing , The initialization scripts. **More file attributes:** file systems and Inodes, hard links, symbolic links and ln, **t**he directory, umask: Default file and directory permission, modification and access times, find: locating files, **Simple filters:** the sample database, pr:printing files, head: displaying the beginning of a file, tail: displaying the end of a file, cut: slitting a file vertically, paste : pasting files, sort: ordering a file, uniq: locate repeated and non repeated lines, tr:translating characters.
Text Book1:Ch 9, Ch 10, Ch 11, Ch 12

UNIT III
08 hours
Filters using regular expression: grep: searching for a pattern, Basic regular expression(BRE), Extended regular expression(ERE) and egrep. **sed:** the stream editor, line addressing, using multiple instructions, context addressing, writing selected lines to a file, text editing, substitution, basic regular expression. **Essential shell programming: s**hell script, read: making scripts interactive, using command line arguments, exit and exit status of command, logical operator && and || - conditional execution,t he if conditional, using test and [] to evaluate expressions**,** the case conditional, expr: computation and string handling , $0: calling a script by different names, while: looping, for: looping with a list , set and shift :manipulating the positional parameter, here the document , trap :interrupting a program, debugging shell script with set –x, sample validation and entry scripts.
Text Book1:Ch 13, Ch 14, Ch 21

UNIT IV
08 hours
AWK-advanced filter: Simple awk filtering, Splitting a line into fields, printf: formatting output, variables and expressions, The comparison operators, number processing, variables, The –f option : storing awk programs in a file, The BEGIN and END section, built in variables, arrays, functions, control flow – the if statement, looping with for, Looping with while.
Text Book1:Ch 18

UNIT V
08 hours

Perl-the master manipulator: Perl preliminaries, the chop function, variables and operators, the string handling functions, specifying filenames in command line, $-: the default variable, current line number ($.) and range operator (..), lists and arrays, foreach:looping through a list, split:, join,dec2bin.pl,grep,associative arrays, regular expressions and substitution, file handling, file tests, subroutines

Text Book1:Ch 19

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, vide

COURSE OUTCOMES: On completion of the course, student should be able to:

CO1: Describe the architecture and features of the UNIX operating system and distinguish it from other operating systems.

CO2: Demonstrate UNIX commands for file handling and process control

CO3: Analyze a given problem and apply requisite facets of shell programming in order to devise a shell script to solve the problem

CO4: Demonstrate different types of SED addressing and AWK filtering.

CO5: Develop PERL programs for string usage, file concept and arrays handling.

TEXT BOOK:

1.Sumitabha Das., Unix Concepts and Applications.,4th Edition., Tata McGraw-Hill Education 2006,ISBN:0-07-063546-3.

REFERENCE BOOKS:

1.Behrouz A. Forouzan, Richard F. Gilberg : UNIX and Shell Programming,1st Edition,2002-Cengage Learning – India Edition. 2009, ISBN-13: 978-0-534-39155-3.

2.Unix & Shell Programming, M.G. Venkateshmurthy, Pearson Education, 2005.

EBOOKS/ONLINE RESOURCES

1. https://www.tutorialspoint.com/unix_commands/links.htm
2. https://www.geeksforgeeks.org/introduction-to-unix-system/
3. https://www.javatpoint.com/unix-operating-system
4. https://www.youtube.com/watch?v=txRD_bK062Y&list=PLd3UqWTnYXOloH0vWBs4BtSbP84WcC2NY

SCHEME FOR EXAMINATIONS:

The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE).However, questions from the practical part of IPCC shall be Included in these question paper.

MAPPING of COs with POs

	PO1	**PO**	**PO**	**PO4**	**PO5**	**PO6**	**PO**	**PO**	**PO9**	**PO10**	**PO1**	**PO1**	**PSO**	**PSO**	**PSO**
CO	3	3	3	1	1	--	--	--	--	--	--	--	1	1	1
CO	3	3	2	1	2	--	--	--	--	--	--	--	1	1	1
CO	3	3	3	3	1	--	--	--	--	--	--	--	2	2	2
CO	2	2	2	2	1	--	--	--	--	--	--	--	1	1	1
CO	2	2	2	2	2	--	--	--	--	--	--	--	2	2	2
Strength of correlation: Low-1, Medium- 2, High-3															

Dr Ambedkar Institute of Technology, Bengaluru-56

Department of Information Science and Engineering

Scheme and Syllabus - CBCS-2024 -2025

Course Title	**GRAPH THEORY AND NETWORKS**

Course Code	**22IST405D**							
Category	**ESC**							
Scheme and Credits	Theory/Practical/Integrated					Total teaching hours	Lab slots	Credits
	L	T	P	SDA	Total			
	02	02	00	00	04	40	00	03
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks = 100**		**Duration of SEE: 03 Hours**			

COURSE LEARNING OBJECTIVES

This course is proposed to impart to the students the skills to develop the graph algorithms, networks, and to apply the concepts in complex engineering problems.

Unit	Syllabus content	No. of hours	
		Theory	Tutorial
I	**Graph concepts:** Definition of a graph and examples. Degree sequence - Hakim's theorem (no proof). Handshaking theorem. Standard graphs - complete graph, regular graph, Peterson graph, bipartite graph, complete bipartite graph. Subgraphs - proper subgraph, spanning subgraph, induced subgraph. Isomorphism of graphs. Walk, trial, path, cycle, connectedness, Euler and Hamiltonian graph **Self Study:** Operation on graphs - union, intersection, ring sum, cartesian product, deletion & addition of edge/vertex, complement of a graph, self complimentary graph. **Applications:** Konigsberg bridge problem, Seating arrangement problem. (RBT levels: **L1, L2, L3, L4**)	04	04
II	**Trees and Fundamental circuits**: Definition of a tree, properties and examples. Types of trees - spanning tree, rooted tree, binary tree. Distance and centre. Fundamental circuits. Rank and Nullity. **Self Study:** Line graph, middle graph, total graph and diagraphs. **Applications:** Prefix code: David Huffman Algorithm. (RBT levels: **L1, L2, L3, L4**)	04	04

III	**Matrix representation and Planar graphs:** Incidence matrix, adjacency matrix, path matrix, circuit matrix, fundamental circuit matrix. Planar graphs, Kuratowski's graph, Kuratowski's theorem, Euler's polyhedral formula. **Self Study:** Incidence and adjacency matrix of diagraphs. **Applications:** Detection of planarity using elementary reduction method (RBT levels: **L1, L2, L3, L4**)	04	04
IV	**Graph coloring and Networks:** Vertex coloring, chromatic number, chromatic polynomial, matching, covering, Independent set, domination. Four coloring problem. Cut set, cut vertex, vertex connectivity, edge connectivity, blocks in separable graphs. **Self Study:** Five coloring problem. **Applications:** Simplification of Boolean expression. Network flow, Maximum flow and minimum cut theorem. (RBT levels: **L1, L2, L3, L4**)	04	04
V	**Graph Algorithms:** Dijikstra's shortest path algorithm for directed and undirected graph. Minimal spanning tree algorithm: Kruskal and Prism algorithm. Cyclic exchange algorithm to find all spanning trees. **Self Study:** Algorithm for connectedness. **Applications:** Travelling salesman problem - nearest neighbourhood method. (RBT levels: **L1, L2, L3, L4**)	04	04

COURSE OUTCOMES: On completion of the course, student should be able to:

CO1	**Demonstrate** the knowledge of fundamental concepts in graph theory.
CO2	**Apply** the concepts of graph theory to solve domain specific problems.
CO3	**Analyze** and find the solution by suitable graph theoretical concepts.
CO4	**Examine** for the existence of graph structures by suitable graph algorithms, tree structures, planarity.
CO5	**Develop a variety of algorithms using appropriate technology**

TEACHING – LEARNING PROCESS: Chalk and Talk, power point presentation,

TEXTBOOKS

1. Gary Chartrand and Ping Zang, Introduction to graph theory, Tata McGraw-Hill addition 2006.
2. Narsingh Deo, Graph theory with applications to engineering and computer Science, PHI, 1979.
3. F. Harary, Graph theory, Narosa publishing house, New Delhi, 2013.

REFERENCE BOOKS

1. Geir Agnarsson and Raymond Greenlaw, Graph theory-Modeling, application and Algorithm, Pearson publications, 1998
2. John Clark, Derem Allan Hollon, Graph theory, Allied Publishers, 1995.

Web links and Video Lectures (e-Resources)

1. https://archive.nptel.ac.in/courses/111/106/111106102/
2. https://www.youtube.com/watch?v=sWsXBY19o8I
3. https://youtu.be/ZiojZJfQYh0

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1										
CO2	3	2										
CO3	2	3										
CO4	3	2										
CO5	2	3										
Strength of correlation: Low-1, Medium-2, High-3												

Dr Ambedkar Institute of Technology, Bengaluru-56

Department of Information Science and Engineering

Scheme and Syllabus - CBCS-2024 -2025

Course Title	**OPTIMIZATION TECHNIQUE**							
Course Code	**22IST405E**							
Category	**ESC**							
Scheme and Credits	Theory/Practical/Integrated					Total teaching hours	Lab slots	Credits
	L	T	P	SDA	Total			
	02	02	00	00	04	40	00	03
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks = 100**		**Duration of SEE: 03 Hours**			

COURSE LEARNING OBJECTIVES

This course is proposed to impart to the students the skills to develop the theory of operations research and to obtain optimal solutions for complex engineering problems.

Unit	Syllabus content	No. of hours	
		Theory	Tutorial
I	**Operations Research:** phases, characteristics and limitations, models used in operations research. **Linear Programming Problem:** Definition, Convexity and Basic Feasible Solutions. Formulation and examples, Graphical Solution, Convex and polyhedral sets, Extreme points, Basic solutions, Basic feasible solutions, Correspondence between basic feasible solutions and extreme points. **Self-study:** Computer solution with excel solver and AMPL, Production model, elementary models, bus scheduling model. (RBT levels: **L1, L2, L3, L4**)	04	04
II	**The Simplex method and Sensitivity Analysis** Linear programming model in equation form, transition from graphical to algebraic solution. Simplex method, Canonical and Standard form of Linear programming problem, Optimality criterion, slack and surplus variables, Solutions to LPP by simplex method, Artificial variable, penalty method and two-phase simplex method. **Self-Study:** Degeneracy in LPP.	04	04

	(RBT levels: **L1, L2, L3, L4**)		
III	**Duality and Post-optimal Analysis** Formulation of the dual problem, Duality theorems, Unbounded and infeasible solutions in the primal, Solving the primal problem using duality theory. Post-optimal analysis: changes affecting feasibility and optimality. **Self-study:** Solving LPP by Generalized simplex method. (RBT levels: **L1, L2, L3, L4**)	04	04
IV	**Transportation Problem :** Formulation, methods of finding initial basic feasible solutions: North-west corner rule, Least-cost method, Vogel approximation method, Algorithm for obtaining optimal solution using MODI method. **Assignment Problem:** Formulation, Hungarian method. **Self-study:** Travelling sales man problem. (RBT levels: **L1, L2, L3, L4**)	04	04
V	**Integer Linear Programming** Illustrative applications, integer programming algorithm: branch and bound algorithm, cutting plane algorithm. **CPM and PERT:** Introduction, limitations, applications, basic steps, frame works, network diagram and rules, common errors in drawing a network, critical path in network analysis, PERT. (RBT levels: **L1, L2, L3, L4**)	04	04

COURSE OUTCOMES: On completion of the course, student should be able to:

CO1	**Understand** the meaning, definitions, scope, need, phases and techniques of operations research.
CO2	**Apply** Simplex methods and determine optimal solutions to linear programming problems by graphical method, Simplex method, Big-M method and Dual Simplex method.
CO3	**Formulate** as Transportation and Assignment problems and derive optimum solutions for transportation, Assignment and travelling salesman problems.
CO4	**Analyze** integer linear programming problems and solve.

CO5	**Construct network diagrams and determine critical path, floats for deterministic and PERT networks including crashing of Networks**

TEACHING – LEARNING PROCESS: Chalk and Talk, power point presentation,

TEXTBOOKS

(vii) Hamdy A. Taha, Operations Research-An Introduction, Seventh Edition, , PHI, 2006.
(viii) S.D.Shama, Operations Research-Theory, methods and applications, Laxmi Publicaitons, 2009.
(ix) P.K.Gupta and D.S.Hera, Operations Research, S.Chand New Delhi, 2009

REFERENCE BOOKS

1. B. S. Grewal, Higher Engineering Mathematics (44th Edition 2018), Khanna Publishers, New Delhi.
2. E. Kreysizig, Advanced Engineering Mathematics, John Wiley and sons, 10th Ed. (Reprint) 2016.

Web links and Video Lectures (e-Resources)

(x) http://nptel.ac.in/courses.php?disciplineID=111
(xi) http://www.class-central.com/subject/math(MOOCs)
(xii) http://academicearth.org/
(xiii) VTU e-Shikshana Program
(xiv) VTU EDUSAT Program

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1										
CO2	3	2										
CO3	2	3										
CO4	3	2										

CO5	2	3										
Strength of correlation: Low-1, Medium-2, High-3												

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024 -2025

Course Title	**Green IT and Sustainability**						
Course Code	**22IST406A**						
Category	**Ability Enhancement Course-IV**						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	01	00	00	00	01	15	01
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

COURSE OBJECTIVES:

5) To familiarize the students to the area of Green IT and concepts of sustainability engineering.
6) To enable students with an understanding of principles and frame work of sustainable engineering.
7) To provide students with an understanding of Life Cycle Assessment tool in sustainable engineering.
8) To provide students with understanding of integration of sustainability with design.
9) Demonstrate the broad perspective of sustainable practices.

UNIT I **3 hours**

Climate change:

Enterprise IT emits a lot of greenhouse gases and contributes to climate change. Businesses must track and reduce their emissions as well as various types of toxic electronic waste that pollute the environment. Green IT approaches can be a useful part of broader climate strategies in companies.

Benefits of green IT: Benefits of Green Computing & Green IT Practices

UNIT II **3 hours**

Compliance:

Businesses are increasingly under pressure from governments and the public to reduce their environmental impact. Green IT makes more efficient use of resources, reducing waste and emissions and improving recycling rates. This helps businesses comply with government regulations.

Challenges of green IT: Designing energy-efficient computers, servers, printers, projectors, and other digital devices is considered a sustainable and green design.

UNIT III **3 hours**

Sustainable Development and Role of Engineers: Introduction, Sustainable Development, Paris Agreement and Role of Engineering, Sustainable Development and the Engineering Profession, Key attributes of the Graduate Engineering.

Sustainable Engineering Concepts: Key concepts – Factor 4 and Factor 10: Goals of sustainability, System Thinking, Life Cycle Thinking and Circular Economy.

UNIT IV **3 hours**

Cleaner Production(CP):

Definition, principles of Cleaner production and its benefits, Role of Industry, Government and Institutions in cleaner production, clean development mechanism, reuse, recovery, recycle, raw material substation Wealth from waste.

UNIT V **3 hours**

Integrating Sustainability in Engineering Design: Problems Solving in Engineering, conventional to Sustainable Engineering Design Process, Design for Life Guidelines and Strategies, Measuring Sustainability, Sustainable Design through sustainable procurement criteria, Case studies on sustainable Engineering Design Process – Sustainable Process Design, Sustainable Production Design Sustainable product design in Electronic Engineering,

TEACHINGLEARNINGPROCESS: Chalk and Talk, power point presentation, animations, videos blended with Practical classes

COURSE OUTCOMES: On completion of the course, student should be able to:

CO1: Understand the Green IT and Sustainability.

CO2: Elucidate the basics of sustainable development, engineering and its role.

CO3: Apply the Principle, and methodology of Life Cycle Assessment Tool
CO4: Understand integration methods of sustainability to Engineering Design
CO5: Develop innovative, reliable, sustainable and economically viable designs

TEXTBOOKS

10) Toolseeram Ramjeawon,"**Introduction to Sustainability for Engineers**", CRC Press, 1st Edn., 2020.
11) Allen, D. T., and Shonnard, D.R., "**Sustainability Engineering: Concepts, Design and Case Studies"**, Prentice Hall, Pearson Education Limited, 2015.
12) Shachi Shah, V. Venkatramanan, Ram Prasad **"Sustainable Green Technologies for Environmental Management"**, Springer Singapore, 2019.
13) Ni bin Chang, "**Systems Analysis for Sustainable Engineering: Theory and Applications**", McGraw-Hill Professional, 2011.

REFERENCEBOOKS

14) UNESCO, International Centre for Engineering Education, "**Engineering for Sustainable development: Delivery a sustainable development goals**", France, 1st Edn., 2021

ONLINERESOURCES

1. Business and Sustainable Development, IIT Bombay, Prof. Trupti Mishra https://nptel.ac.in/courses/110101153
2. https://www.techtarget.com/searchcio/definition/green-IT-green-information-technology
3. https://nptel.ac.in/courses/107103081/www.macf
4. https://engineeringforoneplanet.org/

MAPPING of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	2	3	-	-	-	-	2	1		
CO2	-		-	-	-	2	3	-	-	-	-	2	1		
CO3	-	-	-	-	-	2	3	-	-	-	-	2	1		
CO4	-	-	-	-	-	2	3	-	-	-	-	2	1		
CO5	-	-	-	-	-	2	3	-	-	-	-	2	1		
Strengthofcorrelation: Low-1, Medium-2, High-3															

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024 -2025

Course Title	**UI/UX**						
Course Code	**22IST406B**						
Category	**Ability Enhancement Course-IV**						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	01	00	00	00	01	15	01
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

COURSE OBJECTIVE:

1. To Understand user interface
2. To understand user interface design process
3. To understand UX design process
4. To find user experience

UNIT I **3 hours**

The User Interface: 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.

UNIT II The User Interface Design process: 3**hours**. The User Interface Design process- Obstacles, Usability, Human characteristics in Design, Human Interaction speeds, Business functions-Business definition and requirement analysis, Basic business functions, Design standards.
UNIT III **3 hours** System menus and navigation schemes: System menus and navigation schemes- Structures of menus, Functions of menus, Contents of menus, Formatting of menus, Phrasing the menu, Selecting menu choices, Navigating menus, Kinds of graphical menus.
UNIT IV **3 hours** Defining UX and the Process : What Is UX, Really, The Promise of Good UX Design, UX Components, How UX and Usability Work Together, Necessary UX Inputs, Considerations before Beginning UX, How a Typical Project Works. Examining Why You Should Use UX
UNITV **3 hours** Determining Your Users: Modeling the Experience

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos

COURSE OUTCOMES: On completion of the course, student should be able to:

CO1: Explain about the user interfaces
CO2: Design the interface, menu creation
CO3: Analyze the usage of UX
CO4 : Create a compelling portrait of a sample user

TEXT BOOKS:

1. Wilbert O. Galitz, "The Essential Guide to User Interface Design", John Wiley & Sons, Second Edition 2002.
2. UX for dummies a Wiley publication by Donald chesnut and kevin Nichols , 2014

.

REFERENCE BOOKS:

1.William Buxton, Sketching user experiences-getting the design right and the right design, Elsevier-Morgan Kaufmann, 2007.
2.Don Norman, The Design of Everyday Things - Revised and Expanded Edition, 2013.
3.Jesse James Garrett - The Elements of User Experience-User-Centered Design for the Web and Beyond, 2nd Edition, New Riders Press, 2010.
4.ACM, International Journal of Human-Computer Studies.

SCHEME FOR EXAMINATIONS:

Ability Enhancement Course shall be evaluated both by CIE and SEE

MAPPING of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2		2										
CO2	2		2		2								1	1
CO3	2	2												1
CO4	2				2									2
Strength of correlation: Low-1, Medium- 2, High-3														

Scheme and Syllabus - CBCS-2024 -2025

Course Title	Technical writing using LATEX						
Course Code	**22ISL406C**						
Category	**Ability Enhancement Course-IV**						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	00	00	02	00	02	26	01
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 02 Hours**		

COURSE OBJECTIVES:

Understand the use of basic installation process and environment
Understand editing text documents using latex packages and commands.
Understand to create and edit mathematical formulae and Tables
Understand to insert and edit images using latex packages
Understand to write article/letters/resumes using Latex

List of Programs

1. **Introduction:** Installation of Latex and usage, Demonstrate usage of Class and packages Latex programming and commands, sample packages, Latex Error messages.

2. **Latex Programs for the following:**
   Fonts, symbols, indenting, paragraphs, line spacing, word spacing, titles and subtitles.
   Document class, page style, parts of the documents, table of contents.

3. **Latex Programs for the following:**
   Command names and arguments, environments, declarations.

Theorem like declarations, comments within text.

4. **Latex Programs for the following:**
   Mathematical environments, math mode ,mathematical symbols
   Graphic package, multivalued functions, drawing matrices

5. **Latex Programs for the following:**
   Tables, tables with captions .
   References to figures and tables in text

6. **Latex Programs for the following:**
   Mathematical environments, math mode ,mathematical symbols
   Graphic package, multivalued functions, drawing matrices

7. **Latex Programs for the following:**
   Tables, tables with captions
   References to figures and tables in text

8. **Latex Programs for the following:**
   picture environments
   extended pictures, other drawing packages
   Preparing book, project report in LaTeX.

9. **Latex Programs for the following:**
   Editing articles
   Creating resumes

10. **Latex Programs for the following:**
    Letters wring
    Managing references

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

CO1. Install Latex software's and use the environment comfortably
CO2. Edit text documents using latex packages and commands.

CO3. Create and edit mathematical formulae and Tables
CO4. Insert and edit images using latex packages
CO5. Write article/letters/resumes using Latex

REFERENCE BOOKS

1. Guide to LaTeX, Fourth Edition by Helmut Kopka, Patrick W. Daly, Released November 2003 Publisher(s): Addison-Wesley Professional, ISBN: 9780321173850

ONLINE RESOURCES

15) https://latex-tutorial.com/tutorials/
16) https://www.javatpoint.com/latex

MAPPING of COs with POshttps

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	2	-	-	-	-	-	-	2
CO2	3	2	2	2	2	-	-	-	-	-	-	2
CO3	3	2	2	2	2	-	-	-	-	-	-	2
CO4	3	2	2	2	2	-	-	-	-	-	-	2
CO5	3	2	2	2	2	-	-	-	-	-	-	2
Strength of correlation: Low-1, Medium- 2, High-3												

Detailed Scheme and Syllabus

ACADEMIC YEAR 2024-2025

V- VI (2022-2026 BATCH) (160Credits)

Dr. Ambedkar Institute of Technology
Bangalore

Department Of
Information Science and Engineering

Vision

11. To create **D**ynamic, **R**esourceful, **A**dept and**I**nnovative **T**echnical professionals to meet global challenges.

Mission

12. To offer state-of-the-art undergraduate, postgraduate and doctoral programmes in the fields of Engineering, Technology and Management.
13. To generate new knowledge by engaging faculty and students in research, development and innovation
14. To provide strong theoretical foundation to the students, supported by extensive practical training to meet industry requirements.
15. To install moral and ethical values with social and professional commitment.

DEPARTMENT VISION AND MISSION

Vision:

16. Imparting quality technical education and preparing professionals to meet Information Technological challenges globally.

Mission:

17. Prepare highly capable Information Science engineers through best practices.
18. Encourage students to pursue higher education for further growth in the learning process and to promote research in the frontier areas of Information Technology.
19. Educate students to take up social and professional responsibilities with ethical values for the betterment of the society

PROGRAM SPECIFIC OUTCOMES(PSOS)

PSO1: Students should be able to develop and optimize solutions for information systems employing fundamentals of mathematics, Hardware, software, data storage, security and communication networks.

PSO2:Students should be able to understand, analyze and adopt principles of programming paradigms by using latest technologies such as Cloud computing, Big data analytics, AI ,Machine Learning and IoT based applications for solving real-world problems.

PSO3: Students should be able to acquire and demonstrate the team work, professional ethics, competence and communication skills while developing software products.

PROGRAMME OUTCOMES (POs)

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 the 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 the 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 the engineering practice.
9. Individual and team work: 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

Dr.Ambedkar Institute of Technology, Bengaluru-560056
Outcome Based Education(OBE) and Choice Based Credit System
B.E in Information Science and Engineering
Tentative Scheme of Teaching and Examination effective from the Academic Year 2024-25
2022 Scheme

V SEMESTER

Sl. No	Course and Course Code		Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Self - Study	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	HSMS	22IST501	Software Engineering & Project Management	ISE	3	0	0		03	50	50	100	3
2	IPCC	22ISU502	Computer Networks	ISE	3		2		03	50	50	100	4
3	PCC	22IST503	Theory of computation and compiler Design	ISE	4	0	0		03	50	50	100	4
4	PCCL	22ISL504	Mobile Application development lab	ISE	0	0	2		03	50	50	100	1
5	PEC	22IST505x	Professional Elective Course	ISE	3	0	0		03	50	50	100	3
6	PROJ	22ISM506	Mini Project	ISE	0	0	4		03	100		100	2
7	AEC	22RMT507	Research Methodology and IPR	EEE department	2	2	0		02	50	50	100	3
8	MC	22CVT508	Environmental Studies	TD: CV PSB: CV	2	0	0		02	50	50	100	2
9	HS	22CDN509	Aptitude and Verbal Ability Skills	Placement Cell	2	0	0		--	50	--	50	PP/ NP
10	MC	22NSN510	National Service Scheme (NSS)	NSS coordinator	0	0	2			100	---	100	PP/ NP
		22PEN510	Physical Education (PE) (Sports and Athletics)	Physical Education Director									
		22YON510	Yoga	Yoga Teacher									
								Total		500	300	800	22

PCC: Professional Core Course, PCCL: Professional Core Course laboratory, UHV: Universal Human Value Course, MC: Mandatory Course (Non-credit), AEC: Ability Enhancement Course, SEC: Skill Enhancement Course, L: Lecture, T: Tutorial, P: Practical, S= Self-Study CIE: Continuous Internal Evaluation, SEE:Semester End Evaluation. K : The letter in the course code indicates common to al the stream of Engineering. PROJ: Project /Mini Project. PEC: Professional Elective Course

Professional Elective Course 22IST505x

22IST505A	**Python programming**	**22IST505C**	**Network and cyber security**
22IST505B	**Artificial Intelligence**	**22IST505D**	**Unix System Programming**

Professional Core Course (IPCC): Refers to Professional Core Course Theory Integrated with practicals of the same course. Credit for IPCC can be 04 and its Teaching– Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper. For more details, the regulation governingthe Degree of Bachelor of Engineering /Technology (B.E./B.Tech.) 2022-23

National Service Scheme /Physical Education/Yoga: All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education(PE)(Sports and Athletics), and Yoga(YOG) with the concerned coordinator of the course during the first Week of III semesters. Activities shall be carried out between III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the Degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, and Yoga activities. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of Degree.

Mini-project work: Mini Project is a laboratory-oriented/hands on course that will provide a platform to students to enhance their practical knowledge and skills by the development of small systems/applications etc. Based on the ability/abilities of the student/s and recommendations of the mentor, a single discipline or a multidisciplinary Mini- project can be assigned to an individual student or to a group having not more than 4 students.

CIE procedure for Mini-project:

20. **Single discipline:** The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two faculty members of the Department, one of them being the Guide. The CIE marks awarded for the Mini-project work shall be based on the evaluation of the project report, project presentation skill, and question and answer session in the ratio of 50:25:25. The marks awarded for the project report shall be the same for all the batches mates.

21. **Interdisciplinary:** Continuous Internal Evaluation shall be group-wise at the college level with the participation of all the guides of the project.

The CIE marks awarded for the Mini-project, shall be based on the evaluation of the project report, project presentation skill, and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.

No SEE component for Mini-Project.

Professional Elective Courses (PEC): A professional elective (PEC) course is intended to enhance the depth and breadth of educational experience in the Engineering and Technology curriculum. Multidisciplinary courses that are added supplement the latest trend and advanced technology in the selected stream of Engineering. Each group will provide an option to select one course. The minimum number of students' strengths for offering a professional elective is 10. However, this conditional shall not be applicable to cases where the admission to the program is less than 10.

Dr.Ambedkar Institute of Technology, Bengaluru-560056
Outcome Based Education(OBE) and Choice Based Credit System
B.E. in Information Science and Engineering
Tentative Scheme of Teaching and Examination effective from the Academic Year 2024-25
2022 Scheme

VI SEMESTER

Course and Course Code		Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination				Credits
				Theory Lecture	Tutorial	Practical/ Drawing	Self-Study	Duration in hours	CIE Marks	SEE Marks	Total Marks	
				L	T	P	S					
IPCC	22ISU601	Full stack development		3	0	2		03	50	50	100	4
PCC	22IST602	Machine Learning		3	2	0		03	50	50	100	4
PEC	22IST603x	Professional Elective Course		3	0	0		03	50	50	100	3
OEC	22IST604x	Open Elective Course-I		3	0	0		03	50	50	100	3
PROJ	22ISP605	Major Project Phase I		0	0	4		03	100	--	100	2
PCCL	22ISL606	Machine Learning Lab		0	0	2		03	50	50	100	1
AEC/SDC	22IST607x OR 22ISL607x	Ability Enhancement Course/ Skill Development Course V		If the course is offered as a Theory				01	50	50	100	1
				1	0	0						
				If course is offered as a practical								
				0	0	2						
HS	22CDN608	Analytical and Reasoning Skills	Placement Cell	2	0	0		--	50	--	50	PP/ NP
	22NSN609	National Service Scheme (NSS)	NSS coordinator									

MC	**22PEN609**	**Physical Education (PE) (Sports and Athletics)**	**Physical Education Director**	**0**	**0**	**2**			**100**	**---**	**100**	**PP/ NP**
	22YON609	**Yoga**	**Yoga Teacher**									
								Total	**500**	**300**	**800**	**18**

PCC: Professional Core Course, **PCCL**: Professional Core Course laboratory, **UHV**: Universal Human Value Course, **MC**: Mandatory Course (Non-credit), **AEC**: Ability Enhancement Course, **SEC**: Skill Enhancement Course, **L:** Lecture, **T**: Tutorial, **P**: Practical, **S**= Self-Study, **CIE**: Continuous Internal Evaluation, **SEE**: Semester End Evaluation. **K :** The letter in the course code indicates common to all the stream of Engineering. **PROJ**: Project /Mini Project. **PEC**: Professional Elective Course. **PROJ**: Project Phase -I, **OEC**: Open Elective Course.

Professional Elective Course: 22IST603x			
22IST603A	Cloud Computing	**22IST603C**	Blockchain Technology
22IST603B	Internet of Things	**22IST603D**	

Open Elective Course 22IST604x			
22IST604A	Introduction to Data Structures	**22IST604C**	Software engineering
22IST604B	Fundamentals of Operating Systems	**22IST604D**	Introduction to Artificial Intelligence

Ability Enhancement Course / Skill Enhancement Course-V 22IST607x OR 22ISL607x			
22IST607A	Robotics and automation	**22IST607C**	Software Testing Automation Using Selenium
22IST607B	Tosca – Automated Software Testing	**22IST607D**	DevOps
		22IST607E	Generative Artificial Intelligence

Professional Core Course (IPCC): Refers to Professional Core Course Theory Integrated with practicals of the same course. Credit for IPCC can be 04 and its Teaching– Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper. For more details, the regulation governingthe Degree of Bachelor of Engineering /Technology (B.E./B.Tech.) 2022-23 **National Service Scheme /Physical Education/Yoga:** All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education(PE)(Sports and Athletics), and Yoga(YOG) with the concerned coordinator of the course during the first Week of III semesters. Activities shall be carried out between III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the Degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, and Yoga activities. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of Degree.
Professional Elective Courses (PEC): A professional elective (PEC) course is intended to enhance the depth and breadth of educational experience in the Engineering and Technology curriculum. Multidisciplinary courses that are added supplement the latest trend and advanced technology in the selected stream of Engineering. Each group will provide an option to select one course. The minimum number of students' strengths for offering professional electives is 10. However, this conditional shall not be applicable to cases where the admission to the program is less than 10.
Open Elective Courses: Students belonging to a particular stream of Engineering and Technology are not entitled to the open electives offered by their parent Department. However, they canopt for an elective offered by other Departments, provided they satisfy the prerequisite condition if any. Registration to open electives shall be documented under the guidance of the Program Coordinator/ Advisor/Mentor. The minimum numbers of students' strength for offering Open Elective Course is 10. However, this condition shall not be applicable to class where the admission to the program is less than 10.
Project Phase-I : Students have to discuss with the mentor /guide and with their help he/she has to complete the literature survey and prepare the report and finally define the problem statement for the project work.

V Semester

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024 -2025

Course Title	SOFTWARE ENGINEERING & PROJECT MANAGEMENT						
Course Code	**22IST501**						
Category	HSMS						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	**00**	**00**	**00**	**03**	**39**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objectives:

1. Knowledge of basic SW engineering methods and practices, and their appropriate application.
2. Understanding of software requirements and the SRS documents.
3. Describe System model and Object oriented concepts.
4. Understanding the concepts of project management, methods and management practices.
5. Understanding software quality, quality management and its metrics.

UNIT I : 07 hours **Overview:** FAQ's about software engineering, Professional and ethical responsibility.**Socio-Technical systems:** Emergent system properties; Systems engineering.**Software Processes:** Process activities; The Rational Unified Process; Agile methods, Plan-driven and agile development, XP, Scrum, Computer Aided Software Engineering T1: Ch 1, Ch 2, Ch 3
UNIT II 08 hours **Requirements:** Software Requirements: Functional and Non-functional requirements; User requirements; System requirements; The software requirements document. **Requirements Engineering Processes:** Feasibility studies; Requirements elicitation and analysis; Requirements validation; Requirements management. . T1: Ch 4
UNIT III 08 hours **System modeling:** System Models: Context models; Behavioral models; Object models; Structured methods.**Software Design:** Architectural Design: Architectural design decisions; System organization; Modular decomposition styles; Control styles.**Object-Oriented design:** Objects and Object Classes; An Object-Oriented design process; Object-oriented design using the UML T1: Ch 5 ,Ch 6
UNIT IV 08 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, Traditional versus Modern Project Management Practices.
Textbook 2: Chapter 1: 1.1 to 1.17

UNIT V **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, Quality Management systems, process capability models, techniques to enhance software quality, testing, Software reliability, quality plans.
Textbook 2: Chapter 13: (13.1 to 13.14)

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos

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

CO 1. Understand the activities involved in software engineering and analyze the role of various process models
CO 2. Explain the basics of software requirements and requirement engineering process.
CO 3. Explain the basics of object-oriented concepts and build a suitable class model using modelling techniques
CO 4. Illustrate the role of project planning and quality management in software development
CO 5. Understand the importance of activity planning and different planning models

Text Books

1. Ian Sommerville: Software Engineering, 9th Edition, Pearson Education, 2012. (Listed topics only from Chapters 1,2,3,4, 5,6, 7, 8, 9,10,11, 22, 23 and 24)
2.Bob Hughes, Mike Cotterell, Rajib Mall: Software Project Management, 6th Edition, McGraw Hill Education, 2018.

REFERENCE BOOKS

1.Roger S. Pressman: Software Engineering-A Practitioners approach, 7th Edition, Tata McGraw Hill. 30.04.2024
2.Pankaj Jalote: An Integrated Approach to Software Engineering, Wiley India.

Web links and Video Lectures (e-Resources)

- https://onlinecourses.nptel.ac.in/noc20_cs68/preview
- https://www.youtube.com/watch?v=WxkP5KR_Emk&list=PLrjkTql3jnm9b5nrggx7Pt1G4UAHeFlJ
- http://elearning.vtu.ac.in/econtent/CSE.php.
- http://elearning.vtu.ac.in/econtent/courses/video/CSE/15CS42.html
- https://nptel.ac.in/courses/128/106/128106012/ (DevOps)

SCHEME FOR EXAMINATIONS:

The PCC shall be evaluated both by CIE and SEE.

MAPPING of COs with POs and PSOs

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3		3												3
CO2			3	3											3
CO3		3	3		3							3			3
CO4															3
CO5				3					3			3			3
Strength of correlation: Low-1, Medium- 2, High-3															

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024 -2025

Course Title	**COMPUTER NETWORKS**						
Course Code	**22 ISU502**						
Category	Integrated Professional Core Course (IPCC)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	**00**	**02**	**00**	**05**	**60**	**04**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objectives:

1. To understand basic concepts, topologies and OSI/TCP layers
2. Understand the working of different protocols.
3. To understand the working of various Network layer Routing algorithms & Transport layer services
4. To understand usage of application layer like DNS, Remote login, E-mail, FTP etc.

UNIT I 12 hours

Data Communications :Introduction to Data Communications; Network Models;; Layered tasks; The OSI Model and the layers in the OSI model; TCP / IP Protocol Suite.
Digital & Analog Transmission: Data signals; Digital Transmission; Analog Transmission
Textbook 1: Ch 1, Ch 2, Ch 3
Laboratory Components*:* The following experiments shall be conducted using either NS2/OPNET/NCTUNS or any other suitable simulator.
1.Simulate a three nodes point – to – point network with duplex links between them. Set the queue size and vary the bandwidth and find the number of packets dropped.
2.Simulate a four node point-to-point network with the links connected as follows:
n0 – n2, n1 – n2 and n2 – n3. Apply TCP agent between n0-n3 and UDP between n1-n3. Apply relevant applications over TCP and UDP agents changing the parameter and determine the number of packets sent by TCP / UDP.

UNIT II **10 hours**

Data Link Layer
Error detection and correction : Introduction to error detection / correction; Block coding; Linear block codes; Cyclic codes, Checksum.
Data Link control: Framing; Flow and Error control; Protocols; Noiseless channels; Noisy channels; HDLC; Point-to-point Protocol - framing, transition phases.
Multiple Access Random Access; Controlled Access; Channelization
Textbook 1: Ch 10, Ch 11,Ch 12
Laboratory Components:
1.Write a program for error detecting code using CRC-CCITT (16- bits).
.

UNIT III 10 hours

Network layer
Logical addressing ipv4 addresses, ipv6 addresses, internet protocol, delivery, forwarding and routing, security
TextBook 1: Ch 19, Ch 20,Ch 22,Ch 30
Laboratory Components:

1. Write a programming java for distance vector algorithm to find suitable path for transmission
2. Implement Diffie -Hellman Key exchange algorithm in java.
3. Write a program in java for simple RSA algorithm to encrypt and decrypt the data.

UNIT IV **10 hours**

Transport Layer

Process to process Delivery: UDP, TCP, SCTP, Congestion control and Quality of Service

Textbook 1: Ch 23, Ch 24

Laboratory Components:

1. Write a program in Java for congestion control using leaky bucket algorithm.

The following experiments shall be conducted using either NS2/OPNET/NCTUNS or any other suitable simulator.

1.Simulate the transmission of ping messages over a network topology consisting of 6 nodes and find the number of packets dropped due to congestion.

UNIT V **10 hours**

Application Layer Network Management

Domain Name System (DNS): Name Space, Domain name space, Distribution of name space , DNS in internet, Resolution, DNS messages, Types of record. Remote Login, E-mail: Architecture, user agent, Message Transfer Agent(SMTP),Message Access Agent: POP and IMAP. FTP

World Wide Web and HTTP: Architecture, web documents, HTTP: HTTP transaction, Network Management: SNMP.

TextBook 1: Ch 25, Ch 26, Ch 27, Ch 28

Laboratory Components:

The following experiments shall be conducted using either NS2/OPNET/NCTUNS or any other suitable simulator.

1.Implement simple ESS and with transmitting nodes in wireless LAN by simulation and determine the performance with respect to transmission of packets

2.Simulate an Ethernet LAN using n nodes and set multiple traffic nodes and plot congestion window for different source / destination.

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, vid

COURSE OUTCOMES: On completion of the course, student should be able to:

CO1: Analyze and formulate components of computer networks.

CO2: Design and develop protocols for transmission at lower layers

CO3: Identify and develop routing algorithms for network layer.

CO4: Recognize and apply technology for transport layer services.

CO5: Demonstrate the knowledge of Computer networks for different applications

TEXT BOOKS:

1. Behrouz A. Forouzan: Data Communications and Networking, 5th Edition, Tata McGraw-Hill, 2012

REFERENCE BOOKS:

1. William Stallings: Data and Computer Communication, 8th Edition, Pearson Education,2007.

2.Larry L. Peterson and Bruce S. David: Computer Networks – A Systems Approach, 4thEdition, Elsevier, 2007.

3.Wayne Tomasi: Introduction to Data Communications and Networking, PearsonEducation, 2005

EBOOKS/ONLINE RESOURCES

1. http://www.nptel.ac.in
2. https://en.wikipedia.org

SCHEME FOR EXAMINATIONS:

The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE).However, questions from the practical part of IPCC shall be Included in these question paper.

MAPPING of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PS03
CO1	2	3			2							2	2		3
CO2	2	2	3	2					2			3			
CO3			3		3										
CO4			3		3								2		
CO5			3		2	3			3			3			3
Strength of correlation: Low-1, Medium- 2, High-3															

Course Title	**THEORY OF COMPUTATION AND COMPILER DESIGN**						
Course Code	**22IST503**						
Category	Professional Core Course (PCC)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	04	**00**	**00**	**00**	**04**	**52**	**04**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course objectives:

22. Introduce concepts in automata theory and to classify machines by their power to recognize languages.
23. To understand and design deterministic and non-deterministic finite automata, Regular languages.
3.To apply ideas and techniques discussed to various software designs. Recognize phases of compiler with respect to design.

UNIT I **10 hours**

Introduction to Finite Automata: Introduction to Finite Automata; The central concepts of Automata theory; Deterministic finite automata; Non-deterministic finite Automata; Finite automata with Epsilon-transitions.

Regular expressions and LanguageS: Regular expressions;; Minimization of automata

T1: Ch 1-Ch 4

UNIT II **10 hours**

Context-Free Grammars And Languages: Context free grammars; Writing a Grammar; Parse trees; Ambiguity in grammars.

Normal forms for CFGs: Useless symbols, λ-productions, Unit productions, CNF, GNF.

T1:Ch 5: 5.1-5.4; Ch 7: 7.1.

UNIT III 10 hours

Pushdown Automata: Definition of the Pushdown automata; Acceptance by empty stack and final state methods.

Introduction To Turing Machine: The standard Turing machine; Design of Turning machine.

T1:Ch 6: 6.1-6.2; Ch 8: 8.2-8.4

UNIT IV **10 hours**

Introduction, Lexical analysis: Language processors; The structure of a Compiler.**Lexical analysis:** The Role of Lexical Analyzer.**Syntax Analysis – 1:** Introduction; Top-down Parsing: Predictive parser.

T2: Ch 1, T2: Ch 3, Ch 4: 4.1, 4.3-4.4

UNIT V **12 hours**

Syntax Analysis – 2: Bottom-up Parsing; Introduction to LR Parsing: Simple LR parser; More powerful LR parsers(CLR,LALR)

Syntax-Directed Translation: Syntax-Directed definitions; Evaluation order for SDDs.

Intermediate Code Generation: Variants of syntax trees; Three-address code.

Code Generation: Issues in the design of Code Generator; The Target language; Basic blocks and Flow graphs; Optimization of basic blocks

T2: Ch 4: 4.5-4.9 Ch 5: 5.1-5.2; Ch 6: 6.1-6.2; Ch 8: 8.1-8.5

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, vid

COURSE OUTCOMES: On completion of the course, student should be able to:

CO1: Analyze concepts in automata theory and classify machines by their power to recognize languages.

CO2: Impart the knowledge of models of computation.

CO3: Design grammar and recognizers for different formal languages.

CO4: Design and solve problems related to Pushdown Automata & Turing Machine.

CO5: Demonstrate the syntax analysis and error correction strategies in Compiler Design.

TEXT BOOKS:

24. John E. Hopcroft, Rajeev Motwani, Jeffrey D.Ullman: Introduction to Automata Theory, Languages and Computation, 3rd Edition, Pearson Education, 2009.

25. Alfred V Aho, Monica S. Lam, Ravi Sethi, Jeffrey D Ullman, Compilers- Principles, Techniques and Tools - 2nd Edition, Addison-Wesley, 2010.

REFERENCE BOOKS/WEB LINKS:

1.John C Martin: Introduction to Languages and Automata Theory, 3rd Edition, Tata McGraw-Hill, 2007.

2.Nandini Prasad K.S: Automata Theory and Computability, 1st Edition, Cengage Publication, 2019.

3.Peter Linz: An Introduction to Formal Languages and Automata, 5th Edition, Jones and Bartlett, New Delhi, India, 2011.

4.Nandini Prasad K S, Principles of Compiler Design - 3rd Edition, Elsevier Publication, 2014.

5.http://mapmf.pmfst.unist.hr/~milica/Matem_teorija_r/MTR_web/Introduction%20To%20Automata%20Theory.pdf

SCHEME FOR EXAMINATIONS:

The PCC shall be evaluated both by CIE and SEE.

MAPPING of COs with POs and PSOs

	PO1	PO2	PO 3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PS03
CO1	2		2		2								2		
CO2		2	2	2	2								2		
CO3			2	2	2								2		
CO4			2	2	2								2		
CO5		2	2		2								2		
Strength of correlation: Low-1, Medium- 2, High-3															

Course Title	**Mobile Application Development Lab**						
Course Code	**22ISL504**						
Category	**Professional Core Course Lab(PCCL)**						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	00	**00**	**02**	**00**	**02**	**26**	**01**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objectives:

This course will enable students to:

1. Learn and acquire the art of Android Programming.
2. Configure Android studio to run the applications.
3. Understand and implement Android's User interface functions.
4. Create, modify and query on SQlite database.
5. Inspect different methods of sharing data using services.

LIST OF PROGRAMS

26. Create an application to design a Visiting Card. The Visiting card should have a company logo at the top right corner. The company name should be displayed in capital letters, aligned to the center. Information like the name of the employee, job title, phone number, address, email, fax and the website address is to be displayed.

27. Develop an Android application using controls like Button, Text View, Edit Text for designing a calculator having basic functionality like Addition, Subtraction, Multiplication, and Division.

28. Create a SIGN UP activity with Username and Password. Validation of password should happen based on the following rules:
29. Password should contain uppercase and lowercase letters.
30. Password should contain letters and numbers.
31. Password should contain special characters.
32. Minimum length of the password (the default value is 8).

    On successful SIGN UP proceed to the next Login activity. Here the user should SIGN IN using the Username and Password created during signup activity. If the Username and Password are matched then navigate to the next activity which displays a message saying "Successful Login" or else display a toast message saying "Login Failed". The user is given only two attempts and after that display a toast message saying "Failed Login Attempts" and disable the SIGN IN button.

33. Develop an application to set an image as wallpaper. On click of a button, the wallpaper image should start to change randomly every 20 seconds.

34. Write a program to create an activity with two buttons START and STOP. On pressing the START button, the activity must start the counter by displaying the numbers from One and the counter must keep on counting until the STOP button is pressed. Display the counter value in a Text View.

35. Create two files of XML and JSON type with values for CityName, Latitude, Longitude,

Temperature and Humidity. Develop an application to create an activity with two buttons to parse the XML and JSON files which when clicked should display the data in their respective layouts side by side.

36. Develop a simple application with one Edit Text so that the user can write some text in it. Create a button called "Convert Text to Speech" that converts the user input text into voice.

37. Create an activity like a phone dialer with CALL and SAVE buttons. On pressing the CALL button, it must call the phone number and on pressing the SAVE button it must save the number to the phone contacts.

Course Outcomes:
After completion of course students will be able to:

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 wide range of devices.
CO4: Demonstrate methods in storing, sharing and retrieving data in Android Applications.
CO5: Create a mobile Application by using various components like activity, views, services, content providers and receivers.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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		
CO5	1		3		2							1	2		
Strength of correlation: Low-1, Medium- 2, High-3															

Professional Elective Course

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - CBCS – 2024 -2025

Course Title	**PYTHON PROGRAMMING**						
Course Code	**22IST505A**						
Category	**Professional Elective Course** (PEC)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	**00**	**00**	**00**	**03**	**39**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

COURSE OBJECTIVE:

1. Learn Syntax, Semantics and create Functions in Python.
2. Handle Strings and Files in Python.
3. Understand Lists, Dictionaries and Regular expressions in Python.
4. Implement Object Oriented Programming concepts in Python.
5. Build Threaded applications and Database Programming in Python.

UNIT I **07 Hours**

Introduction to Python: Features of Python, Python Virtual Machine (PVM), Writing Our First Python Program, Executing a Python Program, Getting Help in Python, Comments in Python, Doc Strings. **Datatypes in Python:** Built-in datatypes, The None Type, bool Datatype, Sequences in Python, Sets, Literals in Python, Determining the Datatype of a Variable, Characters in Python, User-defined Datatypes, Constants in Python, Identifiers and Reserved words, Naming Conventions in Python. **Operators in Python**: Arithmetic Operators, Assignment Operators, Unary minus Operator, Relational Operators, Logical Operators, Boolean Operators, Membership Operators, Identity Operators, Operator Precedence and Associativity, Mathematical Functions. **Input and Output:** Output statements, Various formats of The print(), Input Statements, Command Line Arguments. **Control Statements**: If Statement, If … else Statement, If … elif … else Statement, While Loop, For Loop, Infinite Loops, Nested Loops, Else Suite, Break Statement, Continue Statement, Pass Statement, Assert Statement, Return Statement.

Text Book1: Ch 1, Ch 2, Ch 3, Ch 4,Ch 5 , Ch 6

UNIT II **07 Hours**

Arrays in Python: Creating an Array, Importing the Array Module, Indexing and Slicing on Arrays, Types of Arrays, Working with Arrays using numpy, Creating Arrays using linspace, logspace, arrange function, Creating Arrays using zeros() and ones() Functions, Mathematical Operations on Arrays, Comparing Arrays, Aliasing the Arrays, Slicing and Indexing in numpy Arrays, Dimensions of Arrays, Attributes of an Array, Reshape() Method, Flatten() Method, Working with Multi-dimensional Arrays, The array() Function, The ones() and zeros() Functions, The eye() Function, The reshape() Function, Matrices in numpy. **Strings and Characters**: Creating Strings, Length of a String, Indexing in Strings, Repeating the Strings, Concatenation of Strings, Checking Membership, Comparing Strings, Finding Sub Strings, Strings are Immutable, Replacing a String with another String, Splitting and Joining Strings, Checking Starting and Ending of a String, String

Testing Methods, Formatting the Strings, Sorting Strings. **Functions**: Defining a Function, Calling a Function, Returning Results from a Function, Returning Multiple Values from a Function, Positional Arguments, Default Arguments, Variable Length Arguments, Local and Global Variables, The Global Keyword, Passing a Group of Elements to a Function, Recursive Functions, Lambdas, Using Lambdas with filter(),map(),reduce() Function, Function Decorators, Generators. Structured Programming: Creating Own Modules in Python,Special Variable __name__,

Text Book1: Ch 7,Ch 8,Ch 9

UNIT III **09 Hours**

Lists and Tuples: Creating Lists using range() Function, Updating the Elements of a List, Concatenation of Two Lists, Repetition of Lists, Membership in Lists, Aliasing and Cloning Lists, Methods to Process Lists, Nested Lists, List Comprehensions, Tuples, Creating Tuples, Accessing the Tuple Elements, Basic Operations on Tuples, Functions to Process Tuples, Nested Tuples, **Dictionaries:** Operations on Dictionaries, Dictionary Methods, Using for Loop with Dictionaries, Sorting the Elements of a Dictionary using Lambdas, Converting Lists into Dictionary, Converting Strings into Dictionary, Ordered Dictionaries. **Introduction to OOPS**: Problems in Procedure Oriented Approach, Features of Object Oriented Programming System (OOPS), Classes and Objects, Encapsulation, Abstraction, Inheritance, Polymorphism, Classes and Objects, Self Variable, Constructor, Types of Variables, Namespaces, Types of Methods, Passing Members of One Class to Another Class, Inner Classes, **Inheritance and Polymorphism**: Constructors in Inheritance, Overriding Super Class Constructors and Methods, Super() Method, Types of Inheritance, Method Resolution Order (MRO), Operator Overloading, Method Overloading, Method Overriding, Abstract Classes and Interfaces in Python.

Text Book1: Ch 10,Ch 11,Ch12,Ch13,Ch14,Ch15

UNIT IV **09 Hours**

Exceptions: Errors in a Python Program, Exceptions, Exception Handling, Types of Exceptions, The Except Block, Assert Statement, User-Defined Exceptions, Logging the Exceptions. **Files in Python**: Types of Files in Python, Working with Text Files, Working with Binary Files, Pickle in Python, seek() and tell() Methods, Random Accessing of Binary Files using mmap, Running Other Programs from Python Program. **Regular Expressions in Python**: Sequence Characters in Regular Expressions, Quantifiers in Regular Expressions, Special Characters in Regular Expressions, Using Regular Expressions on Files, Data Structures in Python. **Date and Time**: The epoch, Date and Time Now, Formatting Dates and Times, Finding Durations using time delta, Comparing Two Dates, Sorting Dates, Stopping Execution Temporarily, Knowing the Time taken by a Program, Working with Calendar Module.

Text Book1: Ch 16,Ch 17, Ch 18 ,Ch 19, Ch 20

UNIT V **07 hours**

Threads: Differences between a Process and a Thread, Concurrent Programming and GIL, Uses of Threads, Creating Threads in Python, Thread Class Methods, Single Tasking using a Thread, Multitasking using Multiple Threads, Thread Synchronization, Avoiding Deadlocks in a Program, Communication between Threads, Thread Communication using nofity() and wait() Methods, , Daemon Threads, Networking in Python **Graphical User Interface**: GUI in Python, The Root Window, Fonts and Colors, Working with Containers, Canvas, Frame, Widgets, Button Widget, Label Widget, Message Widget, Text Widget, Scrollbar Widget, Checkbutton Widget, Radiobutton Widget, Entry Widget, Spinbox Widget, Listbox Widget, Menu Widget, **Python's Database Connectivity**: Advantages of a DBMS over Files, Working with MySQL Database, Operations on rows of a Table, Creating Database Tables through Python, Working with Oracle Database in Python, Stored Procedures.

Text Book1: Ch 21, Ch 22, Ch 23,Ch 24

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos

COURSE OUTCOMES: On completion of the course, student should be able to:

CO1: Explain syntax and semantics of different statements and functions in Python.

CO2: Demonstrate the use of strings, files, lists, dictionaries, and tuples in simple applications.
CO3: Write simple applications using regular expressions, multiple threads.
CO4: Build simple database applications with GUI.
CO5: Analyze the given problem and select appropriate data types and modules to develop the solution

Textbooks:

1. Dr. R. Nageswawa Rao, Core Python Programming, Dreamtech press, 2nd Edition 2018 (Chapter Numbers: 3,4,5,6,7, 8,9,10,11,16,17,18,22).

Reference Books:

1. Gowrishankar S. Veena A, Introduction to Python Programming, CRC Press Taylor & Francis Group, 1st Edition 2019.
2. Michael Urban and Joel Murach, Mike Murach Elizabeth Drake, Python Programming, 1st Edition, 2016.

EBOOKS/ONLINE RESOURCES

1. http://www.w3schools.com
2. http://docs.python.org
3. http://www.tutorialspoint.com
4. http://www.learnpython.org

SCHEME FOR EXAMINATIONS:

The PEC shall be evaluated both by CIE and SEE.

MAPPING of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	2		1								2		
CO2	2	3	3		1								3	1	1
CO3	3	3	3		1								3	1	1
CO4	3	3	3		1								3	1	1
CO5	2	3	1		1								3	1	1
Strength of correlation: Low-1, Medium- 2, High-3															

Scheme and Syllabus - CBCS-2024 -2025

Course Title	**Artificial Intelligence**						
Course Code	**22IST505B**						
Category	Professional Elective Courses-I (PEC)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	**00**	**00**	**00**	**03**	**39**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objectives:

1. Understand about agent, behavior and structure
2. Learn different AI models and search strategies
3. Representation of knowledge and reasoning
4. Gain knowledge about learning strategies

UNITI : **07 hours**

What is AI? Intelligent Agents: Agents and environment; Rationality; the nature of environment; the structure of agents. Problem-solving agents, Example problems.

Text book 1: Chapter 1- 1.1, 1.2, 1.3 Chapter 2- 2.1, 2.2, 2.3, 2.4

UNIT II **08 hours**

Searching for Solutions Uninformed Search Strategies: Breadth First search, Depth First Search, Iterative deepening depth first search;

Knowledge representation issues: Representations and mappings approaches to knowledge representation, Issues in knowledge representation.**Text book 1**: Chapter 3- 3.1, 3.2, 3.3, 3.4

UNIT III **08 hours**

Informed Search Strategies: Heuristic functions, Greedy best first search, A*search. Heuristic Functions

Logical Agents: Knowledge based agents, The Wumpus world, Logic Propositional logic Reasoning patterns in Propositional logic.**Text book 1**: Chapter 3-3.5,3.6

UNIT IV **08 hours**

First Order Logic: Representation Revisited, Syntax and Semantics of First Order logic, Using First Order
Inference in First Order Logic :Propositional Versus First Order Inference, Unification, Forward Chainin
Backward Chaining

Text book 1: Chapter 8- 8.1, 8.2, 8.3 Chapter 9- 9.1, 9.2, 9.3, 9.4, 9.5

UNITV **08 hours**

Statistical learning, Maximum likelihood parameter learning, Bayesian parameter learning.

Expert Systems: Representing and using domain knowledge, ES shells. Explanation, knowledge acquisition

Text Book 2: Chapter 20

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, vid

Course outcomes:

On successful completion of the course, the student will be able to

CO1: Apply knowledge of agent architecture, searching and reasoning techniques for different applications.

CO 2. Compare various Searching and Inferencing Techniques.

CO 3. Describe the concepts of knowledge based agents

CO 4. Develop knowledge base sentences using propositional logic and first order logic

CO5: Use the concepts of Expert Systems to build applications..

TEXT BOOK:

2. Stuart J. Russell and Peter Norvig , Artificial Intelligence, 3rd Edition, Pearson,2015
3. Elaine Rich, Kevin Knight, Artificial Intelligence, 3rd edition,Tata McGraw Hill,2013

REFERENCE BOOKS

4. George F Lugar, Artificial Intelligence Structure and strategies for complex, Pearson Education, 5th Edition, 2011
5. Nils J. Nilsson, Principles of Artificial Intelligence, Elsevier, 1980
3.Saroj Kaushik, Artificial Intelligence, Cengage learning, 2014

EBOOKS/ONLINE RESOURCES

6. https://www.kdnuggets.com/2019/11/10-free-must-read-books-ai.html

7. https://www.udacity.com/course/knowledge-based-ai-cognitive-systems--ud409

3.https://nptel.ac.in/courses/106/105/106105077/

SCHEME FOR EXAMINATIONS:

The PEC shall be evaluated both by CIE and SEE.

MAPPING of COs with POs and PSOs

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO 1	3	3										3	3		
CO 2	3	3										3		3	
CO 3	3	3		3		3						3		3	
CO 4	3	3	3	3								3		3	
CO 5	3	3	3	3		3						3		3	
Strength of correlation: Low-1, Medium- 2, High-3															

Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024 -2025

Course Title	**NETWORK AND CYBER SECURITY**						
Course Code	**22IST503C**						
Category	**PROFESSIONAL ELECTIVE COURSE**						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	**00**	**00**	**00**	**03**	**39**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objectives:

8. To gain knowledge of cryptography
9. To acquire knowledge of application protocols to provide security.
10. To gain knowledge of securing data in transit across networks.
11. To gain knowledge about web security.
12. To introduce the area of cybercrime and Cyber security to students.

UNIT I : **07 hours**

Classical Encryption Techniques : Symmetric Cipher Model: Cryptography, Cryptanalysis and Brute-Force Attack.

Substitution Techniques:caeser cipher, monoalphabetic cipher, playfair cipher, hill cipher, polyalphabetic cipher, one-time pad

Public-Key Cryptography Principles of public-key cryptosystems: Public-key cryptosystems, Applications for public-key cryptosystems, requirements for public-key cryptosystems, public-key cryptanalysis. RSA algorithm, ECC

T1:Ch2:1,2 Ch9:1,2

UNIT II **08 hours**

Electronic Mail Security: Pretty good privacy, notation, operational; description, S/MIME, RFC5322, Multipurpose internet mail extensions, S/MIME functionality, S/MIME messages, S/MIME certificate processing.T1:Ch19:1,2,3

UNIT III **09 hours**

IP Security: IP Security overview: Applications of IPsec, benefits of IPsec, Routing applications, IPsec documents, IPsec services, transport and tunnel modes. Encapsulating Security payload: ESP format, encryption and authentication algorithms, Padding, Anti replay service, transport and tunnel modes

T1:Ch20:1,3

UNIT III **09 hours**

IP Security: IP Security overview: Applications of IPsec, benefits of IPsec, Routing applications, IPsec documents, IPsec services, transport and tunnel modes. Encapsulating Security payload: ESP format, encryption and authentication algorithms, Padding, Anti replay service, transport and tunnel modes

T1:Ch20:1,3

UNIT IV **07 hours**

Transport Level Security: Web security considerations: Web security threats, Web Traffic security approaches

Secure sockets layer: SSL architecture, SSL Record Protocol, Change Cipher Spec Protocol, Alert protocol, hand shake protocol

T1:Ch17:1,2

UNIT V **08 hours**

Introduction to Cybercrime & Cyber security: Introduction,Cybercrime:Definition and Origins of the word. Definition of Cyber Security. Cybercrime and Information Security, Who are Cybercriminals,? Classifications of Cybercrimes. Cybercrime: The Legal Perspectives, Cybercrimes: An Indian Perspective. Cybercrime and the Indian ITA 2000. A Global Perspective on Cybercrimes. Cybercrime Era: Survival Mantra for the Netizens.

Cyberoffenses: How Criminals Plan Them: Introduction, How Criminals Plan the Attacks. Social Engineering, Cyberstalking, Cyber cafe and Cybercrimes. Botnets: The Fuel for Cybercrime. Attack Vector. Cloud Computing.

T2:Ch1,Ch2

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos

COURSE OUTCOMES: On completion of the course, student should be able to:

CO1: Apply the knowledge of symmetric and asymmetric technique for securing data.
CO2: Analyze Email Security aspects and application protocols .
CO3: Analyze security aspects and protocols of IP layer .
CO4: Secure data in transit across network by using appropriate protocol.
CO5: Acquire Knowledge on the cyber security, cybercrime.

TEXT BOOK:

- William Stallings: Cryptography and Network Security, Principles and Practice Pearson, 6th edition 2014.
- Sunit Belapure and Nina Godbole, " Cyber Security: Understandign Cyber Crimes, Computer Forensics And Legal Perspectives", Wiley India Pvt Ltd, ISBN:978-81-265-2179-1. Publish Date 2013.

REFERENCE BOOKS:

- Jennifer L. Bayuk, Jason Healey, Paul Rohmeyer, "**Cyber Security Policy Guidebook** "

Wiley Publications .

- Behrouz A. Forouzan: Cryptography and Network Security Tata-Macgraw Hill 2007

MAPPING of COs with POs and PSOs

	PO1	PO	PO	PO4	PO5	PO6	PO	PO	PO9	PO10	PO1	PO1	PSO	PSO	PSO
CO	2	2	2		2							2	2	2	
CO	2	2	2		2	2							2	2	
CO			2		2	2							2	2	
CO	2	2	2	2	2							2	2	2	
CO	2	2	2	2	2							2	2	2	
Strength of correlation: Low-1, Medium- 2, High-3															

Course Title	**UNIX System Programming**						
Course Code	**22IST505D**						
Category	Professional Elective Course (PEC)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	**00**	**00**	**00**	**03**	**39**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objectives:

- Know the operating system standards like POSIX standards and ANSI Standards.
- Design & develop UNIX commands and applications using UNIX system API's.
- Understand the UNIX process control mechanism.
- Analyze the problem & apply the relevant IPC techniques in UNIX system programming.
- Adopting signals as IPC for efficient application development on Unix Systems.

UNIT I : **07 hours**

Introduction: UNIX and ANSI Standards:The ANSI C Standard, The ANSI/ISOC++ Standards, Difference between ANSI C and C++, The POSIX Standards, The POSIX.1 FIPS Standard, The X/Open Standards.
UNIX and POSIX APIs: The POSIX APIs, The UNIX and POSIX Development Environment, API Common Characteristics. ---
T1.CH1,CH2,CH3

UNIT II **08 hours**

UNIX Files: File Types, The UNIX and POSIX File System, The UNIX and POSIX File Attributes, Inodes in UNIX System V, Application Program Interface to Files, UNIX Kernel Support for Files, Relationship of C Stream Pointers and File Descriptors, Directory Files, Hard and Symbolic Links.
UNIX File APIs: General File APIs, File and Record Locking, Directory File APIs, Device File APIs, FIFO File APIs, Symbolic Link File APIs.Rules
T2-CH4,CH5,CH6

UNIT III **08 hours**

UNIX Processes: The Environment of a UNIX Process:Introduction, main function, Process Termination, Com Line Arguments, Environment List, Memory Layout of a C Program, Shared Libraries, Memory Allocation, Environment Variables, setjmp and longjmp Functions, getrlimit, setrlimit Functions, UNIX Kernel Support for Processes.
T1&T2-CH7,CH8

UNIT IV **08 hours**

Process Control: Introduction, Process Identifiers, fork, vfork, exit, wait, waitpid, wait3, wait4 Functions, Race Conditions, exec Functions, Changing User IDs and Group IDs, Interpreter Files, system Function, Process Accounting, User Identification, Process Times, I/O Redirection.
Process Relationships: Introduction, Terminal Logins, Network Logins, Process Groups, Sessions, Controlling Terminal, tcgetpgrp and tcsetpgrp Functions, Job Control, Shell Execution of Programs, Orphaned Process Gro
T2-12&15

UNIT V **08 hours**

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

Interprocess Communication – 1: Overview of IPC Methods, Pipes, popen, pclose Functions, Coprocesses, FIFOs, System V IPC, Message Queues, Semaphores.T2-CH17,CH 20

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos

COURSE OUTCOMES: On completion of the course, student should be able to:

CO1: Understand ANSI C, C++ standards, POSIX standards, UNIX & POSIX API's for UNIX Operating system.
CO2: Analyze the UNIX File, File System, UNIX Kernel support for files and different types of APIs.
CO3: Demonstrate advanced UNIX features such as signals, Job Control, daemon processes and IPC.
CO4 : Develop UNIX commands, utilities and applications utilizing UNIX System calls.
CO5 : Analyze process control, Deamon characteristics, coding rules and error logging and IPC facilities

TEXT BOOKS:

- Terrence Chan: UNIX System Programming Using C++, Pearson India, 2015.
- W.Richard Stevens: Advanced Programming in the UNIX Environment, 3rd Edition, Pearson Education, 2015.

REFERENCE BOOKS / WEBLINKS:

- Maurice JBach :Advanced UNIX Programming, 2nd Edition, Pearson Education, 2015.
- UNIX kernel Internals –UreshVahlia PHI 2010.
- www.tutorialspoint.com/unix/unix-basic-operators.html
- https://www.youtube.com/watch?v=DpcCtaaGxyQ&list=PLd3UqWTnYXOmKXhD-PVqMN1XhNQV-s4lj

EBOOKS/ONLINE RESOURCES

1. https://www.youtube.com/watch?v=gTU1IP8JSxc&list=PLOZyfu4IYm88aq4qTqqzKfwgrHhl-hcTJ
2. https://www.youtube.com/watch?v=JkN6GMkSgXw&list=PLawoGO2yQK2Y6sRsFLHuJhAjcR-a0JYsd

SCHEME FOR EXAMINATIONS:

The PEC shall be evaluated both by CIE and SEE.

MAPPING of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1										1	1		
CO2	2	1										2	2		
CO3	2	1										2	2		
CO4	2	1										2	2		
CO5	2	1										2	2		
Strength of correlation: Low-1, Medium- 2, High-3															

Detailed Scheme and Syllabus

ACADEMIC YEAR 2024-2025

V- VI (2022-2026 BATCH) (160Credits)

Dr. Ambedkar Institute of Technology
Bangalore

Department Of
Information Science and Engineering

Vision

13. To create **D**ynamic, **R**esourceful, **A**dept and**I**nnovative **T**echnical professionals to meet global challenges.

Mission

14. To offer state-of-the-art undergraduate, postgraduate and doctoral programmes in the fields of Engineering, Technology and Management.
15. To generate new knowledge by engaging faculty and students in research, development and innovation
16. To provide strong theoretical foundation to the students, supported by extensive practical training to meet industry requirements.
17. To install moral and ethical values with social and professional commitment.

DEPARTMENT VISION AND MISSION

Vision:

18. Imparting quality technical education and preparing professionals to meet Information Technological challenges globally.

Mission:

19. Prepare highly capable Information Science engineers through best practices.
20. Encourage students to pursue higher education for further growth in the learning process and to promote research in the frontier areas of Information Technology.
21. Educate students to take up social and professional responsibilities with ethical values for the betterment of the society

PROGRAM SPECIFIC OUTCOMES(PSOS)

PSO1: Students should be able to develop and optimize solutions for information systems employing fundamentals of mathematics, Hardware, software, data storage, security and communication networks.

PSO2:Students should be able to understand, analyze and adopt principles of programming paradigms by using latest technologies such as Cloud computing, Big data analytics, AI ,Machine Learning and IoT based applications for solving real-world problems.

PSO3: Students should be able to acquire and demonstrate the team work, professional ethics, competence and communication skills while developing software products.

PROGRAMME OUTCOMES (POs)

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 the 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 the 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 the engineering practice.
9. Individual and team work: 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

Dr.Ambedkar Institute of Technology, Bengaluru-560056
Outcome Based Education(OBE) and Choice Based Credit System
B.E in Information Science and Engineering
Tentative Scheme of Teaching and Examination effective from the Academic Year 2024-25
2022 Scheme

V SEMESTER

Sl. No	Course and Course Code		Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Self - Study	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	HSMS	22IST501	Software Engineering & Project Management	ISE	3	0	0		03	50	50	100	3
2	IPCC	22ISU502	Computer Networks	ISE	3		2		03	50	50	100	4
3	PCC	22IST503	Theory of computation and compiler Design	ISE	4	0	0		04	50	50	100	4
4	PCCL	22ISL504	Mobile Application development lab	ISE	0	0	2		03	50	50	100	1
5	PEC	22IST505x	Professional Elective Course	ISE	3	0	0		03	50	50	100	3
6	PROJ	22ISM506	Mini Project	ISE	0	0	4		03	100		100	2
7	AEC	22RMT507	Research Methodology and IPR	EEE department	2	2	0		02	50	50	100	3
8	MC	22CVT508	Environmental Studies	TD: CV PSB: CV	2	0	0		02	50	50	100	2
9	HS	22CDN509	Aptitude and Verbal Ability Skills	Placement Cell	2	0	0		--	50	--	50	PP/ NP
10	MC	22NSN510	National Service Scheme (NSS)	NSS coordinator	0	0	2			100	---	100	PP/ NP
		22PEN510	Physical Education (PE) (Sports and Athletics)	Physical Education Director									
		22YON510	Yoga	Yoga Teacher									
								Total		500	300	800	22

PCC: Professional Core Course, PCCL: Professional Core Course laboratory, UHV: Universal Human Value Course, MC: Mandatory Course (Non-credit), AEC: Ability Enhancement Course, SEC: Skill Enhancement Course, L: Lecture, T: Tutorial, P: Practical, S= Self-Study CIE: Continuous Internal Evaluation, SEE:Semester End Evaluation. K : The letter in the course code indicates common to al the stream of Engineering. PROJ: Project /Mini Project. PEC: Professional Elective Course

Professional Elective Course 22IST505x

22IST505A	**Python programming**	**22IST505C**	**Network and cyber security**
22IST505B	**Artificial Intelligence**	**22IST505D**	**Unix System Programming**

Professional Core Course (IPCC): Refers to Professional Core Course Theory Integrated with practicals of the same course. Credit for IPCC can be 04 and its Teaching– Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper. For more details, the regulation governingthe Degree of Bachelor of Engineering /Technology (B.E./B.Tech.) 2022-23

National Service Scheme /Physical Education/Yoga: All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education(PE)(Sports and Athletics), and Yoga(YOG) with the concerned coordinator of the course during the first Week of III semesters. Activities shall be carried out between III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the Degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, and Yoga activities. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of Degree.

Mini-project work: Mini Project is a laboratory-oriented/hands on course that will provide a platform to students to enhance their practical knowledge and skills by the development of small systems/applications etc. Based on the ability/abilities of the student/s and recommendations of the mentor, a single discipline or a multidisciplinary Mini- project can be assigned to an individual student or to a group having not more than 4 students.

CIE procedure for Mini-project:

22. **Single discipline:** The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two faculty members of the Department, one of them being the Guide. The CIE marks awarded for the Mini-project work shall be based on the evaluation of the project report, project presentation skill, and question and answer session in the ratio of 50:25:25. The marks awarded for the project report shall be the same for all the batches mates.

23. **Interdisciplinary:** Continuous Internal Evaluation shall be group-wise at the college level with the participation of all the guides of the project.

The CIE marks awarded for the Mini-project, shall be based on the evaluation of the project report, project presentation skill, and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.

No SEE component for Mini-Project.

Professional Elective Courses (PEC): A professional elective (PEC) course is intended to enhance the depth and breadth of educational experience in the Engineering and Technology curriculum. Multidisciplinary courses that are added supplement the latest trend and advanced technology in the selected stream of Engineering. Each group will provide an option to select one course. The minimum number of students' strengths for offering a professional elective is 10. However, this conditional shall not be applicable to cases where the admission to the program is less than 10.

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2022 Scheme

VI SEMESTER

Course and Course Code		Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination				Credits
				Theory Lecture	Tutorial	Practical/ Drawing	Self-Study	Duration in hours	CIE Marks	SEE Marks	Total Marks	
				L	T	P	S					
IPCC	22ISU601	Full stack development		3	0	2		03	50	50	100	4
PCC	22IST602	Machine Learning		3	2	0		03	50	50	100	4
PEC	22IST603x	Professional Elective Course		3	0	0		03	50	50	100	3
OEC	22IST604x	Open Elective Course-I		3	0	0		03	50	50	100	3
PROJ	22ISP605	Major Project Phase I		0	0	4		03	100	--	100	2
PCCL	22ISL606	Machine Learning Lab		0	0	2		03	50	50	100	1
AEC/SDC	22IST607x OR 22ISL607x	Ability Enhancement Course/ Skill Development Course V		If the course is offered as a Theory				01	50	50	100	1
				1	0	0						
				If course is offered as a practical								
				0	0	2						
HS	22CDN608	Analytical and Reasoning Skills	Placement Cell	2	0	0		--	50	--	50	PP/ NP
	22NSN609	National Service Scheme (NSS)	NSS coordinator									

MC	**22PEN609**	**Physical Education (PE) (Sports and Athletics)**	**Physical Education Director**	**0**	**0**	**2**			**100**	**---**	**100**	**PP/ NP**
	22YON609	**Yoga**	**Yoga Teacher**									
								Total	**500**	**300**	**800**	**18**

PCC: Professional Core Course, **PCCL**: Professional Core Course laboratory, **UHV**: Universal Human Value Course, **MC**: Mandatory Course (Non-credit), **AEC**: Ability Enhancement Course, **SEC**: Skill Enhancement Course, **L:** Lecture, **T**: Tutorial, **P**: Practical, **S**= Self-Study, **CIE**: Continuous Internal Evaluation, **SEE**: Semester End Evaluation. **K :** The letter in the course code indicates common to all the stream of Engineering. **PROJ**: Project /Mini Project. **PEC**: Professional Elective Course. **PROJ**: Project Phase -I, **OEC**: Open Elective Course.

Professional Elective Course: 22IST603x			
22IST603A	Cloud Computing	**22IST603C**	Blockchain Technology
22IST603B	Internet of Things	**22IST603D**	

Open Elective Course 22IST604x			
22IST604A	Introduction to Data Structures	**22IST604C**	Software engineering
22IST604B	Fundamentals of Operating Systems	**22IST604D**	Introduction to Artificial Intelligence

Ability Enhancement Course / Skill Enhancement Course-V 22IST607x OR 22ISL607x			
22IST607A	Robotics and automation	**22IST607C**	Software Testing Automation Using Selenium
22IST607B	Tosca – Automated Software Testing	**22IST607D**	DevOps
		22IST607E	Generative Artificial Intelligence

Professional Core Course (IPCC): Refers to Professional Core Course Theory Integrated with practicals of the same course. Credit for IPCC can be 04 and its Teaching– Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper. For more details, the regulation governingthe Degree of Bachelor of Engineering /Technology (B.E./B.Tech.) 2022-23 **National Service Scheme /Physical Education/Yoga:** All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education(PE)(Sports and Athletics), and Yoga(YOG) with the concerned coordinator of the course during the first Week of III semesters. Activities shall be carried out between III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the Degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, and Yoga activities. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of Degree.
Professional Elective Courses (PEC): A professional elective (PEC) course is intended to enhance the depth and breadth of educational experience in the Engineering and Technology curriculum. Multidisciplinary courses that are added supplement the latest trend and advanced technology in the selected stream of Engineering. Each group will provide an option to select one course. The minimum number of students' strengths for offering professional electives is 10. However, this conditional shall not be applicable to cases where the admission to the program is less than 10.
Open Elective Courses: Students belonging to a particular stream of Engineering and Technology are not entitled to the open electives offered by their parent Department. However, they canopt for an elective offered by other Departments, provided they satisfy the prerequisite condition if any. Registration to open electives shall be documented under the guidance of the Program Coordinator/ Advisor/Mentor. The minimum numbers of students' strength for offering Open Elective Course is 10. However, this condition shall not be applicable to class where the admission to the program is less than 10.
Project Phase-I : Students have to discuss with the mentor /guide and with their help he/she has to complete the literature survey and prepare the report and finally define the problem statement for the project work.

VI SEMESTER

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024 -2025

Course Title	FULL STACK DEVELOPMENT						
Course Code	**22ISU601**						
Category	Integrated Professional Core Course (IPCC)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	**00**	**02**	**00**	**05**	**60**	**04**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objectives:

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

UNIT I : **08 hours**

MVC based Web Designing,Web framework, MVC Design Pattern, Django Evolution, Views, Mapping URL to Views, Working of Django URL Confs and Loose Coupling, Errors in Django, Wild Card patterns in URLS.

Textbook 1: Chapter 1 and Chapter 3

Laboratory Component:

1. Installation of Python, Django and Visual Studio code editors can be demonstrated.
2. Creation of virtual environment, Django project and App should be demonstrated
3. Develop a Django app that displays current date and time in server
4. Develop a Django app that displays date and time four hours ahead and four hours before as an offset of current date and time in server

UNIT II **08 hours**

Django Templates and Models

Template System Basics, Using Django Template System, Basic Template Tags and Filters, MVT Development Pattern, Template Loading, Template Inheritance, MVT Development Pattern.

Configuring Databases, Defining and Implementing Models, Basic Data Access, Adding Model String Representations, Inserting/Updating data, Selecting and deleting objects, Schema Evolution

Textbook 1: Chapter 4 and Chapter 5

Laboratory Component:

1. Develop a simple Django app that displays an unordered list of fruits and ordered list of selected students for an event
2. Develop a layout.html with a suitable header (containing navigation menu) and footer with copyright and developer information. Inherit this layout.html and create 3 additional pages: contact us, About Us and Home page of any website.
3. Develop a Django app that performs student registration to a course. It should also display list of students registered for any selected course. Create students and course as models with enrolment as ManyToMany field.

UNIT III 08 hours

Django Admin Interfaces and Model Forms

Activating Admin Interfaces, Using Admin Interfaces, Customizing Admin Interfaces, Reasons to use Admin Interfaces.

Form Processing, Creating Feedback forms, Form submissions, custom validation, creating Model Forms, URLConf Ticks, Including Other URLConfs.

Textbook 1: Chapters 6, 7 and 8

Laboratory Component:

1. For student and course models created in Lab experiment for Module2, register admin interfaces, perform migrations and illustrate data entry through admin forms.
2. Develop a Model form for student that contains his topic chosen for project, languages used and duration with a model called project

UNIT IV **08 hours**

Generic Views and Django State Persistence

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

MIME Types, Generating Non-HTML contents like CSV and PDF, Syndication Feed Framework, Sitemap framework, Cookies, Sessions, Users and Authentication.

Textbook 1: Chapters 9, 11 and 12

Laboratory Component:

1. For students enrolment developed in Module 2, create a generic class view which displays list of students and detailview that displays student details for any selected student in the list.
2. Develop example Django app that performs CSV and PDF generation for any models created in previous laboratory component.

UNIT V **07 hours**

jQuery and AJAX Integration in Django.

Ajax Solution, Java Script, XHTMLHttpRequest and Response, HTML, CSS, JSON, iFrames, Settings of Java

Script in Django, jQuery and Basic AJAX, jQuery AJAX Facilities, Using jQuery UI Autocomplete in Django

Textbook 2: Chapters 1, 2 and 7

Laboratory Component:

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

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

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos

COURSE OUTCOMES: On completion of the course, student should be able to:

CO1: Understand the working of MVT based full stack web development with Django.

CO2: Designing of Models and Forms for rapid development of web pages.

CO3 : Analyze the role of Template Inheritance and Generic views for developing full stack web applications.

CO4: Apply the Django framework libraries to render nonHTML contents like CSV and PDF.

CO5: Perform jQuery based AJAX integration to Django Apps to build responsive full stack web application.

TEXT BOOKS:

1Adrian Holovaty, Jacob Kaplan Moss, The Definitive Guide to Django: Web Development Done Right, Second Edition, Springer-Verlag Berlin and Heidelberg GmbH & Co. KG Publishers, 2009

2. Jonathan Hayward, Django Java Script Integration: AJAX and jQuery, First Edition, Pack Publishing, 2011

REFERENCE BOOKS:

1. Aidas Bendroraitis, Jake Kronika, Django 3 Web Development Cookbook, Fourth Edition, Packt Publishing, 2020.

2. William Vincent, Django for Beginners: Build websites with Python and Django, First Edition, Amazon Digital Services, 2018

3 Antonio Mele, Django3 by Example, 3rd Edition, Pack Publishers, 2020.

4. Arun Ravindran, Django Design Patterns and Best Practices, 2nd Edition, Pack Publishers, 2020.

5. Julia Elman, Mark Lavin, Light weight Django, David A. Bell, 1st Edition, Oreily Publications, 2014

EBOOKS/ONLINE RESOURCES

1.MVT architecture with Django: https://freevideolectures.com/course/3700/django-tutorials

2. Using Python in Django: https://www.youtube.com/watch?v=2BqoLiMT3Ao

3. Model Forms with Django: https://www.youtube.com/watch?v=gMM1rtTwKxE

4. Real time Interactions in Django: https://www.youtube.com/watch?v=3gHmfoeZ45k

5. AJAX with Django for beginners: https://www.youtube.com/watch?v=3VaKNyjlxAU

SCHEME FOR EXAMINATIONS:

The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE).However, questions from the practical part of IPCC shall be Included in these question paper.

MAPPING of COs with POs and PSOs

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1		2	2										2		1
CO2		2	2		2					1			2		1
CO3		2	3		2					2			2		1
CO4			2		2					1			2		1
CO5		2	3		2					1			2		1
Strength of correlation: Low-1, Medium- 2, High-3															

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024 -2025

Course Title	**Machine Learning**						
Course Code	**22IST602**						
Category	Professional Core Course (PCC)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	**02**	**00**	**00**	**05**	**52**	**04**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objectives:

1. Basics on what is learning machine
2. Basic mathematics behind learning algorithms
3. Different types of learning

UNIT I **10 hours**

Introduction To Machine Learning: Introduction; Human learning and types of human learning; What is machine learning?; Types of machine learning; Well-posed learning problems; Designing a learning system; Applications of machine learning; Tools in machine learning; perspectives and Issues in machine learning.

Concept Learning And The General-To-Specific Ordering: Concept learning task; Concept learning as search; Find-S algorithm; Version spaces and the Candidate-elimination algorithm

T1- **chapter 1(**1.1-1.3),chapter 2(2.1-2.5),T2- **chapter 1(1.1- 1.5 ,1.7,1.8)**

UNIT II **10 hours**

Regression: example of regression, common regression algorithms, maximum likelihood estimation.

Decision Tree Learning: Decision tree representation; Appropriate problems for decision tree learning; Basic decision tree learning algorithm; hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning. Issues in decision tree learning.

T1: chapter 3(3.1-3.4,3.7),T2- chapter 8(8.1-8.3)

UNIT III **10 hours**

Artificial Neural Networks: Introduction; Neural Network representations; Appropriate problems for neural network learning; Perceptron's; Back propagation algorithm.

Bayesian Learning: Introduction; Bayes theorem; Bayes theorem and concept learning; Bayes optimal classifier; Naive Bayes classifier; Bayesian belief networks,EM algorithm.

T1: chapter 4(4.1-4.5),chapter6 (6.1-6.3,6.7,6.9,6.11,6.12)

UNIT IV **10 hours**

Classification: example of supervised learning, classification model, learning steps, common classification algorithms. Unsupervised learning: Applications, clustering.

Case Studies Of Applications: Weather forecasting, Stock market prediction, Real Time Sentiment

Analysis,etc
T2: chapter 7(7.1-7.5),chapter 8 (9.1-9.4)

UNIT V **12 hours**

Evaluating Hypothesis:
Motivation, Estimating hypothesis accuracy, Basics of sampling theorem, General approach for deriving confidence intervals, Difference in error of two hypothesis, Comparing learning algorithms.
Instance Based Learning:: Introduction, k-nearest neighbor learning, locally weighted regression, radial basis function, cased-based reasoning,.
Reinforcement Learning: Introduction, Learning Task, Q Learning
T1- chapter 5(5.1-5.6), chapter 8(8.1-8.5), chapter 13(13.1-13.3),T2-chapter11(11.4,11.6)

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentati animations, videos

COURSE OUTCOMES:
CO1: Learn the basics of learning problems with hypothesis and version spaces.
CO2: Characterize the machine learning algorithms as supervised learning and unsupervised learning
CO3: Learn the concepts in Bayesian analysis from probability models and methods
CO4: Apply and analyse the various algorithms of supervised and unsupervised learning
CO5: Learn the concepts of evaluating hypothesis, probability models and methods.

TEXT BOOKS:
1. Tom M. Mitchell, “Machine Learning”, McGraw Hill Education. India Edition 2017.
2.Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, “Machine Learning” , Pearson India Education Services Pvt. Ltd., 2019
REFERENCE BOOKS:
1. Ethem Alpaydin, “Introduction to Machine Learning”, 2nd Ed., PHI Learning Pvt. Ltd., 2013.
2. Peter Harrington , “Machine Learning in Action”, MANNING Shelter Island Publication, 2012.

EBOOKS/ONLINE RESOURCES
29. NPTEL course by Balaram Ravindran
30. Machine Learning course from Coursera by Andrew Ng
31. FAST.ai course on ML

SCHEME FOR EXAMINATIONS:
Professional Core Course shall be evaluated both by CIE and SEE

MAPPING of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3		3										3		
CO2			3	3										3	
CO3		3	3		3							3		3	
CO4														3	
CO5				3					3			3	3		
Strength of correlation: Low-1, Medium- 2, High-3															

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024 -2025

Course Title	**Machine Learning Lab**						
Course Code	**22ISL606**						
Category	**Professional Core Course Lab(PCCL)**						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	00	**00**	**02**	**00**	**02**	**26**	**01**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objectives:

This course will enable students to:

32. Define machine learning and understand about various machine learning applications
33. Differentiate supervised, unsupervised and reinforcement learning methods.
34. Apply decision trees, neural networks, Bayes classifier, K-means clustering and k-nearest neighbor methods for problems in machine learning

LIST OF PROGRAMS

Execute the following programs using Google Colab/Anaconda/Jupiter Notebook:

1. Demonstrate the following:
35. Creation of .CSV files
36. insert synthetic data manually into .CSV files
37. uploading of .CSV files from local drive to python environment.
38. uploading of .CSV files from Google drive to python environment.

2. Demonstrate how to generate synthetic datasets(not manual entry) and generate at least 4 features.

3. Demonstrate the working of Find-S algorithm for finding the most specificities hypothesis using appropriate training samples.

4. Implement Candidate Elimination algorithm and display all the consistent hypotheses using appropriate training samples.

5. Create a .CSV file for the datasets containing the following fields(age, income, student, credit_rating, Buys_computer) where Buys_computer is the target attribute and implement ID3 algorithm for the same.

6. Demonstrate the working of XOR gate using Artificial Neural network with Backpropagation method using Tanh activation function.

7. Implement KNN algorithm to classify “iris dataset” using Kaggle or Machine learning repositories.

8. Implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets..
9. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select the appropriate data set for your experiment and draw graphs.
10. Implement the EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using the k-Means algorithm.

Course Outcomes:
After completion of course students will be able to:
CO1: Identify problems of machine learning and it's methods
CO2: Apply appropriate machine learning strategy for any given problem
CO3: Design systems that uses appropriate models of machine learning
CO4: Solve problems related to various learning techniques

MAPPING of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3											3	3	3
CO2			3	3										3	
CO3		3		3	3							3	3		3
CO4				4					3			3	3		3
Strength of correlation: Low-1, Medium- 2, High-3															

Professional Elective Course:

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024 -2025

Course Title	**CLOUD COMPUTING**						
Course Code	**22IST603A**						
Category	Professional Elective Courses(PEC)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	**00**	**00**	**00**	**03**	**39**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objectives:

1. To study the history and the fundamental concepts of Cloud Computing, Parallel, Distributed Computing.
2. To understand the concepts of Virtualization, Containers and Microservices for developing and deploying applications with cloud
3. To learn the concept of Cloud Computing Architecture and different Cloud Models.
4. To Understand cloud management and cloud security.
5. To impart open source cloud platforms for developing the applications

UNIT I : **08 hours**

Introduction to Cloud Computing: Cloud Computing at a Glance, Historical Developments, Building Cloud Computing Environments Computing Platforms and Technologies.

Principles of Parallel and Distributed Computing: Eras of Computing, Parallel vs. Distributed Computing, Elements of Parallel Computing, Elements of Distributed Computing, Technologies for Distributed Computing

T1: Ch1: 1.1-1.3, Ch 2: 2.1-2.5

UNIT II **09 hours**

Virtualization: Introduction, Characteristics of Virtualized Environments, Virtualization and Cloud Computing, Pros & Cons of Virtualization.

Microservices, Dockers and Containers: An Introduction to Microservices, Modular Architecture, Advantages and Disadvantages of Microservices. Docker Containers: Containers, Docker architecture and Components, The Power of Docker : A Simple Example

T1: Ch 3: 3.1-3.5, T2: Ch 1 & Ch5

UNIT III **07 hours**

Cloud Computing Architecture: Introduction, Cloud Reference Model, Types of Clouds, Economics of the cloud, Open challenges. T1: Ch 4: 4.1-4.5

UNIT IV	**08 hours**
Managing the Cloud: Administrating the Clouds, Cloud Management Products, Emerging Cloud Management Standards. **Understanding Cloud Security:** Securing the Cloud, Securing Data, Establishing Identity and Presence. T3: Chapter 11 & 12	
UNIT V	**07 hours**
Cloud Platforms in Industry: Amazon Web Services, Google AppEngine. **Cloud Applications:** Scientific Applications, Business and Consumer Applications. T1: Ch 9: 9.1-9.2, Ch: 10: 10.1-10.2	

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos

COURSE OUTCOMES: On completion of the course, student should be able to:

CO1: Analyze core concepts and fundamentals of the Cloud Computing.
CO2: Identify mechanisms to support Cloud Infrastructure.
CO3: Analyze the reference models for Cloud Computing.
CO4: To manage the Cloud Environment& Cloud Security.
CO5: Develop applications and host on Cloud Environment.

TEXT BOOK:

1. Rajkumar Buyya, Christian Vecchiola, S Thamarai Selvi ,Mastering Cloud Computing , Tata McGraw Hill Education Private Limited, 2013.
2. Parminder Singh Kocher, Microservices and Containers, Addison Wesley, 2018
3. Barrie Sosinsky: "Cloud Computing Bible", Wiley-India, 2010

REFERENCE BOOKS

1. Dinkar Sitaram, Geetha Manjunath, Moving to the Cloud. Elsevier Publications, 2011.
2. Dr. Kumar Saurabh , Cloud Computing , Wiley India, 2011.

EBOOKS/ONLINE RESOURCES

MOOCs:1. Cloud Computing - https://archive.nptel.ac.in/courses/106/105/106105167/

SCHEME FOR EXAMINATIONS:

PEC shall be evaluated both by CIE and SEE. Both Assignment and Group Activity are evaluated for 5 Marks each. Each CIE test is conducted for 25 Marks .Total CIE theory test marks of 50 is reduced to 40 Marks and Assignment & Group Activity Marks are added to get final CIE Marks . SEE Theory exam is conducted for 100 marks and then reduced to 50 Marks.

MAPPING of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1				3	3					3	3	3		2	
CO2	3	3	3				3	3	3					2	3
CO3		3	3	3	3				3		3	3		3	
CO4			3	3	3		3	3	3	3				2	3
CO5				3	3	3	3	3	3	3				2	3
Strength of correlation: Low-1, Medium- 2, High-3															

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024 -2025

Course Title	**Internet of Things**						
Course Code	**22IST603B**						
Category	Professional Elective Courses-I (PEC)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	**00**	**00**	**00**	**03**	**39**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objectives:

39. To Learn the characteristics, designs,and challenges in the IoT
40. To Understand the key Technologies and protocols in IoT
41. To Analyze various Layers connectivity and motivation of IPV6
42. To Illustrate the role of IoT in various domains of Industry
43. Infer the role of Data Analytics in IOT

UNIT I : **07 hours**

Introduction to IoT: Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models & APIs.Enabling IOT Technologies,IOT and M2M-Introduction, difference between IOT and M2M.

T1:Chapter1-1.1,1.2,1.3,1.4 , Chapter3-3.1,3.2,3.3

UNIT II **08 hours**

Fundamentals IoT: Mechanism and Key Technologies-Identification of IoT Object and Services, Structural Aspects of the IoT, Key IoT Technologies. Evolving IoT Standards-Overview and Approaches,IETF IPV6 Routing Protocol for RPL Roll, Constrained Application Protocol(COAP), Representational State Transfer, ETSI M2M,Third Generation Partnership Project Service,CENELEC,IETF IPV6,6LoWPAN,ZIGB IP.

T2:Chapter4-4.1,4.2,4.3 Chapter5-5.1,5.2,5.3,5.4,5.5,5.6,

UNIT III **08 hours**

Layer ½ Connectivity: Wireless Technologies for the IoT-WPAN Technologies for IoT/M2M, Cellular and Mobile Network Technologies for IoT/M2M,Layer 3 Connectivity :IPv6 Technologies for the IoT: Overview and Motivations. Address Capabilities,IPv6 Protocol Overview, IPv6 Tunneling.

T 2: Chapter6-6.1,6.2, Chapter7-7.1,7.2,7.3,7.4,7.5

UNIT IV **08 hours**

Case Studies Illustrating : IoT Design-Introduction, Home Automation, Cities,Environment, Agriculture, Productivity Applications.

T1:Chapter 9-9.1,9.2,9.3,9.4,9.5,9.6

UNIT V **08 hours**

Data Analytics for IoT:Introduction, Apache Hadoop, Using Hadoop MapReduce for Batch Data Analysis, Apache Oozie, Apache Spark, Apache Storm, Using Apache Storm for Real-time Data Analysis, Structural Health Monitoring .

T1:Chapter 10-10.1,10.2,10.3,10.4,10.5,10.6,10.7,10.8

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos

Course outcomes:

On successful completion of the course, the student will be able to

CO1: Interpret the impact and challenges posed by IoT networks

CO2: Appraise the role of IoT protocols for efficient network communication

CO3: Deployment of different sensor technologies and Layers to connect the network.

CO4: To Deploy the role of IoT design in various domains of Industry

CO5:Elaborate the need for Data Analytics .

TEXT BOOK:

1 ArshdeepBahga, Vijay Madisetti, "Internet of Things : A Hands on Approach" Universities Press., 2015

2. Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6:The Evolving World of M2M Communications", Wiley, 2013

REFERENCE BOOKS/WEBLINKS

1.Michael Miller," The Internet of Things", First Edition, Pearson, 2015.

2.Claire Rowland,Elizabeth Goodman et.al.," Designing Connected Products", First Edition,O'Reilly, 2015

SCHEME FOR EXAMINATIONS:

PEC shall be evaluated both by CIE and SEE. Both Assignment and Group Activity are evaluated for 5 Marks each. Each CIE test is conducted for 25 Marks .Total CIE theory test marks of 50 is reduced to 40 Marks and Assignment & Group Activity Marks are added to get final CIE Marks . SEE Theory exam is conducted for 100 marks and then reduced to 50 Marks.

MAPPING of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1			3	3	3	3							3		
CO2	3	3										3	3	3	
CO3	3	3		3		3			3		3	3	3		3
CO4	3	3	3	3								3		3	
CO5	3	3	3	3		3			3		3	3		3	3
Strength of correlation: Low-1, Medium- 2, High-3															

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024 -2025

Course Title	BLOCKCHAIN TECHNOLOGY						
Course Code	**22IST603C**						
Category	Professional Elective Course (PEC)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	**00**	**00**	**00**	**03**	**39**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objectives:

44. Understand the fundamentals of Blockchain.
45. Understand the concept of decentralization, its impact, and its relationship with block chain technology
46. Gain knowledge of the inner workings of block chain and the mechanisms behind bitcoin and alternative crypto currencies.
47. Understand the theoretical foundations of smart contracts.
48. Identify and examine applications of the block chain technology - beyond currencies

UNIT I	**07 hours**
Block chain 101: Distributed systems, History of block chain and Bitcoin , Types of blockchain, Consensus, CAP theorem and blockchain Text Book 1: Chapter 1	
UNIT II	**08 hours**
Decentralization and Cryptography: Decentralization using block chain, Methods of decentralization, Routes to decentralization, Blockchain and full ecosystem decentralization, Decentralized organizations,platforms for decentralization. Cryptography and Technical Foundations: Cryptographic primitives, Asymmetric cryptography, Public and private keys Text Book 1: Chapter 2,Chapter 3(selective topics),chapter 4 (selective topics)	
UNIT III	**09 hours**
Bitcoin and Alternative Coins A: Bitcoin, Digital keys and Addresses ,Transactions, Blockchain,Mining , Bitcoin network,Wallets ,Bitcoin payments Alternative Coins Theoretical foundations, Bitcoin limitations, Namecoin, Litecoin, Primecoin, Zcash Text Book 1: Chapter 5, Chapter 6, Chapter 8.	
UNIT IV	**07 hours**
Smart Contracts and Ethereum 101: Smart Contracts: Definition, Ricardian contracts. Ethereum 101: Introduction, Ethereum , Etherium network, components of Ethereum ecosystem ,Blocks and block chain Text Book 1: Chapter 10	
UNIT V	**08 hours**

Alternative Blockchains: Blockchains: Kadena, Ripple, Quorum
Blockchain-Outside of Currencies: Internet of Things, Government, Health, Finance, Media
Text Book 1: Chapter 16,Chapter 17

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos

COURSE OUTCOMES: On completion of the course, student should be able to:

CO1: Comprehend the fundamentals of Blockchain Technology.

CO2: Understand methods and levels of Decentralization and its relationship with block chain technology .

CO3: Analyse the working of Bitcoin and alternative coins.

CO4: Analyze the importance of Smart Contracts and Ethereum block chain

CO5: Apply blockchain technology in various fields like Government, Health finance etc

TEXT BOOK:

1. Mastering Blockchain Distributed ledgers, decentralization and smart contracts explained , Imran Bashir, Packt Publishing Ltd, Second Edition, ISBN 978-1-78883-904-4, 2018

REFERENCE BOOKS:

- Block chain Technology (Concepts and applications), Kumar saurabh, Ashutosh saxena, Wiley, 2020.
- Bitcoin and Crypto currency Technologies, Arvind Narayanan, Joseph Bonneau, Edward Felten,2016.
- Blockchain Basics: A Non-Technical Introduction in 25 Steps, Daniel Drescher, Apress, First Edition, 2017.
- Mastering Bitcoin: Unlocking Digital Crypto currencies, Andreas M. Antonopoulos, O'Reilly Media, First Edition, 2014.
- https://www.packtpub.com/in/big-data-and-business-intelligence/mastering-blockchainsecond-edition

EBOOKS/ONLINE RESOURCES

https://onlinecourses.nptel.ac.in/

SCHEME FOR EXAMINATIONS:

PEC shall be evaluated both by CIE and SEE. Both Assignment and Group Activity are evaluated for 5 Marks each. Each CIE test is conducted for 25 Marks .Total CIE theory test marks of 50 is reduced to 40 Marks and Assignment & Group Activity Marks are added to get final CIE Marks . SEE Theory exam is conducted for 100 marks and then reduced to 50 Marks.

MAPPING of COs with POs and PSOs

	PO	PO 2	PO 3	PO 4	PO5	PO 6	PO 7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		2	2											3	
CO2		2	2	2										3	
CO3				2					2					3	
CO4		2	2	2										3	
CO5			3	3										3	
Strength of correlation: Low-1, Medium- 2, High-3															

Open Elective Course

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024 -2025

Course Title	**INRODUCTION TO DATA STRUCTURES**						
Course Code	**22IST604A**						
Category	Open Elective Courses-I(OEC)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	**00**	**00**	**00**	**03**	**39**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objectives:

- To become familiar with the concept of pointers and its usage in dynamic memory allocation.
- To study and understand the representation and implementation of linear data structures.
- To classify and comprehend the consequences of using non linear data structures in implementing a system .
- To identify the suitable data structure during application development
- To gain knowledge of sorting, searching and hashing techniques .

UNIT I : **07 hours**

Introduction: Data Structures, Classifications (Primitive & Non Primitive), Data structure Operations, Review of Arrays, Structures, Self-Referential Structures, and Unions. Pointers and Dynamic Memory Allocation Functions. Representation of Linear Arrays in Memory, Dynamically allocated arrays.

Array Operations: Traversing, inserting, deleting, searching, and sorting. Multidimensional Arrays, Polynomials and Sparse Matrices.

Strings: Basic Terminology, Storing, Operations and Pattern Matching algorithms.

T 1: 1.2, 2.2 - 2.7 T 2: 1.1 - 1.4, 3.1 - 3.3, 3.5, 3.7 , 4.1 - 4.9, 4.14 R3: 1.4

UNIT II **08 hours**

Stacks: Definition, Stack Operations, Array Representation of Stacks, Stacks using Dynamic Arrays, Stack Applications: Polish notation, Infix to postfix conversion, evaluation of postfix expression.

Recursion - Factorial, GCD, Fibonacci Sequence, Tower of Hanoi, Ackerman's function.

Queues: Definition, Array Representation, Queue Operations, Circular Queues,Circular queues using Dynamic arrays, Dequeues, Priority Queues

T 1: 3.1 -3.7 T 2: 6.1 -6.3, 6.5, 6.7-6.10, 6.12, 6.13

UNIT III **09 hours**

Linked Lists: Definition, Representation of linked lists in Memory, Memory allocation;Garbage Collection. Linked list operations: Traversing, Searching, Insertion, and Deletion. Doubly Linked lists, Circular linked lists, and header linked lists. Linked Stacks and Queues.

Applications of Linked lists – Polynomials, Sparse matrix representation.

T 1: 4.1 – 4.6, 4.8 T 2: 5: 5.1 – 5.10

UNIT IV **07 hours**

Trees: Terminology, Binary Trees, Properties of Binary trees, Array and linked Representation of Binary Trees, Binary Tree Traversals - Inorder, postorder, preorder; Additional Binary tree operations,Threaded binary trees, Binary Search Trees – Definition,Insertion, Deletion, Traversal, Searching, Application of Trees-Evaluation of Expression

T 1: 5.1 –5.5, 5.7 T 2: 7.1 – 7.9

UNIT V **08 hours**

Graphs: Definitions, Terminologies, Matrix and Adjacency List Representation Of Graphs, Elementary Graph operations, Traversal methods: Breadth First Search and Depth First Search.

Sorting and Searching: Insertion Sort, Radix sort, Address Calculation Sort.

Hashing: Hash Table organizations, Hashing Functions, Static and Dynamic Hashing.

Files and Their Organization: Data Hierarchy, File Attributes, Text Files and Binary Files, Basic File Operations, File Organizations and Indexing.

T 1: 7, 8.1, 9.1, 9.2, 9.3

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos

COURSE OUTCOMES: On completion of the course, student should be able to:

CO1: Implement pointers in memory allocation , data structure functions.
CO2: Classify common data structures and implement them.
CO3: Apply appropriate algorithm for problem solving after identifying the appropriate linear data structure.
CO4: Design efficient programs by choosing the most apt non linear data structure.

TEXT BOOK:

1. Ellis Horowitz and Sartaj Sahni, Fundamentals of Data Structures in C, 2nd Ed, Universities Press,2014.

2. Seymour Lipschutz, Data Structures Schaum's Outlines, Revised 1st Ed, McGraw Hill, 2014.

REFERENCE BOOKS

- Gilberg & Forouzan, Data Structures: A Pseudo-code approach with C, 2nd Ed, Cengage Learning,2014
- Reema Thareja, Data Structures using C, 3rd Ed, Oxford press, 2012.
- Jean-Paul Tremblay & Paul G. Sorenson, An Introduction to Data Structures with Applications, 2nd Ed, McGraw Hill, 2013
- A M Tenenbaum, Data Structures using C, PHI, 1989
- Robert Kruse, Data Structures and Program Design in C, 2nd Ed, PHI, 1996.

EBOOKS/ONLINE RESOURCES

1. http://www.nptel.ac.in

2. https://en.wikipedia.org

SCHEME FOR EXAMINATIONS:

The OEC shall be evaluated both by CIE and SEE.

MAPPING of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1			3	3					3	3			3		
CO2		3	3	3					3			3	3		
CO3		3	3	3					3			3	3		
CO4		3	3	3					3			3	3		
Strength of correlation: Low-1, Medium- 2, High-3															

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024 -2025

Course Title	**FUNDAMENTALS OF OPERATING SYSTEM**						
Course Code	**22IST604B**						
Category	Open Elective Courses-I(OEC)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	**00**	**00**	**00**	**03**	**39**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objectives:

1. To explain main components of OS and their working
2. To familiarize the concepts of process scheduling and multithreading in operating system
3. To impart various scheduling policies of OS
4. To teach the concepts of virtual memory management
5. To understand the mass storage system in operating system.

UNIT I : **07 hours**

Introduction: What operating systems do, Computer-System Architecture, Operating System Structure, Operating System Operations, Process Management, Memory Management, Storage Management, Protection and Security.
T1:1.1 to 1.9.

System Structures: Operating System Services, User Operating System Interface, System Calls, Types of System Calls, System Programs, Operating System Structure;
T1: 2.1 to 2.7.

UNIT II **08 hours**

Processes: Process Concept, Process Scheduling, Operations on Processes, Inter process Communication; Multithreaded Programming: Multithreading Models;
T1: 3.1 to 3.4, 4.1 to 4.3.

Process Synchronization: The Critical Section Problem, Peterson‟s Solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors, Synchronization Examples;
T1:5.1 to 5.9.

UNIT III **09 hours**

CPU Scheduling : Scheduling Criteria , Scheduling Algorithms , Thread Scheduling, Multiple-Processor Scheduling , Real-Time CPU Scheduling ,Operating-System Examples.
T1: 6.1 to 6.7.

Dead locks: System Model, Deadlock Characterization, Methods for handling Deadlocks, Deadlock Prevention, Deadlock Avoidance and detection, Recovery from Deadlock
T1:7.1 to 7.7.

UNIT IV **07 hours**

Memory Management Strategies:

Main Memory: Background, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of Page Table.
T1: 8.1 to 8.6.
Virtual Memory Management: Background, Demand Paging, Copy on Write, Page Replacement, Allocation of frames, Allocating Kernel Memory.
T1: 9.1 to 9.8

UNIT V **08 hours**

File System: File Concept, Access Methods, Directory Structure, File System Mounting, File Sharing, Protection;
T1: 11.1 to 11.6.
Mass storage structures, protection: Mass storage structures; Disk structure; Disk attachment, Disk scheduling; Disk management; Swap space management.
T1: 10.1 to 10.6

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos

COURSE OUTCOMES: On completion of the course, student should be able to:

1. Outline various concepts and features of Operating systems.
2. able to understand the concept of process scheduling.
3. Implement algorithm of CPU Scheduling, Memory Scheduling and disk scheduling
4. Make changes in the OS configurations as per need
5. able to understand the file system and mass storage system.

TEXT BOOK:

Abraham Silberschatz Peter Baer Galvin, Greg Gagne **- Operating System concepts,** , 9th edition, Wiley-India, 2012.

REFERENCE BOOKS:

- D.M Dhamdhere – **Operating Systems: A Concept Based Approach**, 2nd Edition, Tata McGraw- Hill, 2002.
- P.C.P. Bhatt **- Operating Systems**, 2nd Edition, PHI, 2006.
- Harvey M Deital **- Operating Systems** –, 3rd Edition Wesley, 1990.

SCHEME FOR EXAMINATIONS:

The theory part of the OEC shall be evaluated both by CIE and SEE.

MAPPING of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3					3		3			3	3	3		3
CO2	3	3	3									3		3	3
CO3	3	3	3		3	3							2	2	2
CO4	3	3	3							3			2	2	2
CO5	3	2			2	3									2
Strength of correlation: Low-1, Medium- 2, High-3															

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024 -2025

Course Title	**SOFTWARE ENGINEERING**						
Course Code	**22IST604C**						
Category	Open Elective Courses(OEC)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	**00**	**00**	**00**	**03**	**39**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objectives:

1.Knowledge of basic SW engineering methods and practices, and their appropriate application.
2. Understanding of software requirements and the SRS documents.
3. Describe System model and Object oriented concepts.
4. Understanding of software evolution and related issues of Design Patterns.
5. Understanding of approaches to verification and validation including static analysis, project management,

UNIT I : 07 hours

Overview: FAQ about software engineering, Professional and ethical responsibility ,Case studies. Socio-Technical systems: Systems engineering, system procurement ,system development and operation. Software Processes: Process activities; The Rational Unified Process; Agile methods, Plan-driven and agile development, XP, Scrum

T1:Ch1,Ch2,Ch3,Ch10

UNIT II 08 hours

Requirements: Software Requirements: Functional and Non-functional requirements; User requirements; System requirements; The software requirements document. Requirements Engineering Processes: Feasibility studies; Requirements elicitation and analysis; Requirements validation; Requirements management.

Introduction, Modelling Concepts and Class Modelling: What is Object orientation? What is OO development? OO Themes; Evidence for usefulness of OO development; OO modelling history. Modelling as Design technique: Modelling; abstraction; The Three models. Class Modelling: Object and Class Concept; Link and associations concepts; Generalization and Inheritance; A sample class model; Navigation of class models;

T1:Ch4, T2:1,2,3

UNIT III 09 hours

System modelling: System Models: Context models; Behavioural models; Object models; Structured methods. Architectural Design: Architectural design ,Architectural views, patterns and architecture.

Design patterns ,Implementation issues, Design evolution. Development: Rapid Software Development: Rapid application development. Open source development

T1: Ch 5 ,Ch 6,Ch 7

UNIT IV 07 hours

Software Testing: Development testing ,Test-driven development ,Release testing, User testing. Test Auto

Evolution processes. Program evolution dynamics. Software maintenance,

Legacy system management

T1: Ch 8 , Ch 9

UNIT V **08 hours**

Project Management; Risk management.Project planning: software pricing; Project scheduling; Agile Planning; Estimation techniques.

Quality management: Software quality Reviews and inspections . Software measurement and metrics . Software standards.

T1: Ch 22, Ch 23,Ch 24

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, vid

COURSE OUTCOMES: On completion of the course, student should be able to:

CO1: Assess professional and ethical responsibility of a software engineer.

CO2: Design and develop software system, component, or process to meet desired needs within realistic constraints

CO3: Identify and develop system models to design the software system.

CO4:Recognize and apply the testing techniques, modern engineering tools necessary for engineering practice

CO5:Demonstrate the knowledge of project management to ensure good quality software

TEXT BOOK:

1.Ian Sommerville: Software Engineering, 9th Edition, Pearson Education, 2012. (Listed topics only from Chapters 1,2,3,4, 5,6, 7, 8, 9,10,11, 22, 23 and 24)

2. Michael Blaha, James Rumbaugh: Object Oriented Modelling and Design with UML,2nd Edition, Pearson Education,2005

REFERENCE BOOKS

1.Roger S. Pressman: Software Engineering-A Practitioners approach, 7th Edition, Tata McGraw Hill

2. Pankaj Jalote: An Integrated Approach to Software Engineering, Wiley India.

EBOOKS/ONLINE RESOURCES

1.http://agilemanifesto.org/

2. http://www.jamesshore.com/Agile-Book

SCHEME FOR EXAMINATIONS:

The OEC shall be evaluated both by CIE and SEE.

MAPPING of COs with POs and PSOs

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO 1	3					3		3				3	3		3
CO 2	3	3	3									3			3
CO 3	3	3	3		3								2		
CO 4	3	3	3							3			2		
O5	3					3				3	3	3	3		3
Strength of correlation: Low-1, Medium- 2, High-3															

Scheme and Syllabus - CBCS-2024 -2025

Course Title	**INTRODUCTION TO ARTIFICIAL INTELLIGENCE**						
Course Code	**22IST604D**						
Category	Open Elective Courses-I(OEC)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	**00**	**00**	**00**	**03**	**39**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objectives:

1. Understand about agent, behavior and structure
2. Learn different AI models and search strategies
3. Representation of knowledge and reasoning
4. Gain knowledge about learning strategies

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UNIT I : 08 hours

What is AI? Intelligent Agents: Agents and environment; Rationality; the nature of environment; the structure of agents. Problem-solving agents, Example problems

Text book 1: Chapter 1- 1.1, 1.2, 1.3 Chapter 2- 2.1, 2.2, 2.3, 2.4

UNIT II 08 hours

Searching for Solutions Uninformed Search Strategies: Breadth First search, Depth First Search, Iterative deepening depth first search;

Knowledge representation issues: Representations and mappings approaches to knowledge representation, Issues in knowledge representation.

Text book 1: Chapter 3- 3.1, 3.2, 3.3, 3.4

UNIT III 08 hours

Informed Search Strategies: Heuristic functions, Greedy best first search, A*search. Heuristic Functions

Logical Agents: Knowledge based agents, The Wumpus world, Logic Propositional logic Reasoning patterns in Propositional logic.

Text book 1: Chapter 3-3.5,3.6

UNIT IV 08 hours

First Order Logic: Representation Revisited, Syntax and Semantics of First Order logic, Using First Order logic. **Inference in First Order Logic** :Propositional Versus First Order Inference, Unification, Forward Chaining, Backward Chaining,

Text book 1: Chapter 8- 8.1, 8.2, 8.3 Chapter 9- 9.1, 9.2, 9.3, 9.4, 9.5

UNIT V 07 hours

Statistical learning, Maximum likelihood parameter learning, Bayesian parameter learning.

Expert Systems: Representing and using domain knowledge, ES shells. Explanation, knowledge acquisition

Text Book 2: Chapter 20

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, vid

COURSE OUTCOMES: On completion of the course, student should be able to:

CO1: Apply knowledge of agent architecture, searching and reasoning techniques for different applications.
CO 2. Compare various Searching and Inferencing Techniques.
CO 3. Describe the concepts of knowledge based agents
CO 4. Develop knowledge base sentences using propositional logic and first order logic
CO5: Use the concepts of Expert Systems to build applications

TEXT BOOK:

- Stuart J. Russell and Peter Norvig , Artificial Intelligence, 3rd Edition, Pearson,2015
- Elaine Rich, Kevin Knight, Artificial Intelligence, 3rd edition,Tata McGraw Hill,2013

REFERENCE BOOKS

49. George F Lugar, Artificial Intelligence Structure and strategies for complex, Pearson Education, 5th Edition, 2011
50. Nils J. Nilsson, Principles of Artificial Intelligence, Elsevier, 1980

3.Saroj Kaushik, Artificial Intelligence, Cengage learning, 2014

EBOOKS/ONLINE RESOURCES

51. https://www.kdnuggets.com/2019/11/10-free-must-read-books-ai.html
52. https://www.udacity.com/course/knowledge-based-ai-cognitive-systems--ud409

3.https://nptel.ac.in/courses/106/105/106105077/

SCHEME FOR EXAMINATIONS:

The OEC shall be evaluated both by CIE and SEE.

MAPPING of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3										3	3		
CO2	3	3										3		3	
CO3	3	3		3		3						3		3	
CO4	3	3	3	3								3		3	
CO5	3	3	3	3		3						3		3	
Strength of correlation: Low-1, Medium- 2, High-3															

Ability Enhancement Course/Skill Development Course:

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024 -2025

Course Title	**ROBOTICS AND AUTOMATION**						
Course Code	**22IST607A**						
Category	**Ability Enhancement Course -V(AEC)**						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	01	00	00	00	01	15	01
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 02 Hours**		

COURSE OBJECTIVE:

1. To understand basic concepts of RPA
2. To Describe RPA, where it can be applied and how it implemented
3. To Describe the different types of variables, Control Flow and data manipulation techniques
4. To Understand Image,Text Ind Data Tables Automation
5. To Describe various types of Exceptions and strategies to handle

UNIT I **3 hours**

RPA Foundations- What is RPA - Flavors of RPA- History of RPA- The Benefits of RPA- The downsides of RPA- RPA Compared to BPO, BPM and EPA - Consumer Willingness for Automation- The Workforce of the Future- RPA Skills-On-Premise Vs. the Cloud- Web Technology- Programming Languages and Low Code- OCR-Databases-AP!s- Al-Cognitive Automation-Agile, Scrum, Kanban and WaterfallO DevOps- Flowcharts.

Textbook 1: Ch 1, Ch 2

UNIT II **3 hour s**

RPA Platforms- Components of RPA- RPA Platforms-About Ui Path- About UiPath - The future of automation - Record and Play - Downloading and installing UiPath Studio -Learning Ui Path Studio- -

Task recorder - Step-by• step examples using the recorder. Textbook 2: Ch 1, Ch 2	
UNIT III	**3 hours**
Sequence, Flowchart, and Control Flow-Sequencing the workflow-Activities-Control flow, various types of loops, and decision making-Step-by- step example using Sequence and Flowchart-Step-by-step example using Sequence and Control flow-Data Manipulation-Variables and Scope• Collections-Arguments - Purpose and use-Data table usage with examples• Clipboard management-File operation with step-by-step example-CSV/Excel to data table and vice versa (with a step-by-stepexample). Textbook 2: Ch 3, Ch 4	
UNIT IV	**3 hours**
Taking Control of the Controls- Finding and attaching windows- Finding thecontrol- Techniques for waiting for a control- Act on controls - mouse and keyboard activities- Working with UiExplorer- Handling events- Revisit recorder- Screen Scraping- When to use OCR- Types of OCR available- How to use OCR- Avoiding typical failure points. Text book 2: Ch 5	
UNIT V	**3 hours**
Exception Handling, Debugging, and Logging- Exception handling- Common exceptions and ways to handle them- Logging and taking screenshots• Debugging techniques- Collecting crash dumps- Error reporting- Future of RPA Textbook2:Ch8 Textbook1:Ch13	

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos

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

CO1:Understand the basic concepts of RPA

CO2:Describevarious components and platforms of RPA

CO3:Describe the differenvtypes of variables, control flow and data manipulation techniques

CO4:Understand various control techniques and OCR in RPA

CO5:Describevarioustypes andstrategies tohandle exceptions

Text Books:

1. Tom Taulli, The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems,2020, ISBN-13 (electronic): 978-1-4842-5729-6, Publisher: A press

2. Alok Mani Tripathi, Learning Robotic Process Automation, Publisher: Packt Publishing Release Date: March 2018 ISBN: 9781788470940

Reference Books:

I. Frank Casale, Rebecca Dilla, Heidi Jaynes ,Lauren Livingston,"Introduction to Robotic Process Automation: a Primer", Institute of Robotic Process Automation.

2. Richard Murdoch, Robotic Process J\utomation: Guide To Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant

3. Srikanth Merianda, Robotic Process Automation Tools, Process Automation and their benefits: Understanding RPA and Intelligent Automation

4. https:I/www.uipath.com/rpa/robotic-process-automation

EBOOKS/ONLINE RESOURCES

Weblinks and Video Lectures (e-Resources):

https://www.youtube.com/watch?v=yxZm9WQJUA0&list=PLRLB5WCqU54UJG45UnazSYmnmhl-gt76o

https://www.youtube.com/watch?v=6f3bvIhSWyM&list=PLRLB5WCqU54X5Vy4DwjfSODT3ZJgwEjyE

SCHEME FOR EXAMINATIONS:

Ability Enhancement Course shall be evaluated both by CIE and SEE

MAPPING of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	3	-	2	-	-	-	-	-	-	1	2	-	1
CO2	1	3	-	-	2	-	-	-	-	-	-	1	2	-	1
CO3	1	3	1	-	2	-	-	-	-	-	-	1	2	-	1
CO4	1	-	3	-	2	-	-	-	-	-	-	1	2	-	1
CO5	1	-	2	-	1	-	-	-	-	-	-	1	2	-	1

Dr. Ambedkar Institute of Technology, Bengaluru-56

Department of Information Science and Engineering

Scheme and Syllabus - CBCS-2024 -2025

Course	**TOSCA AUTOMATED SOFTWARE TESTING**

Title							
Course Code	**22IST607B**						
Category	**Ability Enhancement Course (AEC)**						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	01	00	00	00	01	15	01
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 02 Hours**		

COURSE OBJECTIVE:

1. Learn the fundamentals of automation testing.
2. Get an overview of Tosca architecture and its key features.
3. Design automated test cases
4. Perform test executions on different browsers.
5. Get an overview of test case designs and modules used in Tosca automation tool.

UNIT I	**3 hours**
Introduction: Automation Testing, TOSCA Introduction, Advantages of TOSCA,TOSCA Installation. **TOSCA Overview:** TOSCA Architecture, TOSCA Wizard, TOSCA Enabler, TOSCA Executor, TOSCA License Configurator, TOSCA Commander, Workspace Creation, Single User, Multi User, Standard Modules.	
UNIT II	**3 hours**
Modules: TOSCA Xscan, Identification of Elements, Properties, Dynamic Objects Handling Synchronization of Modules, Generic Elements. **Test Cases:** Action Modes, Test Cases Creation Test Cases using Standard Modules, Scratch Book, Buffers, Properties, Library Creation, Re-Usable Blocks, Business Parameters, Test Configuration Parameters, Loops, Conditions, Recovery Scenario & Cleanup Scenario, Synchronization, Business Test Cases.	

UNIT III	**3 hours**
TABLES: Dynamic Date and Time Expressions, Data Driven Testing Using Excel, Test Case Design, Test Sheets, Work with Instances, Attributes Creation, Creation of Test Case Template Instances, Implement Conditions through Test Case Design. **Execution Lists:** Execution List Creation, Logs Verification, Report Generation, CI/CD Configurations.	
UNIT IV	**3 hours**
DATABASE ENGINE:ODBC Data Source Configuration, Open & Close Database Connections, Database Expert Module, Database Versus GUI.**API ENGINE:**API Scan,API Modules, API Test Cases.	
UNIT V	**3 hours**
More on Modules: Adding Technical parameters, Steering parameters, Dynamic handling of Objects. **Risk Based Approach:** Create Requirements, Frequency and Damage Class, Calculate Risk, Test cases mapping to Requirements, Execution List mapping to Requirements. **Recovery Scenarios and Reporting:** Recovery Scenario, Clean up Scenario, Generate Report.	

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos

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

CO1: Apply advanced test automation methodologies to streamline software testing processes.

CO2: Utilize API testing techniques to validate software functionalities effectively, ensuring seamless integration and functionality.

CO3: Develop comprehensive test suites tailored to specific software applications, ensuring thorough testing coverage and reliability.

CO4: Leverage practical skills to navigate Tosca's interface and features confidently, contributing to improved testing outcomes.

CO5: Enhance defect identification and resolution processes using Tosca's defect tracking and management capabilities, improving software quality.

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TEXT BOOKS:

1. **TOSCA** - Hardmod Carlyle Nicolao Crypt Publishing, 2016

REFERENCE BOOKS:

1. **Tresentis Tosca** :Model-based functional testing through the lifecycle Wilson Mar 2017

2. **Testing in an Agile World** by Courtney Saba, PHI 2016

EBOOKS/ONLINE RESOURCES

Weblinks and Video Lectures (e-Resources):

53. https://www.youtube.com/watch?v=Cdmul1knpsI&list=PLkLerKPSoQ_O81yaTjYoVG3MG98-wj1Sh
54. https://www.youtube.com/watch?v=4At7coUGDJU&list=PLox9xfUeaKQ7CwyJHCWZXbdeVOalQzl53
55. https://www.youtube.com/watch?v=QDV_Tl0_JyU&t=1337s&pp=ygUjdG9zY2EgYXV0b21hdGlvbiB0b29sIHR1dG9yaWFsIGZ1bGw%3D

SCHEME FOR EXAMINATIONS:

Ability Enhancement Course shall be evaluated both by CIE and SEE.

MAPPING of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	3	-	2	-	-	-	-	-	-	1	2	-	1
CO2	1	3	-	-	2	-	-	-	-	-	-	1	2	-	1
CO3	1	3	1	-	2	-	-	-	-	-	-	1	2	-	1
CO4	1	-	3	-	2	-	-	-	-	-	-	1	2	-	1
CO5	1	-	2	-	1	-	-	-	-	-	-	1	2	-	1
Strength of correlation: Low-1, Medium- 2, High-3															

Dr Ambedkar Institute of Technology, Bengaluru-56

Department of Information Science and Engineering

Scheme and Syllabus - CBCS-2024 -2025

Course Title	**SOFTWARE TESTING AUTOMATION USING SELENIUM**						
Course Code	**22IST607C**						
Category	**Ability Enhancement Course**						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	01	00	00	00	01	15	01
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 02 Hours**		

Course Objectives:

56. Equip students with software testing principles, types, and techniques, highlighting its importance in the development lifecycle.
57. Develop skills to use Selenium WebDriver for browser automation, focusing on WebDriver commands and locator strategies.
58. Enable handling of dynamic elements, synchronization using waits, and management of file operations in web automation.
59. Train integration of Selenium with TestNG for execution and reporting, and use Selenium Grid for parallel testing.
60. Best practices for robust test scripts using Page Object Model (POM) and continuous integration tools like Jenkins.

UNIT I	**3 hours**
Introduction to Software Testing and Selenium: Types of testing, testing levels, testing techniques, What is Selenium, History and evolution of Selenium, Advantages of Selenium, Selenium IDE, Selenium WebDriver, Selenium Grid, Installing Java, Eclipse IDE, and Selenium WebDriver, Creating and running a simple test script.	
UNIT II	**3 hours**
Selenium WebDriver and Locators: Selenium WebDriver: Architecture, WebDriver vs. Selenium RC, Browser commands, Navigation commands, WebElement commands, ID, Name, Class Name, Tag Name, Link Text, Partial Link Text, CSS Selector, XPath, Interacting with text boxes, buttons, checkboxes, radio buttons, dropdowns, alerts, frames, windows.	
UNIT III	**3 hours**
Advanced Selenium Features: Waits in Selenium: Implicit Wait, Explicit Wait, Fluent Wait, Handling Dynamic Elements: Using advanced XPath and CSS selectors, Browser Navigation Commands: Forward, Backward, Refresh, Handling File Uploads and Downloads, Working with Tables: Extracting data from web tables.	
UNIT IV	**3 hours**
Introduction to TestNG: Advantages of TestNG, installing TestNG in Eclipse. **Annotations in TestNG**: @Test, @BeforeMethod, @AfterMethod, @BeforeClass, @AfterClass, @BeforeTest, @AfterTest. **TestNG Features**: Grouping tests, Parameterization, DataProvider, Parallel execution. **Selenium Grid**: Concept and use, Setting up a Hub and Nodes, Configuring Selenium Grid	
UNIT V	**3 hours**
Introduction to Page Object Model: Concept and advantages. **Implementing POM**: Creating Page Classes, Writing Test Cases using POM. **Automation Best Practices**: Code organization, Use of external files for data (Excel, JSON), Logging, Reporting, Handling exceptions. **Continuous Integration (CI) with Selenium**: Integrating Selenium tests with Jenkins	

TEACHING LEARNING PROCESS: Chalk and Talk, Power Point Presentation, Animations, videos

Text Books

61. Selenium Testing Tools Cookbook" by Unmesh Gundecha, Gundecha, Unmesh. *Selenium Testing Tools Cookbook*. Packt Publishing Ltd, 2015.
62. "Selenium WebDriver Recipes in Java" by Zhimin Zhan, Springer, Apress, 2015.

References and Resources:

- **Online Resources**: Selenium official documentation, TestNG official documentation, Jenkins CI documentation.
- **Tools and Software**: Java, Eclipse IDE, Selenium WebDriver, TestNG, Jenkins.

Course outcomes:

- Students will understand fundamental software testing principles and recognize the critical role of testing in the software development lifecycle.
- Students will gain expertise in using Selenium WebDriver for automating browser interactions.
- Students will learn to manage dynamic web elements, synchronize tests using waits, and handle file uploads and downloads.
- Students will be skilled in integrating Selenium with the TestNG framework
- Students will be capable of writing maintainable and robust test scripts, implementing the Page Object Model (POM), and integrating with continuous integration (CI) tools

SCHEME FOR EXAMINATIONS:

Ability Enhancement Course shall be evaluated both by CIE and SEE

MAPPING of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	3	-	2	-	-	-	-	-	-	1	2	-	1
CO2	1	3	-	-	2	-	-	-	-	-	-	1	2	-	1
CO3	1	3	1	-	2	-	-	-	-	-	-	1	2	-	1
CO4	1	-	3	-	2	-	-	-	-	-	-	1	2	-	1
CO5	1	-	2	-	1	-	-	-	-	-	-	1	2	-	1
Strength of correlation: Low-1, Medium- 2, High-3															

Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024 -2025

Course Title	**DevOps**						
Course Code	**22IST607D**						
Category	Ability Enhancement Course						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	01	**00**	**00**	**00**	**01**	**15**	**01**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 02 Hours**		

Course Objectives:

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

- Apply fundamental principles to DevOps environment and applications to be developed and deployed.
- Examine continuous feedback practices across DevOps pipeline.
- Choose collaboration and affinity to improve organizational structure and pipeline.
- Determine the test APIs with Postman, static code analysis with SonarQube and perform security and performance tests.
- Apply security in the DevOps process with DevSecOps and related best practices.

UNIT I: **03 hours**

The Big Picture, A Snapshot of Devops Culture, The Evolution of Culture, The Value of the Story, Katherine's Story, Jennifer's Story, Illustrating Devops with Stories, What Is Devops? A Prescription for Culture, The Devops Equation, A History of Devops, Developer as Operator, The Advent of Software Engineering, The Advent of Proprietary Software and Standardization, The Age of the Network, The Beginnings of a Global Community, The Age of Applications and the Web, The Growth of Software

Development Methodologies, Open Source Software, Proprietary Services, Agile Infrastructure, The Beginning of devops days, The Current State of Devops. **Text book-2**

UNIT II **03 hours**

Foundational Terminology and Concepts, Software Development Methodologies, Operations Methodologies, Systems Methodologies, Development, Release, and Deployment Concepts, Infrastructure Concepts, Cultural Concepts, Devops Misconceptions and Anti-Patterns, Common Devops Misconceptions, Devops Anti-Patterns, The Four Pillars of Effective Devops, Collaboration, Affinity, Tools, Scaling,Artifacts.

Text Book-2

UNIT III **03 hours**

DevOps CI/CD Pipeline: Managing Your Source Code with Git: Overviewing Git and its command lines, Understanding the Git process and GitFlow pattern.Continuous Integration and Continuous Delivery:The CI/CD principles, using a package manager, Using Jenkins, Using Azure Pipelines, Using GitLab CI.

UNIT IV **03 hours**

Containerized Applications with Docker and Kubernetes: Containerizing Your Application with Docker: Installing Docker, Creating a Dockerfile, Building and running a container on a local machine, Pushing an image to Docker Hub, Deploying a container to ACI with a CI/CD pipeline. Managing Containers Effectively with Kubernetes: Installing Kubernetes, First example of Kubernetes application deployment, Using HELM as a package manager, Using AKS, Creating a CI/CD pipeline for Kubernetes with Azure Pipelines.

UNIT V **03 hours**

Testing Your Application : Testing APIs with Postman: Creating a Postman collection with requests, Using environments and variables to dynamize requests, Writing Postman tests, Executing Postman request tests locally, Understanding the Newman concept, Preparing Postman collections for Newman, Running the Introduction to DevOps 11 Newman command line, Integration of Newman in the CI/CD pipeline process. Static Code Analysis with SonarQube: Exploring SonarQube, Installing SonarQube, Real-time analysis with SonarLint, Executing SonarQube in continuous integration. Security and Performance Tests: Applying web

security and penetration testing with ZAP, Running performance tests with Postman

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos

COURSE OUTCOMES:

On completion of the course, student should be able to:

CO1: Establish a strong foundation for effective devops and clarify common misconceptions about devops.

CO2: Examine the collaboration process of building specific outcomes through the interactions, input, and support of multiple people.

CO3: Demonstrate how to create and run a container from a Docker file and deploy a complex application on Kubernetes.

CO4: Illustrate the different ways to test APIs with Postman, static code analysis with SonarQube and perform security and performance tests.

CO5: Apply security in the DevOps process with DevSecOps and related best practices.

TEXT BOOK:

- Learning DevOps: Mikael Krief, October 2019, Packt Publishing Ltd, ISBN: 978-1-83864-273-0.
- Jennifer Davis and Katherine Daniels, “Effective DevOps”, 1 st Edition, Shroff / O’Reilly Publications, 2021. (ISBN-13: 978-9352133765)

REFERENCE BOOKS

- Gene Kim, Jez Humble, Patrick Debois, John Willis, Nicole Forsgren, “The Devops Handbook”, 2 nd Edition, It Revolution Press, 2021. (ISBN-13: 978-1950508402)
- 1. Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation, Jez Humble and David Farley, 2010, AddisonWesley Professional, ISBN: 9780321670250.
- The DevOPS Handbook: How to Create World, Gene Kim & Jez Humble, 2016, It Revolution Press, ISBN: 9781942788003
- The Phoenix Project: A Novel about It, Devops, and Helping Your Business Win, George Spafford & Gene Kim, 2018, It Revolution Press, ISBN: 9781942788294
- Effective DevOps: Building a Culture of Collaboration, Affinity, and Tooling at Scale, Jennifer Davi & Ryn Daniels, 2016, O'Reilly Media, ISBN

EBOOKS/ONLINE RESOURCES

- Building the culture and collaboration layer for DevOps https://www.youtube.com/watch?v=j0SMcK
- Introduction to Affinity for Venture Capital https://www.youtube.com/watch?v=n8SDv-w17G
- Starting and Scaling DevOps https://www.youtube.com/watch?v=2iPfnIVNUCU

SCHEME FOR EXAMINATIONS:

The AEC shall be evaluated both by CIE and SEE.

MAPPING of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	1	3	-	-	-	3	-	-	-	-	-	3
CO2	3	3	3	2	3	-	-	-	3	-	-	-	-	-	3
CO3	3	3	3	2	3	-	-	-	3	-	-	-	-	-	3
CO4	3	3	3	3	3	-	-	-	3	-	-	-	-	-	3
CO5	3	3	3	3	3	-	-	-	3	-	-	-	-	-	3

Strength of correlation: Low-1, Medium- 2, High-3			

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024 -2025

Course Title	**GENERATIVE ARTIFICIAL INTELLIGENCE**						
Course Code	**22IST607E**						
Category	**Ability Enhancement Course / Skill Enhancement Course**						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	01	00	00	00	01	15	01
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 02 Hours**		

COURSE OBJECTIVE:

63. Grasp the foundational concepts of AI, machine learning, and generative models, including historical context and applications.
64. Learn the architecture, training techniques, and practical applications of GANs, addressing common training challenges
65. Comprehend the theoretical foundations and practical implementation of VAEs for tasks such as image generation and anomaly detection.
66. Gain expertise in autoregressive and flow-based models for applications in text and image generation, including density estimation and sampling.
67. Investigate hybrid models, semi-supervised learning, and ethical considerations, culminating in a capstone project integrating learned techniques.

UNIT I **3 hours**

Introduction to Generative AI, Overview of AI and Machine Learning, Basic concepts of AI and ML, Differences between discriminative and generative models, Generative Models, Definition and applications,

Types of generative models (e.g., GANs, VAEs, autoregressive models), Historical Context, Evolution of generative models, Key milestones and breakthroughs, Applications of Generative AI, Image and video generation, Text generation and natural language processing, Music and art creation
UNIT II **3 hours** Generative Adversarial Networks (GANs), Fundamentals of GANs:, Architecture: Generator and Discriminator, Training process and loss functions, Types of GANs, Vanilla GANs, Conditional GANs, CycleGANs and StyleGANs, Challenges and Solutions, Mode collapse, Stability issues in training, Applications of GANs, Image synthesis, Data augmentation, Super-resolution
UNIT III **3 hours** Variational Autoencoders (VAEs), Fundamentals of VAEs, Encoder and Decoder architecture, Latent space representation, Mathematical Foundation, KL divergence, Reconstruction loss, Training VAEs, Objective function, Optimization techniques, Applications of VAEs:, Image generation, Data compression, Anomaly detection
UNIT IV **3 hours** Autoregressive and Flow-based Models, Autoregressive Models, PixelRNN and PixelCNN, Text generation with RNNs and Transformers, Flow-based Models, Normalizing flows, RealNVP and Glow, Training and Inference: Maximum likelihood estimation, Sampling techniques, Applications:, Image generation, Sequence generation
UNIT V **3 hours** Advanced Topics and Real-World Applications, Hybrid Models, Combining GANs and VAEs, Semi-supervised learning, Ethics and Bias in Generative AI: Addressing biases in data, Ethical considerations and guidelines, Recent Trends and Future Directions, Latest research papers, Future potential of generative AI

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos

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

68. CO1: Articulate the basic principles and historical evolution of AI, machine learning, and generative models.
69. CO2: Implement and train GANs for real-world applications such as image synthesis and data augmentation, addressing training challenges.
70. CO3: Implement and evaluate VAEs for image generation, data compression, and anomaly detection, understanding their theoretical underpinnings.
71. CO4: Apply autoregressive and flow-based models for text and image generation, achieving accurate density estimation and sampling.
72. CO5: Complete a capstone project, demonstrating the ability to integrate and apply various generative AI techniques while addressing ethical considerations.

TEXT BOOKS:

73. "Deep Learning" by Ian Goodfellow, Yoshua Bengio, and Aaron Courville, 2016
https://www.deeplearningbook.org/
74. "Generative Deep Learning: Teaching Machines to Paint, Write, Compose, and Play" by David Foster, 2019

REFERENCE BOOKS:

75. "Hands-On Generative Adversarial Networks with Keras" by Rafael Valle, 2019
76. "Probabilistic Deep Learning: With Python, Keras and TensorFlow Probability" by Oliver Dürr and Beate Sick, 2020

EBOOKS/ONLINE RESOURCES

Weblinks and Video Lectures (e-Resources):

Online Link: https://arxiv.org/abs/1406.2661
Online Link: https://arxiv.org/abs/1312.6114
https://www.youtube.com/watch?v=7eh4d6sabA0
https://www.youtube.com/watch?v=ipG3zs4_Sl4

SCHEME FOR EXAMINATIONS:

Ability Enhancement Course shall be evaluated both by CIE and SEE

MAPPING of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	3	-	2	-	-	-	-	-	-	1	2	-	1
CO2	1	3	-	-	2	-	-	-	-	-	-	1	2	-	1
CO3	1	3	1	-	2	-	-	-	-	-	-	1	2	-	1
CO4	1	-	3	-	2	-	-	-	-	-	-	1	2	-	1
CO5	1	-	2	-	1	-	-	-	-	-	-	1	2	-	1

Strength of correlation: Low-1, Medium- 2, High-3

Detailed Scheme and Syllabus

ACADEMIC YEAR 2024-2025

VII-VIII (2021-2025 BATCH) (160Credits)

Dr. Ambedkar Institute of Technology
Bangalore

Department Of
Information Science and Engineering

Vision

77. To create **D**ynamic, **R**esourceful, **A**dept and**I**nnovative **T**echnical professionals to meet global challenges.

Mission

78. To offer state-of-the-art undergraduate, postgraduate and doctoral programmes in the fields of Engineering, Technology and Management.
79. To generate new knowledge by engaging faculty and students in research, development and innovation
80. To provide strong theoretical foundation to the students, supported by extensive practical training to meet industry requirements.
81. To install moral and ethical values with social and professional commitment.

DEPARTMENT VISION AND MISSION

Vision:

82. Imparting quality technical education and preparing professionals to meet Information Technological challenges globally.

Mission:

83. Prepare highly capable Information Science engineers through best practices.
84. Encourage students to pursue higher education for further growth in the learning process and to promote research in the frontier areas of Information Technology.
85. Educate students to take up social and professional responsibilities with ethical values for the betterment of the society

PROGRAM SPECIFIC OUTCOMES(PSOS)

PSO1: Students should be able to develop and optimize solutions for information systems employing fundamentals of mathematics, Hardware, software, data storage, security and communication networks.

PSO2:Students should be able to understand, analyze and adopt principles of programming paradigms by using latest technologies such as Cloud computing, Big data analytics, AI ,Machine Learning and IoT based applications for solving real-world problems.

PSO3: Students should be able to acquire and demonstrate the team work, professional ethics, competence and communication skills while developing software products.

PROGRAMME OUTCOMES (POs)

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 the 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 the 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 the engineering practice.
9. Individual and team work: 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

Dr. Ambedkar Institute of Technology, Bangalore-56
Outcome Based Education (OBE) and Choice Based Credit System (CBCS) (As per NEP 2020)
B.E in Information Science and Engineering
Tentative Scheme (2021 Scheme) of Teaching and Examination Effective from the Academic Year 2024-25

VII Semester

Sl No.	Course Category	Course Code	Course Title	Teaching Department	Teaching Hours / Week					Examinations				Credits
					L	T	P	S	Total	Duration (Hrs)	CIE Marks	SEE Marks	Total Marks	
1	PCC	21IST701	BIG DATA ANALYTICS		3	0	0	0	3	3	50	50	100	3
2	PCC	21IST702	SOFTWARE TESTING		3	0	0	0	3	3	50	50	100	2
3	PEC	21IST703x	Professional Elective Course - II		3	0	0	0	3	3	50	50	100	3
4	PEC	21IST704x	Professional Elective Course – III		3	0	0	0	3	3	50	50	100	3
5	OEC	21IST705x	Open Elective - II	Concern Department	3	0	0	0	3	3	50	50	100	3
6	PROJECT	21ISP706	Project Work		2 Contact Hours / Week interaction between faculty and students					3	100	100	200	10
									Total	-	350	350	700	24

Note:

PCC: Professional Core Course, **PEC:** Professional Elective Courses, **OEC**: Open Elective Course, **AEC:** Ability Enhancement Courses.

L – Lecture, **T** – Tutorial, **P** - Practical / Drawing, **S** – Self Study Component, **CIE:** Continuous Internal Evaluation, **SEE:** Semester End Examination.

PROJECT WORK (21ISP706): The objective of the Project work is

86. To encourage independent learning and the innovative attitude of the students.
87. To develop interactive attitude, communication skills, organization, time management, and presentation skills.
88. To impart flexibility and adaptability.
89. To inspire team working.
90. To expand intellectual capacity, credibility, judgment and intuition.

91. To adhere to punctuality, setting and meeting deadlines.

92. To install responsibilities to oneself and others.

93. To train students to present the topic of project work in a seminar without any fear, face the audience confidently, enhance communication skills, involve in group discussion to present and exchange ideas.

CIE procedure for Project Work:

94. Single discipline: The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two senior faculty members of the Department, one of whom shall be the Guide.

95. The CIE marks awarded for the project work shall be based on the evaluation of project work Report, project presentation skill, and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.

96. Interdisciplinary: Continuous Internal Evaluation shall be group-wise at the college level with the participation of all guides of the college. Participation of external guide/s, if any, is desirable. The CIE marks awarded for the project work shall be based on the evaluation of project work Report, project presentation skill, and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.

97. SEE procedure for Project Work: SEE for project work will be conducted by the two examiners appointed by the University. The SEE marks awarded for the project work shall be based on the evaluation of project work Report, project presentation skill, and question and answer session in the ratio 50:25:25.

Note: VII and VIII semesters of IV year of the programme

Institutions can swap VII and VIII Semester Scheme of Teaching and Examinations to accommodate research internship/ industry internship after the VI semester.

Credits earned for the courses of VII and VIII Semester Scheme of Teaching and Examinations shall be counted against the corresponding semesters whether VII or VIII semester is completed during the beginning of IV year or later part of IV year of the program.

Professional Elective Courses - II		**Professional Elective Courses - III**		**Open Elective Courses - II**	
Course Code	**Course Title**	**Course Code**	**Course Title**	**Course Code**	**Course Title**
21IST7031	Object oriented Modelling and Design	21IST7041	Software Architecture and Design Patterns	21IST7051	Introduction to BigData
21IST7032	Digital Image Processing	21IST7042	Data Science	21IST7052	Introduction to Artificial Intelligence
21IST7033	Blockchain	21IST7043	Deep Learning	21IST7053	Data Science

	Technology				
21IST7034	Industrial Internet of Things	21IST7044	NOSQL Database		

Dr. Ambedkar Institute of Technology, Bangalore-56
Outcome Based Education (OBE) and Choice Based Credit System (CBCS) (Asper NEP 2020)
B.E in Information Science and Engineering
Tentative Scheme (2021 scheme) of Teaching and Examination Effective from the Academic Year 2024-25

VIII Semester

Sl No.	Course Category	Course Code	Course Title	Teaching Department (TD)/ Paper setting Board(PSB)	Teaching Hours / Week					Examinations				Credits
					L	T	P	S	Total	Duration (Hrs)	CIE Marks	SEE Marks	Total Marks	
1	Seminar	21ISS801	Technical Seminar-		One Contact hour/ week for interaction between the faculty and students					-	100	-	100	1
2	Internship	21ISI802	Research Internship/ Industry Internship-		Two contact hours /week for interaction between the faculty and students.					03 (Batch wise)	100	100	200	15
3	NCMC	21CDN803	National Service Scheme (NSS)	NSS	Completed during the intervening period of III semester to VIII semester.					-	50	50	100	PP/NP
									Total	-	250	150	400	16

TECHNICAL SEMINAR (21ISS801):

The objective of the seminar is to inculcate self-learning, present the seminar topic confidently, enhance communication skill, involve in group discussion for exchange of ideas. Each student, under the guidance of a Faculty, shall choose, preferably, a recent topic of his/her interest relevant to the programme of Specialization.

Carry out literature surveys, systematically organize the content.

101. Prepare the report with your own sentences, avoiding a cut and paste act.
102. Type the matter to acquaint yourself with the use of Microsoft equation and drawing tools or any such facilities.
103. Present the seminar topic orally and/or through PowerPoint slides.
104. Answer the queries and involve in debate/discussion.
105. Submit a typed report with a list of references.
106. The participants shall take part in the discussion to foster a friendly and stimulating environment in which the students are motivated to reach high standards and become self-confident.

Evaluation Procedure:

The CIE marks for the seminar shall be awarded (based on the relevance of the topic, presentation skill, participation in the question and answer session, and quality of report) by the committee constituted for the purpose by the Head of the Department. The committee shall consist of three teachers from the department with the senior-most acting as the Chairman.

Marks distribution for CIE of the course:

Seminar Report: 50 marks, Presentation skill: 25 marks

Question and Answer: 25 marks. **No SEE component for Technical Seminar**

Non – credit mandatory courses (NCMC):

National Service Scheme/Physical Education (Sport and Athletics) / Yoga:

107. Securing 40% or more in CIE, 35 % or more marks in SEE and 40 % or more in the sum total of CIE + SEE leads to successful completion of the registered course.
108. In case, students fail to secure 35 % marks in SEE, they have to appear for SEE during the subsequent examinations conducted by the University.
109. In case, any student fails to register for NSS, PE or Yoga/fails to secure the minimum 40 % of the prescribed CIE marks, he/she shall be deemed to have not completed the requirements of the course. In such a case, the student has to fulfill the course requirements subsequently to earn the qualifying CIE marks subject to the maximum program period.
110. Successful completion of the course shall be indicated as pass (PP) in the grade card. Non-completion of the course (NP) shall be indicated as Unsatisfactory.
111. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the courses shall be mandatory for the award of degree.

VII SEMESTER

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024-2025

Course Title	**BIG DATA ANALYTICS**						
Course Code	**21IST701**						
Category	Professional Core Course (PCC)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	**00**	**00**	**00**	**03**	**39**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objectives:

112. Understand Big data for industry applications.
113. Analyze business case studies for Big data analytics
114. Define managing of Big data without SQL
115. Develop Mapreduce analytics using Hadoop and related tools.

UNIT I **7 hours**

Introduction to Big Data: Types of Digital Data: classification of Data(Structured, semi structured and unstructured), Characteristics of Data, Evolution of Big Data, Definition of Big Data, challenges of Big Data, Characteristics of Big Data (Volume, Velocity, Variety), Other characteristics of Big Data which are not Definitional Traits of Big Data, Why Big Data?, Are we Information consumer of producer? , Traditional BI vs Big Data, Typical Data warehouse environment, Typical Hadoop Environment, What is changing in realms of Big Data?

Text1:Chapter1,Chapter2

UNIT II **8 hours**

Introduction to NoSQL and Hadoop : NoSQL: Introduction What is it?, Where It is Used, Types of NoSQL databases, Why NoSQL?, Advantages of NoSQL, Use of NoSQL in Industry, SQL vs NoSQL, NewSQL.**Hadoop:** Introduction ,features, key advantages of Hadoop, Versions of Hadoop, Overview of Hadoop ecosystems, Hadoop distributions, Hadoop vs SQL, Integrated Hadoop Systems offered by leading market vendors, cloud based Hadoop solutions

Text1:Chapter4,Chapter5

Introduction to MongoDB and MapReduce : **8 hours**

MongoDB: Introduction (What is MongoDB, Why MongoDb, using JSON to MongoDB key features, Core Server tools, MongoDB through the JavaScript's Shell, Creating and Querying through Indexes, Document- Oriented, principles of schema design, Constructing queries on Databases, collections and Documents , MongoDB Query Language. **MapReduce:** Introduction, Mapper, Reducer, Combiner, Partitioner, Searching, Sorting, Compression.

Text1:Chapter6,Chapter8

UNIT IV **8 hours**

Introduction to HIVE AND Pig: HIVE Introduction, What is HIVE?, HIVE Architecture, HIVE data

Types, HIVE File Formats, HIVE query Language, RCFile implementation, Sharding, user-Defined Functions .**Pig:** Introduction, What is Pig? The anatomy of Pig, Pig on Hadoop, Pig philosophy,Use Case for Pig- ETL Processing, Pig Latin overview, Datatypes in Pig, running Pig, Execution modes of Pig, HDFS commands, Relational operators, Eval function, complex Data Types, Piggy Bank, User-Define Functions, Parameter substitution, Diagnostic Operator, Word Count Example using Pig, When to use and not use Pig, Pig at Yahoo, Pig vs HIVE.

Text1:Chapter9,Chapter10

UNIT V **8 hours**

Overview of SPARK, Tensor Flow, Theone: Introduction to Data Analysis with Spark, Downloading Spark and Getting Started, Programming with RDDs, Spark about anatomy of job runs, Anatomy of a Spark Job, Run–Task Execution cluster managers and, Executors and Cluster Managers Python Example ,Hive and, Execution engines installing, Installing Spark MapReduce and, Transformations and Actions RDDs and, Resilient Distributed Datasets–Functions resource requests, Resource Requests shared variables, Shared Variables–Accumulators sorting data, Total Sort YARN and, Spark on YARN–YARN cluster mode. Machine Learning with MLlib.

Text2:Chapter1,Chapter2

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos

COURSE OUTCOMES:

CO1: Understand the fundamentals of Big Data Analytics.

CO2: Investigate Hadoop Framework and Hadoop Distributed file system.

CO3: Illustrate the concepts of NoSQL using MongoDB for Big Data.

CO4: Demonstrate the Map Reduce Programming model to process Big Data along with Hadoop Tools.

CO5: Use machine learning algorithms for real world big data and analyze web content, social networks to provide analytics with relevant visualization tools.

TEXT BOOKS:

1. Seema Acharya, Subhashini Chellappan, " Big Data and Analytics", Wiley India Pvt. Ltd.,2015
2. Matei Zaharia, Patrick Wendell, Andy Konwinski, Holden Karau ,"Learning Spark",O'Reilly Media,2015

REFERENCE BOOKS:

1. Shashank Tiwari, " Professional NoSQL", Wiley India Pvt. Ltd.,2011
2. Kyle Banker,Peter Bakkum,Shaun Verch,Douglas Garrett,Tim Hawkins,"MongoDB in Action", DreamTech Press, 2nd Edition ,2016
3. Chris Eaton,Paul Zikopoulos,Tom Deutsch,George Lapis,Dirk Deroos,"Understanding Big Data : Analytics for Enterprise Class Hadoop and Streaming Data", Mcgraw Hill Education (India)Pvt.Ltd.,2012
4. Tom White,"Hadoop: The Definitive Guide",O'Reilly Media,4th Edition,2015
5. Vignesh Prajapati,"Big Data Analytics With R and Hadoop", Packt Pub Ltd ,2013
6. Dt Editorial Services,"Big Data - Black Book", Dreamtech Press,2016

EBOOKS/ONLINE RESOURCES

a) http://www.bigdatauniversity.com
b)http://www.mongodb.com
c) http://hadoop.apache.org/

SCHEME FOR EXAMINATIONS:
Professional Core Course shall be evaluated both by CIE and SEE

MAPPING of COs with POs and PSOs

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3											3		
CO2	3	2		3	2							1	3		
CO3	3	2	2	3	3							1	3		2
CO4	3	2	2	3	3							1	3		2
CO5	3	3	2	3	3	1						1	2		2
Strength of correlation: Low-1, Medium- 2, High-3															

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024-2025

Course Title	SOFTWARE TESTING						
Course Code	**21IST702**						
Category	Professional Core Course (PCC)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	**00**	**00**	**00**	**03**	**39**	**02**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objectives:

- Discuss about terminologies of software testing .
- Differentiate the various testing techniques.
- Analyze the problem and derive suitable test cases.
- Apply suitable technique for designing of flow graph.
- Explain the need for planning and monitoring a process.

UNIT I **8 hours**

Basics of Software Testing: Basic definitions, Software Quality , Requirements, Behaviour and Correctness, Correctness versus Reliability, Testing and Debugging, Test cases, Identifying test cases, Test-generation Strategies, Test Metrics, Error and fault taxonomies, Testing and Verification, Static Testing. 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

T1:Chapter1, Chapter2. T3:Chapter1

UNIT II **8 hours**

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, , Decision tables, Test cases for the triangle problem, Next Date function, and the commission problem,. Fault Based Testing: Overview, Assumptions in fault based testing, Mutation analysis, Fault-based adequacy criteria, Variations on mutation analysis.

T1: Chapter 5,Chapter 6,Chapter7, T2: Chapter 16

UNIT III **8 hours**

Structural Testing: Overview, Statement testing, Programme testing, Condition testing , Path testing: DD paths, Test coverage metrics, Basis path testing, guidelines and observations, Data –Flow testing: Definition-Use testing, Slice-based testing,. Scaffolding, Generic versus specific scaffolding, Test oracles, Self-checks as oracles, Capture and replay
T1:Chapter 9,Chapter10, T2:Chapter 17, T3:Section 6.2.1, T3:Section 6.2.4

UNIT IV **8 hours**

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 Documenting Analysis and Test:
T2: Chapter 3, Chapter 4, Chapter 20, Chapter 24.

UNIT V **8 hours**

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
T1 : Chapter 12,Chapter 13 T2: Chapter 21,Chapter 22

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentati animations, videos

COURSE OUTCOMES:

CO1: Derive test cases for any given problem
CO2: Compare the different testing techniques
CO3: Classify the problem into suitable testing model
CO4: Apply the appropriate technique for the design of flow graph.
CO5: Create appropriate document for the software artefact.

TEXT BOOKS:

1. Paul C. Jorgensen: Software Testing, A Craftsman's Approach, 3rd Edition, Auerbach Publications, 2008. (Listed topics only from Chapters 1, 2, 5, 6, 7, 9, 10, 12, 13)
2. Mauro Pezze, Michal Young: Software Testing and Analysis – Process, Principles and Techniques, Wiley India, 2009. (Listed topics only from Chapters 3, 4, 16, 17, 20,21, 22,24)
3. Aditya P Mathur: Foundations of Software Testing, Pearson Education, 2008.(Listed topics only from Section 1.2 , 1.3, 1.4 ,1.5, 1.8,1.12,6. 2.1,6. 2.4)

REFERENCE BOOKS:

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

EBOOKS/ONLINE RESOURCES

- https://www.softwaretestingmaterial.com/software-testing/
- https://www.guru99.com/software-testing-introduction-importance.html

SCHEME FOR EXAMINATIONS:

Professional Core Course shall be evaluated both by CIE and SEE

MAPPING of COs with POs and PSOs

	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO1	PO1	PO1	PSO	PSO	PSO

	1	2	3	4	5	6	7	8	9	0	1	2	1	2	3
CO 1	3	3					3	3				3	3		
CO 2	3	3	3		3		3						3		
CO 3	3	3	3		3								3		
CO 4	3	3	3	3	3										3
CO 5					3		3		3	3	3				3
Strength of correlation: Low-1, Medium- 2, High-3															

Professional Elective Course

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024 -2025

Course Title	**OBJECT-ORIENTED MODELING AND DESIGN**						
Course Code	**21IST7031**						
Category	Professional Elective Course -II(PEC)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	**00**	**00**	**00**	**03**	**39**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objectives:

- Introduce the concepst and terms used in Object Oriented Modelling .
- Understand the importance of Object Oriented approach and UML notation .
- Develop an understanding of Class, State and Interaction models.
- Design and develop a system with Object Oriented approach.

UNIT I **08 hours**

Introduction: What is Object Orientation? What is OO development? OO themes; Evidence for usefulness of

OO development; OO modeling history
Modeling Concepts: Modeling as Design Technique: Modeling; abstraction; The three models.
Class Modeling: Object and class concepts; Link and associations concepts; Generalization and inheritance; A sample class model ,practical tips.
Text:1.1-1.5,2.1-2.3,3.1-3.4,3.6

UNIT II **08 hours**

Advanced Class Modeling: Advanced object and class concepts; Association ends; N-ary associations; Aggregation; Abstract classes , Multiple inheritance; Metadata; Reification; Constraints; Derived data; Packages.
State Modeling: Events, States, Transitions and Conditions; State diagrams; State diagram behavior.
Advanced State Modeling: Nested state diagrams; Nested states; Signal generalization; Concurrency; Relation of class and state models
Text:4.1-4.11,5.1-5.5,6.1-6.6

UNIT III **08 hours**

Interaction Modeling: Use case models; Sequence models; Activity models.
Advanced Interaction Modeling: Use case relationships; Procedural sequence models; Special constructs for activity models.
Process Overview: Development stages; Development life cycle.
System Conception: Devising a system concept; Elaborating a concept; Preparing a problem statement.
Text:7.1-7.3,8.1-8.3,10.1,110.2,11.1-11.3

UNIT IV **08 hours**

Domain Analysis: Overview of analysis; Domain class model; Domain state model; Domain interaction model; Iterating the analysis.
Application Analysis: Application interaction model; Application class model; Application state model; Adding operations.
System Design Overview of system design; Estimating performance; Making a reuse plan; Breaking a system in to sub-systems; Identifying concurrency; Allocation of sub-systems; Management of data storage; Handling global resources; Choosing a software control strategy; Handling boundary conditions; Setting the trade-off priorities; Common architectural styles; Architecture of the ATM system as the example.
Text:12.1-12.5,13.1-13.4,14.1-14.13

UNIT V **07 hours**

Class Design: Overview of class design; Bridging the gap; Realizing use cases; Designing algorithms; Recursing downwards, Refactoring; Design optimization; Reification of behavior; Adjustment of inheritance; Organizing a class design; ATM example.
Implementation Modeling: Overview of implementation; Fine-tuning classes; Fine-tuning generalizations; Realizing associations; Testing.
Text:15.1-15.11,17.1-17.5

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos

COURSE OUTCOMES: On completion of the course, student should be able to:

CO1: Identify objects, attributes and operations performed on the objects in real world situations
CO2: Design class and state models for a given problem.
CO3: Analyze and build interaction models for the system to be developed.
CO4: Design System using class and application domain.
CO5: Implement systems with OO approach

TEXT BOOK:

1. Michael Blaha, James Rumbaugh: Object-Oriented Modeling and Design with UML, 2nd Edition, Pearson Education, 2005.

REFERENCE BOOKS:

- Grady Booch et al , Object-Oriented Analysis and Design with Applications -, 3rd Edition, Pearson, 2007.
- Mark Priestley,Practical Object-Oriented Design with UML - 2nd Edition, Tata McGraw-Hill, 2003.
- K. Barclay, J. Savage ,Object-Oriented Design with UML and JAVA -, Elsevier, 2008.
- Booch, G., Rumbaugh, J., and Jacobson ,The Unified Modeling Language User Guide - 2nd Edition, Pearson, 2005.

EBOOKS/ONLINE RESOURCES

https://onlinecourses.nptel.ac.in/

SCHEME FOR EXAMINATIONS:

PEC shall be evaluated both by CIE and SEE. Both Assigment and Group Activity are evaluated for 5 Marks each. Each CIE test is conducted for 25 Marks .Total CIE theory test marks of 50 is reduced to 40 Marks and Assignment & Group Activity Marks are added to get final CIE Marks . SEE Theory exam is conducted for 100 marks and then reduced to 50 Marks.

MAPPING of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO		2	2											3	
CO		2	2	3										3	
CO			2	3										3	
CO		2	2	3										3	
CO			3	3										3	
Strength of correlation: Low-1, Medium- 2, High-3															

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024 -2025

Course Title	**DIGITAL IMAGE PROCESING**						
Course Code	**21IST7032**						
Category	Professional Elective Courses -II(PEC)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	**00**	**00**	**00**	**03**	**39**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objectives:

1.Overview of Digital image processing
2.To gain knowledge of image enhancement.
3.To be aware of image restoration techniques.
4.To acquire knowledge of colour fundamentals and morphological image processing.

UNIT I	**08 hours**
Introduction: What is Digital Image Processing, Origins of Digital Image Processing, Examples of fields	

that use DIP, Fundamental Steps in Digital Image Processing, Components of an Image Processing System. Digital Image Fundamentals: Basic Concepts in Sampling and Quantization, Representing Digital Images TEXT BOOK1 CHAPTER 1,2
UNIT II **08 hours** Image Enhancement in the Spatial Domain: Some Basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters. Image Enhancement in the Frequency Domain: Introduction to the Fourier Transform and the Frequency Domain, Smoothing frequency-Domain Filters. T1 3,4
UNIT III **08 hours** Image Restoration: A Model of the Image degradation/Restoration process, Noise Models, Restoration in the Presence of Noise Only– Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Linear, Position-Invariant Degradations, Estimating the Degradation Function, Inverse Filtering. T1 5,6
UNIT IV **07 hours** Color Fundamentals: Color Models, Pseudocolor Image Processing, Basics of Full-Color Image Processing, Color Transformations, Smoothing and Sharpening, Color Segmentation, Color Image Compression. Wavelets and Multiresolution Processing: Image Pyramids, Subband coding, The Haar Transform. T1 7,8
UNIT V **08 hours** Image Compression: Fundamentals, Image Compression Models, Error-free (Lossless) compression, Lossy Compression Morphological Image Processing: Preliminaries, Dilation and Erosion, Opening and Closing, T1 10,11

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, vid

Course outcomes:

On successful completion of the course, the student will be able to

CO1: Review the fundamental concepts of a digital image processing system.
CO2 : Analyze images in the frequency domain using various transforms.
CO3 : Evaluate the techniques for image enhancement and image restoration.
CO4 : Evaluate the techniques of color fundamentals and segmentation
CO5: : Categorize various compression techniques

TEXT BOOK:

1. Rafael C G., Woods R E. and Eddins S L, Digital Image Processing, Prentice Hall, 3rd edition, 2008

REFERENCE BOOKS

1. Milan Sonka,"Image Processing, analysis and Machine Vision", Thomson Press India Ltd, Fourth Edition.
2. Fundamentals of Digital Image Processing- Anil K. Jain, 2nd Edition, Prentice Hall of India.
3. S. Sridhar , Digital Image Processing, Oxford University Press, 2nd Ed, 2016.

EBOOKS/ONLINE RESOURCES

SCHEME FOR EXAMINATIONS:

The PEC shall be evaluated both by CIE and SEE.

MAPPING of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**3**	**3**											**3**		
CO2	**3**	**3**										**3**	**3**		
CO3	**3**	**3**		**3**		**3**			**3**		**3**	**3**	**3**		
CO4	**3**	**3**	**3**	**3**								**3**	**3**		
CO5	**3**	**3**	**3**	**3**		**3**			**3**		**3**	**3**	**3**		
Strength of correlation: Low-1, Medium- 2, High-3															

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024 -2025

Course Title	BLOCKCHAIN TECHNOLOGY						
Course Code	**21IST7033**						
Category	Professional Elective Course-II (PEC)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	**00**	**00**	**00**	**03**	**39**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objectives:

116. Understand the fundamentals of Blockchain.
117. Understand the concept of decentralization, its impact, and its relationship with block chain technology
118. Gain knowledge of the inner workings of block chain and the mechanisms behind bitcoin and alternative crypto currencies.
119. Understand the theoretical foundations of smart contracts.
120. Identify and examine applications of the block chain technology - beyond currencies

UNIT I	**07 hours**
Block chain 101: Distributed systems, History of block chain and Bitcoin , Types of blockchain, Consensus, CAP theorem and blockchain Text Book 1: Chapter 1	
UNIT II	**08 hours**
Decentralization and Cryptography: Decentralization using block chain, Methods of decentralization, Routes to decentralization, Blockchain and full ecosystem decentralization, Decentralized organizations,platforms for decentralization. Cryptography and Technical Foundations: Cryptographic primitives, Asymmetric cryptography, Public and private keys Text Book 1: Chapter 2,Chapter 3(selective topics),chapter 4 (selective topics)	
UNIT III	**09 hours**
Bitcoin and Alternative Coins A: Bitcoin, Digital keys and Addresses ,Transactions, Blockchain,Mining , Bitcoin network,Wallets ,Bitcoin payments Alternative Coins Theoretical foundations, Bitcoin limitations, Namecoin, Litecoin, Primecoin, Zcash Text Book 1: Chapter 5, Chapter 6, Chapter 8.	
UNIT IV	**07 hours**
Smart Contracts and Ethereum 101: Smart Contracts: Definition, Ricardian contracts. Ethereum 101: Introduction, Ethereum , Etherium network, components of Ethereum ecosystem ,Blocks and block chain Text Book 1: Chapter 10	
UNIT V	**08 hours**
Alternative Blockchains: Blockchains: Kadena, Ripple, Quorum Blockchain-Outside of Currencies: Internet of Things, Government, Health, Finance, Media Text Book 1: Chapter 16,Chapter 17	

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos

COURSE OUTCOMES: On completion of the course, student should be able to:

CO1: Comprehend the fundamentals of Blockchain Technology.

CO2: Understand methods and levels of Decentralization and its relationship with block chain technology .

CO3: Analyse the working of Bitcoin and alternative coins.

CO4: Analyze the importance of Smart Contracts and Ethereum block chain

CO5: Apply blockchain technology in various fields like Government, Health finance etc

TEXT BOOK:

1. Mastering Blockchain Distributed ledgers, decentralization and smart contracts explained , Imran Bashir, Packt Publishing Ltd, Second Edition, ISBN 978-1-78883-904-4, 2018

REFERENCE BOOKS:

- Block chain Technology (Concepts and applications), Kumar saurabh, Ashutosh saxena, Wiley, 2020.
- Bitcoin and Crypto currency Technologies, Arvind Narayanan, Joseph Bonneau, Edward Felten,2016.
- Blockchain Basics: A Non-Technical Introduction in 25 Steps, Daniel Drescher, Apress, First Edition, 2017.
- Mastering Bitcoin: Unlocking Digital Crypto currencies, Andreas M. Antonopoulos, O'Reilly Media, First Edition, 2014.
- https://www.packtpub.com/in/big-data-and-business-intelligence/mastering-blockchainsecond-edition

EBOOKS/ONLINE RESOURCES

https://onlinecourses.nptel.ac.in/

SCHEME FOR EXAMINATIONS:

PEC shall be evaluated both by CIE and SEE. Both Assigment and Group Activity are evaluated for 5 Marks each. Each CIE test is conducted for 25 Marks .Total CIE theory test marks of 50 is reduced to 40 Marks and Assignment & Group Activity Marks are added to get final CIE Marks . SEE Theory exam is conducted for 100 marks and then reduced to 50 Marks.

MAPPING of COs with POs and PSOs

	PO1	**PO**	**PO**	**PO**	**PO5**	**PO**	**PO**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1		2	2											3	
CO2		2	2	2										3	
CO3				2					2					3	
CO4		2	2	2										3	
CO5			3	3										3	
Strength of correlation: Low-1, Medium- 2, High-3															

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024 -2025

Course Title	**Industrial Internet of Things**						
Course Code	21IST7034						
Category	Professional Elective Courses -II(PEC)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	**00**	**00**	**00**	**03**	**39**	**03**
CIE Marks:	**SEE Marks: 50**		**Total Max.**		**Duration of SEE: 03 Hours**		

50		**marks=100**	

Course Objectives:

121. To Learn the characteristics, designs,and challenges in the IoT
122. To Understand the key Technologies and protocols in IoT
123. To Analyze various Layers connectivity and motivation of IPV6
124. To Illustrate the role of IoT in various domains of Industry
125. Infer the role of Data Analytics in IOT

UNIT I : 08 hours **Overview of Internet of Things** Introduction ,IOT Architecture ,Application based IOT Protocols ,Cloud Computing, Fog Computing, Sensor Cloud, Big Data,Cyber Physical system. **T1:Chapter1-1.1,1.2,1.3,1.4 , 1.5**
UNIT II : Industrial Internet of Things Basics 08 hours Introduction-IIOT,and Industry 4.0 IIC ,Industrial Internet Systems-Design of Industrial systems, Impact of Industrial systems ,Benefits of Industrial Internet Industrial Sensing ,Industrial Process, **T1:Chapter4-4.1,4.2,4.3,4.4**
UNIT III 07 hours **Key Technologies on site Technologies** Introduction, Augmented Reality ,Virtual Reality, Big data and Advanced Analytics, Smart factories **T 1: Chapter7-7.1,7.2,7.3,7.4,7.5**
UNIT IV 08 hours Introduction to IIOT Analytics -Introduction , Necessity of Analytics, Categorization of Analytics , usefulness and challenges ,Mapping of Analytics ,Deployment of Analytics, Artificial Intelligence ,Application of Analytics across value chain **T 1: Chapter12-12.1, 12.2, 12.2.1,12.2.2,12.2.3,12.2.4,12.2.5,12.2..6,12.2.7**
UNIT V 08 **hoursCase Studies Industrial IoT-** Application Domains: Healthcare, Inventory Management & Quality Control, Plant Safety and Security **T1:Chapter14- 14.1,14.2, Chapter 15-15.1,15.2 ,15.3 Chapter 16-16.1,16.2,16.3**

TEACHING LEARNING PROCESS: Chalk and Talk, powerpoint presentation, animations, videos

Course outcomes:

On successful completion of the course, the student will be able to
CO1: Interpret the impact and challenges posed by IoT networks
CO2: Appraise the role of IoT protocols for efficient network communication
CO3: Deployment of different sensor technologies and Layers to connect the network.
CO4: To Deploy the role of IoT design in various domains of Industry
CO5:Elaborate the need for Data Analytics .

TEXT BOOK:

1) T1 S. Misra, A. Mukherjee, and A. Roy, 2020. Introduction to IoT. Cambridge University Press.
2) S. Misra, C. Roy, and A. Mukherjee, 2021. Introduction to Industrial Internet of Things and Industry 4.0. CRC Press.

SCHEME FOR EXAMINATIONS:

The PEC shall be evaluated both by CIE and SEE.

MAPPING of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3											3		
CO2	3	3										3	3	3	
CO3	3	3		3		3			3		3	3	3		3
CO4	3	3	3	3								3		3	
CO5	3	3	3	3		3			3		3	3		3	3
Strength of correlation: Low-1, Medium- 2, High-3															

Professional Elective Courses-III

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024 -2025

Course Title	**Software Architecture and Design Patterns**

Course Code	**21IST7041**						
Category	**Professional Elective Courses-III(PEC)**						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	**00**	**00**	**00**	**03**	**39**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objectives:

19) Understand how design patterns solve design problems,,how to select a design pattern.
20) Understand how to gather requirements functional requirements specification in design.
21) Understand various Structural patterns.
22) Understand the MVC architectural pattern,analyzing a simple drawing program.
23) Understand how to implement in gan object-oriented system on the web.

UNIT I : **07 hours**

Introduction:

What is a design pattern? Describing design patterns, the catalog of design patterns, organizing the catalog, how design patterns solve design problems, how to select a design pattern, how to use a design pattern. What is object-oriented development? , key concepts of object oriented design other related concepts, benefits and drawbacks of \the paradigm

UNIT II **08 hours**

Analysis a System: overview of the analysis phase, stage 1: gathering the requirements functional requirements specification, defining conceptual classes and relationships, using the knowledge of the domain.

UNIT III **08 hours**

Design Pattern Catalog: Structural Patterns,Adapter,bridge,composite, decorator, facade, flyweight, proxy.

UNIT IV **08 hours**

Interactive systems and the MVC architectureI: Introduction, The MVC architectural pattern,analyzing a simple drawing program,designing the system, designing of the subsystems, getting into implementation, implementing undo operation.

UNIT V **08 hours**

Designing with Distributed Objects: Client server system, java remote method invocation, implementing an object-oriented system on the web (discussions and further reading) a note on input and output, selection statements, loops arrays.

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos

Course outcomes:

On successful completion of the course, the student will be able to

CO1: Interpret the design patterns and design principles to solve the software design problems.
CO2: Explain object-oriented modeling and design concepts.
CO3: Identify the range of structural patterns in the design of object-oriented systems..
CO4: Discuss the interactive system sand MVC architecture
CO5:Demonstrate the design of distributed objects.

Text Books:

1. Object-oriented analysis, design and implementation, brahma dathan, sarnathrammath, universities press,2013

2. Design patterns, erich gamma, Richard helan, Ralph johman , john vlissides ,PEARSON Publication,2013.

Reference Books:

1. Frank Bachmann, ReginеMeunier, Hans Rohnert "Pattern Oriented Software Architecture" –Volume 1, 1996.

2. William J Brown et al., "Anti-Patterns: Refactoring Software, Architectures and Projects in Crisis", John Wiley, 1998.

MOOCs

1. **https://nptel.ac.in/courses/107104076**
2. **https://www.khanacademy.org/**
3. **https://www.class-central.com/subject(MOOCS)**
4. **E-learning:www.vtu.ac.in**

SCHEME FOR EXAMINATIONS:

The theory part of the PCC shall be evaluated both by CIE and SEE.
MAPPING of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	-	-	-	-	-	-	-	-	3	2	2	2
CO2	3	3	3	-	-	-	-	-	-	-	-	3	2	2	2
CO3	3	3	3	-	-	-	-	-	-	-	-	3	2	2	2
CO4	3	3	3	-	-	-	-	-	-	-	-	3	2	2	2
CO5	3	3	3	-	-	-	-	-	-	-	-	3	2	2	2
Strength of correlation: Low-1, Medium- 2, High-3															

Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024 -2025

Course Title	**DATA SCIENCE**						
Course Code	**21IST7042**						
Category	Professional Elective Courses-III (PEC)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	**00**	**00**	**00**	**03**	**39**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

COURSE OBJECTIVES:

1. To understand the concepts of Data science.
2. To apply the inferential statistics after preprocessing techniques are used.
3. To implement modelling methods for real world problems.
4. Analyzing data from files and visualizing graphical presentations using tableau.

UNIT I: Introduction to Data Science **07 hours**

Introduction, Evolution of data science, Data science process – roles, stages in data science project – components of the Data Science lifecycle, data analytics, exploring data – managing data – cleaning and sampling for modeling and validation.

UNIT II: Data Pre-processing and Data Wrangling **07 hours**

Loading from different files, Accessing datasets. Data Pre-processing: Data Cleaning, stripping out extraneous information, Find and treat missing values, Identify and treat outliers

Data Wrangling: Grouping, merging, combining, concatenating, Reshaping(pivoting), Data Transformation –Mapping. Implementations with python

UNIT III: Statistics and Hypothesis Testing **09 Hours**

Inferential Statistics-Measurement scales, Point estimates, Confidence Interval, Central limit theorem, Normalizing data using z-score, Normal Distributions, Hypothesis testing -ANOVA test, Correlation -Person correlation coefficient.

UNIT IV: Data Science Algorithms **07 hours**

Understanding Linear regression, making prediction-hypothesis on regression coefficients, Adding best fit. Multiple Linear Regression, Polynomial Regression, Logistic Regression, Implementation in python Model Evaluation-Confusion matrix, Implementation in python.

UNIT V: Data Visualization-Tableau **09 hours**

Introduction, Techniques used for visual data representation, Types of data visualization

Introduction to tableau software-connecting to data, architecture of Tableau, dimension Vs measure, data types, data filters, Tableau calculations, function used in tableau, Maps, Dashboard.

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos

COURSE OUTCOMES:

CO1: Outline the role of data science and the significance of exploratory data analysis

CO2: Explain the basic terms of Linear Algebra and Statistical Inference.

CO3: Illustrate data preprocessing techniques and perform computational analysis

CO3: Apply basic data science algorithms for predictive modelling and analysis.

CO4: Formulate and use appropriate models of data analysis and visualize them.

TEXT BOOKS

126. Joel Grus, Data Science from Scratch, O'Reilly Media, 2015.
127. David Dietrich, Barry Heller," Data Science & Big Data Analytics: Discovering, Analysing, Visualizing and Presenting Data",Wiley,2015
128. Joshua N. Milligan, Blair Hutchinson, Mark Tossell and Roberto Andreoli, Learning Tableau 2022 - Fifth Edition, O'Reilly Media

REFERENCE BOOKS

1. W. N. Venables, D. M. Smith and the R Core Team, "An Introduction to R", 2013.
2. Ryan Sleeper, Practical Tableau, O'Reilly Media, Inc., Copyright © 2018
3. Communicating Data with Tableau, Ben Jones, O'Reilly Media, Inc.,

EBOOKS/ONLINE RESOURCES

1. http://www.nptel.ac.in
2. https://en.wikipedia.org

SCHEME FOR EXAMINATIONS:

The PEC shall be evaluated both by CIE and SEE.

MAPPING of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3											1		
CO2	1	2			1										
CO3	1	2		3	2								1		
CO4		2		3	3		3			2			1		
CO5				2	3		3			2	2		1		
Strength of correlation: Low-1, Medium- 2, High-3															

Dr. Ambedkar Institute of Technology, Bengaluru-56

Department of Artificial Intelligence and Machine Learning

Scheme and Syllabus – NEP – 2024-2025

Course Title	**DEEP LEARNING**						
Course Code	**21IST7043**						
Category	Professional Elective Courses-III (PEC)						
Scheme and Credits	**No. of Hours/Week**					**Total Teaching hours**	**Credits**
	L	**T**	**P**	**SS**	**Total**		
	03	00	00	00	03	39	03
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

COURSE OBJECTIVES:

129. Figure out the context of neural networks and deep learning.
130. Know how to use a neural network.
131. Explore the data needs of deep learning.
132. Have a working knowledge of neural networks and deep learning.
133. Explore the parameters for neural networks.

Unit 1 **8 hours**

Machine Learning Basics: Learning Algorithms, Capacity, Overfitting and Underfitting, Hyperparameters and Validation Sets, Estimator, Bias and Variance, Maximum Likelihood Estimation, Bayesian Statistics, Supervised Learning Algorithms, Unsupervised Learning Algorithms, Stochastic Gradient Decent, building a Machine Learning Algorithm, Challenges Motivating Deep Learning.

Unit 2 **8 hours**

Deep Feedforward Networks: Gradient-Based Learning, Hidden Units, Architecture Design, BackPropagation. Regularization: Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, **SemiSupervised Learning, Multi-Task Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Bagging, Dropout**.

Unit 3 **8 hours**

Optimization for Training Deep Models: How Learning Differs from Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms. Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates. Convolutional Networks: The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features.

Unit 4	**8 hours**
Sequence Modelling: Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks. Long short-term memory	
Unit 5	**7 hours**
Practical Methodology: Performance Metrics, Default Baseline Models, Determining Whether to Gather More Data, Selecting Hyperparameters, Debugging Strategies, Example: Multi-Digit Number Recognition. Applications: Vision, NLP, Speech.	

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos

COURSE OUTCOMES: On completion of the course, student should be able to:

CO1: Identify the deep learning algorithms appropriate for various learning tasks in different domains.
CO2: Implement deep learning algorithms to solve real-world problems.
CO3: Analyze performance metrics of Deep Learning Techniques for different types of datasets

TEXT BOOKS

134. Deep Learning , Ian Good fellow and YoshuaBengio MIT Press https://www.deeplearningbook.org/ 2016

REFERENCE BOOKS:

135. Neural Networks: Asystematic Introduction, Raúl Rojas 1996.
136. Pattern Recognition and machine Learning, Chirstopher Bishop 2007.

ONLINE RESOURCES:

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

MAPPING of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**2**	**2**	-	-	-	-	-	-	-	-	-	-		**2**	
CO2	**2**	**3**	**3**	**2**	-	-	-	-	-	-	-	**2**		**2**	
CO3	**3**	**3**	**3**	-	-	-	-	-	-	-	-	**2**		**2**	
CO4	**2**	**3**	**3**	**2**	-	-	-	-	-	-	-	**2**		**2**	

Strength of correlation: Low-1, Medium- 2, High-3

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024 -2025

Course Title	NOSQL Database						
Course Code	21IST7044						
Category	Professional Elective Courses-III (PEC)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	**00**	**00**	**00**	**03**	**39**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objectives:

1.To Understand the basic concepts of NoSQL
2. To Learn the features of various types of NoSQL databases
3. To design the uses case by using NoSQL databases

UNIT I : 08 hours

Why NoSQL? The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, A (Mostly) Standard Model, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL, Aggregate Data Models; Aggregates, Example of Relations and Aggregates, Consequences of Aggregate Orientation, Key-Value and Document Data Models, Column-Family Stores, Summarizing Aggregate-Oriented Databases. More Details on Data Models; Relationships, Graph Databases, Schemaless Databases, Materialized Views, Modeling for Data Access,

UNIT II **08 hours** Distribution Models; Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication. Consistency, Update Consistency, Read Consistency, Relaxing Consiste The CAP Theorem, Relaxing Durability, Quorums. Version Stamps, Business and System Transactions, Version Stamps on Multiple Nodes
UNIT III **08 hours** Map-Reduce, Basic Map-Reduce, Partitioning and Combining, Composing Map-Reduce Calculations, A Two Stage Map-Reduce Example, Incremental Map-Reduce Key-Value Databases, What Is a Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preference, Shopping Cart Data, When Not to Use, Relationships among Data, Multioperation Transactions, Query by Data, Operations by Sets
UNIT IV **08 hours** Document Databases, What Is a Document Database?, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analytics or Real-Time Analytics, ECommerce Applications, When Not to Use, Complex Transactions Spanning Dif erent Operations, Queries against Varying Aggregate Structure
UNIT V **08 hours** Graph Databases, What Is a Graph Database?, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Connected Data, Routing, Dispatch, and Location-Based Services, Recommendation Engines, When Not to Use.

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos

COURSE OUTCOMES: On completion of the course, student should be able to:

CO1: Elaborate the fundamental concepts of No-SQL databases.

CO2: Demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Column-oriented NoSQL databases.

.

CO3: Illustrate map-reduce programming model and understanding of key-value database

CO4: Explain the detailed architecture, define objects, load data, query data and performance tune Document-oriented NoSQL databases..

CO5: Describe the design and use cases of graph databases.

TEXT BOOK:

Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Pearson Addision Wesley, 2012

REFERENCE BOOKS

- Dan Sullivan, "NoSQL For Mere Mortals", 1st Edition, Pearson Education India, 2015. (ISBN13: 978-9332557338)
- Dan McCreary and Ann Kelly, "Making Sense of NoSQL: A guide for Managers and the Rest of us", 1st Edition, Manning Publication/Dreamtech Press, 2013. (ISBN-13: 978-9351192022)

- Kristina Chodorow, "Mongodb: The Definitive Guide- Powerful and Scalable Data Storage", 2nd Edition, O'Reilly Publications, 2013. (ISBN-13: 978-9351102694)

SCHEME FOR EXAMINATIONS:

The PEC shall be evaluated both by CIE and SEE.

MAPPING of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2			2							1	1		
CO2	2	2			2							1			
CO3	2	2	2		2							1			
CO4	2	2	2		2							1			
CO5	2	2	2		2							1			
Strength of correlation: Low-1, Medium- 2, High-3															

Open Elective Courses - II

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024-2025

Course Title	**INTRODUCTION TO BIG DATA**						
Course Code	**21IST7051**						
Category	**Open Elective Courses - II**						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	**00**	**00**	**00**	**03**	**39**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objectives:

- Understand Big data for industry applications.
- Analyze business case studies for Big data analytics
- Define managing of Big data without SQL
- Develop Mapreduce analytics using Hadoop and related tools.

UNIT I	**7 hours**

Introduction to Big Data: Types of Digital Data: classification of Data,Structured, semi structured and unstructured, Characteristics of Data, Evolution of Big Data, Definition of Big Data, challenges of Big Data, Characteristics of Big Data (Volume, Velocity, Variety), Other characteristics of Big Data which are not Definitional Traits of Big Data, Why Big Data?, Are we Information consumer of producer? , Traditional BI vs Big Data, Typical Data warehouse environment, Typical Hadoop Environment, What is changing in realms of Big Data?

Text1:Chapter1,Chapter2

UNIT II **7 hours**

Introduction to NoSQL and Hadoop : NoSQL: Introduction, What is it?, Where It is Used, Types of NoSQL databases, Why NoSQL?, Advantages of NoSQL, Use of NoSQL in Industry, SQL vs NoSQL, NewSQL.**Hadoop:** Introduction ,features, key advantages of Hadoop, Versions of Hadoop, Overview of Hadoop ecosystems, Hadoop distributions, Hadoop vs SQL, Integrated Hadoop Systems offered by leading market vendors, cloud based Hadoop solutions.

Text1:Chapter4,Chapter5

Introduction to MongoDB and MapReduce :MongoDB: Introduction (What is MongoDB, Why MongoDb, using JSON to MongoDB key features, Core Server tools, MongoDB through the JavaScript's Shell, Creating and Querying through Indexes, Document- Oriented, principles of schema design, Constructing queries on Databases, collections and Documents , MongoDB Query Language. **MapReduce:** Introduction, Mapper, Reducer, Combiner, Partitioner, Searching, Sorting, Compression.

Text1:Chapter6,Chapter8

UNIT IV **8 hours**

Introduction to HIVE AND Pig: HIVE Introduction (What is HIVE?, HIVE Architecture, HIVE data Types, HIVE File Formats, HIVE query Language, RCFile implementation, Sharding, user-Defined Functions .**Pig:** Introduction(What is Pig? The anatomy of Pig, Pig on Hadoop, Pig philosophy,Use Case for Pig- ETL Processing, Pig Latin overview, Datatypes in Pig, running Pig, Execution modes of Pig, HDFS commands, Relational operators, Eval function, complex Data Types, Piggy Bank, User-Define Functions, Parameter substitution, Diagnostic Operator, Word Count Example using Pig, When to use and not use Pig, Pig at Yahoo, Pig vs HIVE.

Text1:Chapter9,Chapter10

UNIT V **8 hours**

Overview of SPARK, Tensor Flow, Theone: Introduction to Data Analysis with Spark, Downloading Spark and Getting Started, Programming with RDDs, Spark about anatomy of job runs, Anatomy of a Spark Job, Run–Task Execution cluster managers and, Executors and Cluster Managers Python Example ,Hive and, Execution engines installing, Installing Spark MapReduce and, Transformations and Actions RDDs and, Resilient Distributed Datasets–Functions resource requests, Resource Requests shared variables, Shared Variables–Accumulators sorting data, Total Sort YARN and, Spark on YARN–YARN cluster mode. Machine Learning with MLlib.

Text2:Chapter1,Chapter2

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos

COURSE OUTCOMES:

CO1: Understand the fundamentals of Big Data Analytics.

CO2: Investigate Hadoop Framework and Hadoop Distributed file system.

CO3: Illustrate the concepts of NoSQL using MongoDB for Big Data.
CO4: Demonstrate the Map Reduce Programming model to process Big Data along with Hadoop Tools.
CO5: Use machine learning algorithms for real world big data and analyze web content, social networks to provide analytics with relevant visualization tools.

TEXT BOOKS:

1. Seema Acharya, Subhashini Chellappan, " Big Data and Analytics", Wiley India Pvt. Ltd.,2015
2. Matei Zaharia, Patrick Wendell, Andy Konwinski, Holden Karau ,"Learning Spark",O'Reilly Media,2015

REFERENCE BOOKS:

1. Shashank Tiwari, " Professional NoSQL", Wiley India Pvt. Ltd.,2011
2. Kyle Banker,Peter Bakkum,Shaun Verch,Douglas Garrett,Tim Hawkins,"MongoDB in Action", DreamTech Press, 2nd Edition ,2016
3. Chris Eaton,Paul Zikopoulos,Tom Deutsch,George Lapis,Dirk Deroos,"Understanding Big Data : Analytics for Enterprise Class Hadoop and Streaming Data", Mcgraw Hill Education (India)Pvt.Ltd.,2012
4. Tom White,"Hadoop: The Definitive Guide",O'Reilly Media,4th Edition,2015
5. Vignesh Prajapati,"Big Data Analytics With R and Hadoop", Packt Pub Ltd ,2013
6. Dt Editorial Services,"Big Data - Black Book", Dreamtech Press,2016

EBOOKS/ONLINE RESOURCES

a) http://www.bigdatauniversity.com
b)http://www.mongodb.com
c) http://hadoop.apache.org/

SCHEME FOR EXAMINATIONS:

The OEC shall be evaluated both by CIE and SEE

MAPPING of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3											3		
CO2	3	2		3	2							1	3		
CO3	3	2	2	3	3							1	3		2
CO4	3	2	2	3	3							1	3		2
CO5	3	3	2	3	3	1						1	2		2
Strength of correlation: Low-1, Medium- 2, High-3															

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024 -2025

Course Title	**INTRODUCTION TO ARTIFICIAL INTELLIGENCE**						
Course Code	**21IST7052**						
Category	Open Elective Courses-II(OEC)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	**00**	**00**	**00**	**03**	**39**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

- Course Objectives:
- Understand about agent, behavior and structure
- Learn different AI models and search strategies
- Representation of knowledge and reasoning
- Gain knowledge about learning strategies

UNIT I : 08 hours What is AI,history,applications of AI ,Intelligent Agents: Agents and environment; Rationality; the nature of environment; the structure of agents.Problem solving:Problem solving agents;Example problems,searching for solutions T1.CH1,CH2,CH3
UNIT II 08 hours Knowledge representation issues: Representations and mappings approaches to knowledge representation, Issue in knowledge representation.Using Predicate Logic, Representing knowledge using Rules T2-CH4,CH5,CH6
UNIT III 08 hours Logical Agents: Knowledge based agents, The Wumpus world, Logic-Propositional logic Propositional theorem proving, Effective propositional model checking, Agents based on propositional logic.symbolic reasoning under uncertainity,statistical reasoning T1&T2-CH7,CH8
UNIT IV 08 hours **First Order Logic**: Representation Revisited, Syntax and Semantics of First Order logic, Using First Order logic. **Inference in First Order Logic** :Propositional Versus First Order Inference, Unification, Forward Chaining, Backward Chaining, Text book 1: Chapter 8- 8.1, 8.2, 8.3 Chapter 9- 9.1, 9.2, 9.3, 9.4, 9.5
UNIT V 08 hours Learning-role learning ,learning by taking advice, problem solving, learning from examples, explanation based learning formal learning theory Expert systems-representing and using domain knowledge, expert system shells, knowledge acquisition. T2-CH17,CH 20

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, vid

COURSE OUTCOMES: On completion of the course, student should be able to:

CO1: Apply knowledge of agent architecture, searching and reasoning techniques for different applications.

CO 2. Analyze knowledge representation issues and approaches.

CO 3. Describe the concepts of knowledge based agents

CO 4. Develop knowledge base sentences using propositional logic and first order logic

CO5: Use the concepts of Expert Systems to build applications.

TEXT BOOK:

- Stuart J. Russell and Peter Norvig , Artificial Intelligence, 3rd Edition, Pearson,2015
- Elaine Rich, Kevin Knight, Artificial Intelligence, 3rd edition,Tata McGraw Hill,2013

REFERENCE BOOKS

137. George F Lugar, Artificial Intelligence Structure and strategies for complex, Pearson Education, 5th Edition, 2011
138. Nils J. Nilsson, Principles of Artificial Intelligence, Elsevier, 1980

139. 3.Saroj Kaushik, Artificial Intelligence, Cengage learning, 2014

EBOOKS/ONLINE RESOURCES

140. https://www.kdnuggets.com/2019/11/10-free-must-read-books-ai.html
141. https://www.udacity.com/course/knowledge-based-ai-cognitive-systems--ud409
142. https://nptel.ac.in/courses/106/105/106105077/

SCHEME FOR EXAMINATIONS:

The OEC shall be evaluated both by CIE and SEE.

MAPPING of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3										3	3		
CO2	3	3										3		3	
CO3	3	3		3		3						3		3	
CO4	3	3	3	3								3		3	
CO5	3	3	3	3		3						3		3	
Strength of correlation: Low-1, Medium- 2, High-3															

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024 -2025

Course Title	**DATA SCIENCE**						
Course Code	**21IST7053**						
Category	Open Elective Course-II						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	**00**	**00**	**00**	**03**	**39**	**03**

CIE Marks: 50	SEE Marks: 50	Total Max. marks=100	Duration of SEE: 03 Hours

COURSE OBJECTIVES:

1. To understand the concepts of Data science.
2. To apply the inferential statistics after preprocessing techniques are used.
3. To implement modelling methods for real world problems.
4. Analyzing data from files and visualizing graphical presentations using tableau.

UNIT I: Introduction to Data Science **07 hours**

Introduction, Evolution of data science, Data science process – roles, stages in data science project – components of the Data Science lifecycle, data analytics, exploring data – managing data – cleaning and sampling for modeling and validation.

UNIT II: Data Pre-processing and Data Wrangling **07 hours**

Loading from different files, Accessing datasets. Data Pre-processing: Data Cleaning, stripping out extraneous information, Find and treat missing values, Identify and treat outliers

Data Wrangling: Grouping, merging, combining, concatenating, Reshaping(pivoting),

Data Transformation –Mapping. Implementations with python.

UNIT III: Statistics and Hypothesis Testing **09 Hours**

Inferential Statistics-Measurement scales, Point estimates, Confidence Interval, Central limit theorem, Normalizing data using z-score, Normal Distributions, Hypothesis testing -ANOVA test, Correlation -Person correlation coefficient.

UNIT IV: Data Science Algorithms **07 hours**

Understanding Linear regression, making prediction-hypothesis on regression coefficients, Adding best fit. Multiple Linear Regression, Polynomial Regression, Logistic Regression, Implementation in python Model Evaluation-Confusion matrix, Implementation in python.

UNIT V: Data Visualization-Tableau **09 hours**

Introduction, Techniques used for visual data representation, Types of data visualization

Introduction to tableau software-connecting to data, architecture of Tableau, dimension Vs measure, data types, data filters, Tableau calculations, function used in tableau, Maps, Dashboard.

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos

COURSE OUTCOMES:

CO1: Outline the role of data science and the significance of exploratory data analysis

CO2: Explain the basic terms of Linear Algebra and Statistical Inference.

CO3: Illustrate data preprocessing techniques and perform computational analysis

CO3: Apply basic data science algorithms for predictive modelling and analysis.

CO4: Formulate and use appropriate models of data analysis and visualize them.

TEXT BOOKS

143. Joel Grus, Data Science from Scratch, O'Reilly Media, 2015.
144. David Dietrich, Barry Heller," Data Science & Big Data Analytics: Discovering, Analysing, Visualizing and Presenting Data",Wiley,2015
145. Joshua N. Milligan, Blair Hutchinson, Mark Tossell and Roberto Andreoli, Learning Tableau 2022 - Fifth Edition, O'Reilly Media

REFERENCE BOOKS

1. W. N. Venables, D. M. Smith and the R Core Team, "An Introduction to R", 2013.
2. Ryan Sleeper, Practical Tableau, O'Reilly Media, Inc., Copyright © 2018
3. Communicating Data with Tableau, Ben Jones, O'Reilly Media, Inc.,

EBOOKS/ONLINE RESOURCES

1. http://www.nptel.ac.in
2. https://en.wikipedia.org

SCHEME FOR EXAMINATIONS:

The PEC shall be evaluated both by CIE and SEE.

MAPPING of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3											1		
CO2	1	2			1										
CO3	1	2		3	2								1		
CO4		2		3	3		3			2			1		
CO5				2	3		3			2	2		1		
Strength of correlation: Low-1, Medium- 2, High-3															

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024 -2025

Course Title	**PROJECT WORK**						
Course Code	**21ISP706**						
Category	**PROJECT**						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	2 Contact Hours / Week interaction between faculty and students						**10**
CIE Marks: 100	**SEE Marks: 100**		**Total Max. marks=200**		**Duration of SEE: 03**		

Project Rubrics

Sl.No.	Assessment Criteria	Completed/Not Completed
1.	Problem definition	146. Student is aware and can describe with a broad perspective the problem domain and has understood its relevance. 147. Problem domain is well understood by the student. Student has a clear and specific description of problem. 148. Well formed, specific definition of the problem. Problem relevance is well identified by extensive investigation into the problem domain.
2.	Literature survey	149. Few sources, aware of quality of resources and relevance to problem at hand good judgment of the information,, identification of gaps in knowledge 150. Multiple sources of high quality, well researched and analyzed, continuous effort at acquiring information
3	Requirements Specification	• Multiple, clear, specific, functional requirements • Many, varied, clear, measurable functional requirements, include some non-functional requirements • Multiple and complete requirements which include functional, non-functional, performance measurable requirements.
4	Design	• Flawed design needs correction or check for incorrect application of theory and techniques that do not meet the requirement/ requirements. • Technically correct, meets requirements. Correct choice of hardware and software tools • Technically correct with innovative application of theory and techniques. Correct choice of hardware and software tools
5.	Implementation	• Incorrect programming style or errors in Algorithm that need rectification and hence delay in meeting the deadline date. • Correct algorithmic approach, obtaining the output as required and tends to meet the deadlines/schedule. • Technically complete implementation with very good programming style, document updating up to date, tending to finish well within deadline
6	Testing	• Poor planning and specification of test cases, to check if it meets the functional requirements. Involves haphazard testing • Able to identify test plans for most of the requirements, • Clear test plans created that meets all requirements for providing, optimized solution.

7	Report Writing	• Reasonably well organized, though may lack clarity in few topics, or a few omissions, grammatical corrections, lacks style. • Sound organization and structure, clear, very few errors, complete, reasonably good style. • Excellent organization, no technical or grammatical errors, report is concise and precise with complete documentation.
8	Presentation and viva voce	1. Poor communication skills, poorly organized slide deck, unable to answer technical queries. 2. Reasonably good communication and presentation, able to give technical answers to some extent. 3. Good, professional communication, good visual aids, able to give technical answers. 4. Excellent professional and technical communication, effective presentations, able to analyze technically and clarify views in viva-voce
9	Team work	5. Team roles defined but members fulfill only minimally. 6. Student has Professional approach and works with other, team members with synergy. Well identified roles, help other team members also.

Marks distribution for Project assessment

Sl.No	Assessment Criteria	Project
1	Problem Definition	05
2	Literature survey	10
3	Requirements Specification	05
4	Design	10
5	Implementation & Testing	25
6	Report Writing	25
7	Presentation and viva voce	10
8	Presented paper/Preparation of paper& team work	10
	Total	**100**

VIII SEMESTER

Course Title	**TECHNICAL SEMINAR**						
Course Code	**21ISS801**						
Category	Seminar						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	One Contact hour/ week for interaction between the faculty and students						**01**
CIE Marks: 100	**SEE Marks: ---**		**Total Max. marks=100**		**Duration of SEE: ---**		

Technical Seminar Rubrics:

	Criteria	Satisfactory	Good	Excellent
1.	Literature Review	Mentions other work done in field; connections to current work not as clear.	Describes previous and related work; makes connection to current work.	Thoroughly, concisely, describes previous and related work; clearly explains how current work fits into broader field.
2.	Knowledge in basic engineering	Superficial knowledge of topic; only able to answer basic questions.	Adequate knowledge of most topics; answer the questions, but fails to elaborate.	Demonstrates deep knowledge; answer the questions with explanations and elaboration.
3	Communication Skills.	Difficult to hear; occasional eye contact; some mumbling, little or no expression; nervous, some distracting mannerisms; reads much of slide.	Most of audience can hear presentation; eye contact most of the time; clear voice, but not as expressive; a little nervous, not as polished.	Entire audience can hear presentation; maintains eye contact with audience; clear, expressive voice; poised, good posture, no distracting mannerisms.
4.	Presentation	Some problems with sequencing, lacks clear	Most information presented in	Presented in logical sequence; introduction and

		transitions; incomplete or overly detailed introduction; emphasis given to less important information.	logical sequence; clear introduction; adequate background; some irrelevant information	background give proper context; key points and conclusions are clear and well developed.
5.	Report	Seminar report is according to the specified format but some mistakes. In-sufficient references and citations. all key concepts are not explained and very little relevance to	Seminar report Is according to the specified format; references and citations are appropriate but not mentioned well; complete explanation of	Seminar report is according to the specified format; references and citations are appropriate and well mentioned; complete explanation of the key concepts

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - CBCS-2024 -2025

Course Title	**RESEARCH INTERNSHIP/INDUSTRY INTERNSHIP**						
Course Code	**21ISI802**						
Category	Intership						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	One Contact hour/ week for interaction between the faculty and students						**15**
CIE Marks: 100	**SEE Marks: 100**		**Total Max. marks=200**		**Duration of SEE: 03**		

Introduction:

Research Internship /Industry Internship of sufficient duration encourages students early on in their career. Its main goal is to give an opportunity to improve their analytical and technical skills in an international environment. Internship can be in an industry or at an appropriate work place. Research internships and industrial internships have different purposes and come with their set of benefits. A prior experience in any field is always preferred over a fresh start. Therefore, one of them can be selected depending on the interest the students have. Internships pose unexpected challenges and make students to think appropriately, tackle difficulties with ease and act in a scholarly way to get past the hurdles and practical constraints. An internship is always beneficial however good or bad it is. Internships not only enhance one's learning but also identifies him/her as someone who has the commitment to approaching a project and completing it with or without the guidance. The internship learning is an impetus to professional development. While research internship is a step stone to higher studies, an industry internship is a pathway for a placement. Those who are self-motivated and interested in search of new things that are original and unique can choose a research internship. Those who are interested in the real industry- experience and aspire to get a job soon after graduation can choose an industry internship

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self-motivated and interested in search of new things that are original and unique can choose a research internship. Those who are interested in the real industry- experience and aspire to get a job soon after graduation can choose an industry internship

Methodology for Conducting Research/Industry Internship:

Step 1	**Selection and Assignment of Research/Industry Projects**	
	Voluntary Selection	1. Students are encouraged to explore the ongoing projects in the industry and select the project related to the domain in case of industry internship. 2. Students are encouraged to voluntarily select a topic for their research internship. 3. The selected topic should be aligned with their interests and academic background. 1. Students should prepare a clear and detailed description of the proposed project, highlighting what will be done and the scientific insight.
	Assignment by Faculty or Organization	Students can opt for projects assigned by faculty supervisors, which are part of larger research projects. Alternatively, students can undertake projects offered by organizations, focusing on real-world applications. 1. Projects can be single-disciplinary or multidisciplinary, covering fields such as science, technology, engineering, mathematics, management, and business studies.
Step 2	**Skills Development**	
	Communication Skills	2. Encourage students to develop strong communication skills for effective collaboration with guides, co-workers, and administrators. 24) Provide training on presenting research findings clearly and concisely
	Technical Skills	25) Students should gain proficiency in tools and software relevant to their research, such as data collection meters, statistical software (e.g., SPSS), and Microsoft Office Suite. 26) Offer workshops or training sessions on these tools and software
	Research Skills	27) Emphasize the importance of critical thinking, data analysis, and documentation. 28) Provide guidance on conducting literature surveys, designing experiments, and formulating

		hypotheses
	Soft Skills	29) Promote planning and scheduling, attention to detail, and time management. 30) Encourage ethical practices and maintaining quality and safety standards in research
Step 3	**Internship Structure and Supervision**	
	Initial Phase	31) Students begin with a literature survey to gain an understanding of the research work and context. 32) Collaborate with the researcher or faculty supervisor to design the project plan and objectives.
	Mid-Term Review	33) Conduct a mid-term oral presentation to a review committee for feedback and suggestions. 34) This helps in assessing the progress and making necessary adjustments
	Research and Development	35) Engage in regular data collection, analysis, and implementation of research ideas. 36) Participate in discussions, meetings, symposiums, and lectures to learn new scientific techniques and design experiments
	Documentation and Reporting	37) Maintain detailed records of research activities, data collected, and analyses performed. 38) Write interim and final reports, ensuring clarity and comprehensiveness. 39) Assist in writing research papers and preparing presentations
	Final Presentation and Submission	40) Present the research findings to a committee of faculty members and peers. 41) Submit the final report, including all documentation and analyses
Step 4	**Evaluation and Feedback**	
	Regular Assessments	42) Faculty supervisors should conduct regular assessments to monitor progress and provide feedback 43) Encourage self-assessment and peer review to foster a collaborative learning environment.
	Final Evaluation	44) The final evaluation should be based on the quality of research, innovation, practical application, and the effectiveness of the final presentation. 45) Provide constructive feedback to help students improve their research skills
Step 5	**Responsibilities of Interns**	
	Collaboration	46) Assist researchers in ongoing projects or work collaboratively on new projects. 47) Engage in meaningful discussions and contribute ideas

	Skill Acquisition	48) Become familiar with tools and software used in data collection and analysis. 49) Develop skills in report writing, presentation, and independent correspondence
	Time Management	50) Manage time effectively to balance research activities with other academic commitments. 51) Keep track of project progress and adhere to deadlines
	Ethics and Quality	52) Adhere to ethical standards and maintain high-quality research practices. 53) Ensure accuracy and reliability in data collection and analysis

54) The Internship Programme duration is of **Twenty four Weeks** and it should be carried out in VIII semester. The internship can be carried out in any industry /R and D Organization/Research Institute/ reputed educational institute.

55) The Department/college shall nominate staff member/s to facilitate, guide and supervise students under internship. The students shall report the progress of the internship to the guide in regular intervals and seek his/her advice.

56) After the completion of Internship, students shall submit a report with completion and attendance certificates to the Head of the Department with the approval of both internal and external guides.

57) The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two faculty members of the Department, one of whom shall be the Guide. The CIE marks awarded for the internship, shall be based on the evaluation of the diary, report, presentation skill and question and answer session in the ratio 50:25:25. The marks awarded for the internship report shall be the same for all the batch mates**.**

58) **100 marks for Viva – Voce** conducted during SEE. The minimum requirement of CIE marks shall be **50% of the maximum marks**.

59) The internal guide shall award the marks for internship report after evaluation. The external guide from the industry shall be an examiner for the viva voce on Internship. Viva-Voce on internship shall be conducted at the college and the date of Viva-Voce shall be fixed in consultation with the external Guide.

60) The Examiners shall jointly award the Viva- Voce marks.In case the external Guide expresses his inability to conduct viva voce, the Chief Superintendent

of the institution shall appoint a senior faculty of the Department to conduct viva-voce along with the internal guide. The same shall be informed in writing to the concerned Chairperson, Board of Examiners (BOE).

61) The students are permitted to carry out the internship anywhere in India or abroad.

Rubrics for Assessment of Student Performance in Research/Industry Internship

Sl. No	Assessment Criteria	Marks
1	Daily report, Punctuality of intern and conduct and character	**25**
2	Tactfulness and politeness with colleagues and the public Attitude regarding professionalism, Reading Behavioral attitude	
3	Inquisitiveness and eagerness to learn and Research attitude,	**5**
4	Problem-solving techniques and Innovation mind-set	**10**
5	Time management and meeting the deadline	**5**
6	Receptiveness to feedback and critiques	**5**
7	Ability to work in a team as a member, Ability to work without supervision	**5**
8	Supervisory skills and leadership skills and Judgment and decision-making skills, Writing skills, oral communication skills, technical communication skills, computer skills, analysis skills and business writing skills	**10**
9	Appropriateness of technical skills, Familiarization to writing technical papers, standards, codes and so on	**10**
10	Internship Report	**25**
	Total	**100**