PANIMALAR
ENGINEERING COLLEGE

An Autonomous Institution
Approved by AICTE, New Delhi | Affiliated to Anna University, Chennai

CURRICULUM & SYLLABUS
REGULATION 2023

FOR THE STUDENTS ADMITTED DURING 2023-24

B.TECH - ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

www.panimalar.ac.in

PANIMALAR ENGINEERING COLLEGE

(An Autonomous Institution, Affiliated to Anna University, Chennai)

Bangalore Trunk Road, Varadharajapuram,
Poonamallee, Chennai – 600 123.

B.TECH. – ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

CURRICULUM AND SYLLABUS

REGULATION-2023

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA

VISION

To produce high quality creators and ethical engineers for innovative technology in the field of Artificial Intelligence and Data Science.

MISSION

- To develop the department as a center of Artificial Intelligence for significant breakthroughs in advancing the promise of human-machine systems that can address complex cognitive tasks.

- To impart quality and value-based education and contribute towards the innovation of computing Data Science for the translation of data into information to support and improve decision making.

- To produce ethical engineers and researchers by inculcate the values of humanity and courage in producing relevant solutions to address business and societal challenges.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

1. To provide graduates with the proficiency to utilize the fundamental knowledge of Basic Sciences, mathematics and statistics to build systems that require management and analysis of large volume of data.

2. To inculcate the students to focus on augmenting the knowledge to improve the performance for the AI era and also to serve the analytical and data-centric needs of a modern workforce.

3. To enable graduates to illustrate the core AI and Data Science technologies, applying them in ways that optimize human-machine partnerships and providing the tools and skills to understand their societal impact for product development.

4. To enrich the students with necessary technical skills to foster interdisciplinary research and development to move the community in an interesting direction in the field of AI and Data Science.

5. To enable graduates to think logically, pursue lifelong learning and collaborate with an ethical attitude to become an entrepreneur.

PROGRAM OUTCOMES (PO)

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

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

3. 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. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information.

5. 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. 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. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of need for sustainable development.

8. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

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

10. Communicate effectively on complex engineering activities with the engineering community and with society at large. Some of them are, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. 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. Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSO)

PSO1: Graduates should be able to evolve AI based efficient domain specific processes for effective decision making in several domains such as business and governance domains.

PSO2: Graduates should be able to arrive at actionable Fore sight, Insight, hind sight from data for solving business and engineering problems

PSO3: Graduates should be able to create, select and apply the theoretical knowledge of AI and Data Analytics along with practical industrial tools and techniques to manage and solve wicked societal problems

B.Tech- Artificial Intelligence and Data Science

CHOICE BASED CREDIT SYSTEM (CBCS)

I - VIII SEMESTERS CURRICULUM AND SYLLABI (REGULATION 2023)

Semester I							
S. No	COURSE CODE	COURSE TITLE	Category	L/T/P	Contact Hours	Credit	Ext / Int Weightage
Theory Courses							
1	23MA1101	Matrices and Calculus	BS	3/1/0	4	4	60/40
2	23ES1101	Problem Solving using C Programming	ES	3/0/0	3	3	60/40
Theory Cum Practical Courses							
3	23HS1101	Communicative English and Language Skills	HS	2/0/2	4	3	50/50
4	23PH1101	Engineering Physics	BS	2/0/2	4	3	50/50
5	23ES1102	Basic Electrical and Electronics Engineering	ES	3/0/2	5	4	50/50
Laboratory Course							
6	23ES1111	Problem Solving using C Programming Laboratory	ES	0/0/4	4	2	40/60
Mandatory Course							
7	23TA1101	தமிழர் மரபு / Heritage of Tamils	HS	1/0/0	1	1	60/40
TOTAL					25	20	

Semester II							
S. No	COURSE CODE	COURSE TITLE	Category	L/T/P	Contact Hours	Credit	Ext/Int Weightage
Theory Courses							
1	23MA1203	Transforms and Vector Calculus	BS	3/1/0	4	4	60/40
2	23AD1201	Data Structures and Algorithms	PC	3/0/0	3	3	60/40
3	23ES1103	Engineering Graphics	ES	2/0/2	4	3	60/40
4	23ES1201	Python Programming	ES	3/0/0	3	3	60/40
Theory Cum Practical Courses							
5	23HS1201	Communicative and Aptitude Skills	HS	2/0/2	4	3	50/50
Laboratory Courses							
6	23AD1211	Data Structures and Algorithms Laboratory	PC	0/0/4	4	2	40/60
7	23ES1211	Python Programming Laboratory	ES	0/0/4	4	2	40/60
8	23ES1212	Technical Skill Practices-I	EEC	0/0/2	2	1	40/60
Mandatory Courses							
9	23TA1201	தமிழரும் தொழில் நுட்பமும் / Tamils and Technology	HS	1/0/0	1	1	60/40
10		Mandatory Course I	MC	2/0/0	2	0	0/100
TOTAL					31	22	

Semester III

S. No	COURSE CODE	COURSE TITLE	Category	L/T/P	Contact Hours	Credit	Ext / Int Weightage
Theory Courses							
1.	23MA1304	Mathematical Foundations for Artificial Intelligence	BS	3/1/0	4	4	60/40
2.	23AD1301	Internals of Computer Systems	ES	3/0/0	3	3	60/40
3.	23AD1302	Artificial Intelligence and Expert Systems	PC	3/0/0	3	3	60/40
4.	23AD1303	Object Oriented Programming Paradigm	PC	3/0/0	3	3	60/40
5.	23CS1303	Database Management Systems	PC	3/0/0	3	3	60/40
Laboratory Course							
6.	23AD1311	Artificial Intelligence and Expert Systems Laboratory	PC	0/0/4	4	2	40/60
7.	23AD1312	Object Oriented Programming Paradigm Laboratory	PC	0/0/4	4	2	40/60
8.	23CS1312	Database Management Systems Laboratory	PC	0/0/4	4	2	40/60
9.	23ES1311	Technical Skill Practices II	EEC	0/0/2	2	1	40/60
Mandatory Course							
10.		Mandatory Course-II	MC	2/0/0	2	0	60/40
TOTAL					**32**	**23**	

Semester IV

S. No	COURSE CODE	COURSE TITLE	Category	L/T/P	Contact Hours	Credit	Ext/Int Weightage
Theory Courses							
1.	23MA1405	Probability and Statistical techniques for Data Science	BS	3/1/0	4	4	60/40
2.	23AD1401	Machine Learning	PC	3/0/0	3	3	60/40
3.	23AD1402	Basics of Data Science	PC	3/0/0	3	3	60/40
4.	23AD1403	Software Development and Practices	PC	3/0/0	3	3	60/40
5.		Open Elective I	OE	3/0/0	3	3	60/40
Theory Cum Practical Courses							
6.	23AD1404	System Software and Operating Systems	PC	2/0/2	4	3	50/50
Laboratory Courses							
7.	23AD1411	Machine Learning Laboratory	PC	0/0/4	4	2	40/60
8.	23AD1412	Data Science Laboratory	PC	0/0/4	4	2	40/60
9.	23ES1411	Technical Skill Practices III	EEC	0/0/2	2	1	40/60
TOTAL					**30**	**24**	

S. No	COURSE CODE	COURSE TITLE	Category	L/T/P	Contact Hours	Credit	Ext/Int Weightage
Semester V							
					Contact Hours	**Credit**	**Ext/Int Weightage**
Theory Courses							
1.	23AD1501	Formal Language and Automata Theory	PC	3/0/0	3	3	60/40
2.	23AD1502	Data Communication and Network Security	PC	3/0/0	3	3	60/40
3.	23AD1503	Data Analytics	PC	3/0/0	3	3	60/40
4	23AD1504	Knowledge Engineering and Intelligent Systems	PC	3/0/0	3	3	60/40
5.		Professional Elective I	PE	3/0/0	3	3	60/40
Theory Cum Practical Courses							
6.	23AD1505	Data Exploration and Visualization	PC	3/0/2	5	4	50/50
Laboratory Courses							
7.	23AD1511	Data Analytics Laboratory	PC	0/0/4	4	2	40/60
8.	23AD1512	Knowledge Engineering and Intelligent Systems Laboratory	PC	0/0/4	4	2	40/60
9.	23ES1511	Technical Skill Practices IV	EEC	0/0/2	2	1	40/60
TOTAL					**30**	**24**	

S. No	COURSE CODE	COURSE TITLE	Category	L/T/P	Contact Hours	Credit	Ext/Int Weightage
Semester VI							
					Contact Hours	**Credit**	**Ext/Int Weightage**
Theory Courses							
1.	23AD1601	Deep Learning	PC	3/0/0	3	3	60/40
2.	23AD1602	Augmented Reality and Virtual Reality with AI	PC	3/0/0	3	3	60/40
3.	23ML1604	Natural Language Processing	PC	3/0/0	3	3	60/40
4.		Professional Elective II	PE	3/0/0	3	3	60/40
5.		Open Elective – II	OE	3/0/0	3	3	60/40
Theory Cum Practical Courses							
6.	23AD1603	Digital Image Processing	PC	2/0/2	4	3	50/50
Laboratory Courses							
7.	23AD1611	Deep Learning Laboratory	PC	0/0/4	4	2	40/60
8.	23AD1612	Augmented Reality and Virtual Reality with AI Laboratory	PC	0/0/4	4	2	40/60
9.	23ES1611	Technical Skill Practices V	EEC	0/0/2	2	1	40/60
TOTAL					**29**	**23**	

S. No	COURSE CODE	COURSE TITLE	Category	L/T/P	Contact Hours	Credit	Ext/Int Weightage
Semester VII							
Theory Courses							
1.	23AD1701	Business Analytics	PC	3/0/0	3	3	60/40
2.	23AD1702	Computer Vision	PC	3/0/0	3	3	60/40
3.		Professional Elective III	PE	3/0/0	3	3	60/40
4.		Professional Elective IV	PE	3/0/0	3	3	60/40
Theory Cum Practical Courses							
5.	23AD1703	AI and Robotics	PC	3/0/2	5	4	50/50
Laboratory Courses							
6.	23AD1711	Computer Vision Laboratory	PC	0/0/4	4	2	40/60
7.	23AD1712	Innovation Practices and Mini Project	EEC	0/0/4	4	2	40/60
TOTAL					**25**	**20**	

S. No	COURSE CODE	COURSE TITLE	Category	L/T/P	Contact Hours	Credit	Ext/Int Weightage
Semester VIII							
Theory Courses							
1.		Professional Elective V	PE	3/0/0	3	3	60/40
2.		Professional Elective VI	PE	3/0/0	3	3	60/40
Laboratory Courses							
3.	23AD1811	Project Work	EEC	0/0/16	16	8	40/60
TOTAL					**22**	**14**	
Total No. of Credits: 170							

CREDIT DISTRIBUTION

S.No	Subject Area	Credits Per Semester								Credits Total	Percentage %
	Semester	I	II	III	IV	V	VI	VII	VIII		
1.	Humanities and Social Studies (HS)	4	4							8	4.71
2.	Basic Sciences (BS)	7	4	4	4					19	11.18
3.	Engineering Sciences (ES)	9	8	3						20	11.76
4.	Professional Core (PC)		5	15	16	20	16	12		84	49.41
5.	Professional Electives (PE)					3	3	6	6	18	10.59
6.	Open Electives (OE)				3		3			6	3.53
7.	Project Work (PR/EEC)		1	1	1	1	1	2	8	15	8.82
8.	Non-Credit/ (Mandatory)		0	0						0	0
	TOTAL	**20**	**22**	**23**	**24**	**24**	**23**	**20**	**14**	**170**	**100**

23MA1101	**MATRICES AND CALCULUS**	L	T	P	C
		3	1	0	4

COURSE OBJECTIVE

- Matrix algebra can be readily applied to the structural properties of graphs from an algebraic point of view.
- To introduce the concepts of limits, continuity, derivatives and maxima and Minima.
- To Familiarize the functions of two variables and finding its extreme points.
- To provide understanding of various te4chniques of integration.
- To introduce integral ideas in solving areas, volumes and other practical problems.

UNIT I   MATRICES   9+3

Eigenvalues and Eigenvectors of a real matrix - Characteristic equation -Properties of Eigenvalues and Eigenvectors -Cayley Hamilton theorem -Diagonalization of matrices- Reduction of a quadratic form to canonical form by orthogonal transformation - Nature of quadratic forms.

UNIT II   DIFFERENTIAL CALCULUS   9+3

Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules (Sum, Product & Quotient rule, Chain rule, logarithmic and implicit differentiation) - Maxima and Minima of functions of one variable and its applications**.**

UNIT III   FUNCTIONS OF SEVERAL VARIABLES   9+3

Partial differentiation - Total derivative - Change of variables — Jacobian's - Taylor's series for functions of two variables - Maxima and minima of functions of two variables - Lagrange's method of undetermined multipliers.

UNIT IV   INTEGRAL CALCULUS   9+3

Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts - Bernoulli's formula- Integration of rational functions by partial fraction - Improper integrals - Applications: Hydrostatic force and pressure, moments and centres of mass.

UNIT V   MULTIPLE INTEGRALS   9+3

Double integrals in Cartesian and polar coordinates - Change of order of integration in Cartesian coordinates - Area enclosed by plane curves - Change of variables in double integrals -Triple integrals - Volume of Solids.

TOTAL :60 PERIODS

COURSE OUTCOME

Upon successful completion of the course, students will be able to

CO1   Able to find Eigen values and Eigen vectors, diagonalization of a matrix, symmetric matrices, positive definite matrices.

CO2   Apply limit definition and rules of differentiation to differentiate functions.

CO3   Understand familiarity in the knowledge of Maxima and Minima, Jacobian, Taylor series and apply the problems involving Science and Engineering.

CO4   Understand the knowledge of Integration by parts, Integration of rational functions by partial fraction.

CO5   Understand the knowledge of Area enclosed by plane curves, Change of variables in double integrals, Triple integrals, Volume of Solids.

TEXT BOOKS

1. Gerwal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi,44rdEdition, 2018.
2. James Stewart, "Calculus: Early Transcendental", Cengage Learning, 9thEdition, New Delhi, 2015.
3. Bali N., Goyal M. and Walkins C., "Advanced Engineering Mathematics", FirewallMedia (An

REFERENCE BOOKS

1. Narayanan, S. and Manicavachagom Pillai, T. K., "Calculus" Volume I and II, S. Viswanathan Publishers Pvt.Ltd.Chennai, 2007.
2. Srimantha Paland Bhunia, S.C, "Engineering Mathematics "Oxford University Press,2015.
3. B.V. Ramana"Higher Engineering Mathematics", McGraw Hill Education, India.
4. Erwin Kreyzig, Advanced Engineering Mathematics, JohnWiley sons, 10th Edition,2015.
5. Siva Ramakrishna Dass, C. Vijayakumari, "Engineering Mathematics", Pearson Education India, 4th Edition 2019.
6. Sundar Raj. M and Nagarajan. G , "Engineering Mathematics-I",3rd Edition, SreeKamalamani Publications, Chennai, 2020.

ONLINE COURSES / RESOURCES

1.https://onlinecourses.nptel.ac.in/noc21_ma60/preview

2.https://onlinecourses.nptel.ac.in/noc21_ma58/preview

CO-PO MAPPING

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

23ES1101	PROBLEM SOLVING USING C PROGRAMMING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE

- To learn the syntax for C programming
- To develop C Programs using basic programming constructs
- To develop C programs using arrays and strings
- To develop applications in C using functions, pointers
- To develop applications using structures and union

UNIT I   BASICS OF C PROGRAMMING   9

Introduction to programming paradigms – Algorithms – Flowchart - Structure of C program - C programming: Data Types – Storage classes - Constants – Enumeration Constants - Type Conversion Keywords – Operators: Precedence and Associativity - Expressions - Input/Output statements, Format specifiers, Assignment statements – Decision making statements - Switch statement – Break – Continue - Goto statement - Looping statements – Pre-processor directives - Compilation process.

UNIT II   ARRAYS AND STRINGS   9

Introduction to Arrays: Declaration, Initialization — One dimensional array — Example Program: Computing Mean, Median and Mode - Two dimensional arrays – Example Program: Matrix Operations (Addition, Multiplication, Determinant and Transpose) - String operations: length, compare, concatenate, copy, Reverse and Palindrome — Selection sort, Insertion sort - linear and binary search.

UNIT III   FUNCTIONS AND POINTERS   9

Introduction to functions: Function prototype, function definition, function call, Built-in functions (string functions, math functions) — Recursion — Example Program: Computation of Sine series, Scientific calculator using built-in functions, Binary Search using recursive functions – Pointers – Pointer operators – Pointer arithmetic – Arrays and pointers – Array of pointers – Example Program: Sorting of names – Parameter passing:Pass by value, Pass by reference – Example Program: Swapping of two numbers and changing the value of a variable using pass by reference.

UNIT IV   STRUCTURES AND UNION   9

Structure - Nested structures– Pointer and Structures– Array of structures – Example Program using structures and pointers – Self-referentials structures – Dynamic memoryallocation — Singly linked list– typedef and Union.

UNIT V   FILE PROCESSING   9

Files – Types of file processing: Sequential access, Random access – Sequential access file - Example Program: Finding average of numbers stored in sequential access file - Random access file - Example Program: Transaction processing using random access files – Command line arguments.

TOTAL :45 PERIODS

COURSE OUTCOME

Upon successful completion of the course, students will be able to:
CO1 Learn the syntax for C programming
CO2 Develop simple applications in C using basic constructs
CO3 Design and implement applications using arrays and strings
CO4 Develop and implement applications in C using functions and pointers.
CO5 Develop applications in C using structures and union.

TEXT BOOKS

1. Reema Thareja, —Programming in C, Oxford University Press, Second Edition, 2016.
2. Kernighan, B.W and Ritchie,D.M, —The C Programming language, Second Edition,Pearson Education, 2006.

REFERENCE BOOKS

1. Paul Deitel and Harvey Deitel, ―― C How to Program, Seventh edition, Pearson Publication, 2015
2. Juneja, B. L and Anita Seth, —Programming in C, CENGAGE Learning India pvt.Ltd.,2011
3. Pradip Dey, Manas Ghosh, —Fundamentals of Computing and Programming in C, FirstEdition, Oxford University Press, 2009.
4. Anita Goel and Ajay Mittal, —Computer Fundamentals and Programming in C, Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.
5. Byron S. Gottfried, "Schism"s Outline of Theory and Problems of Programming withC",McGraw-Hill Education, 1996.

CO-PO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	1	-	1	-	-	-	-	-	-
CO2	2	1	1	1	2	1	-	-	-	-	-	-
CO3	3	2	2	1	3	1	-	-	-	-	-	-
CO4	3	2	2	1	3	1	-	-	-	-	-	-
CO5	2	1	1	1	2	1	-	-	-	-	-	-
CO6	2	1	1	1	2	1	-	-	-	-	-	-

23HS1101	COMMUNICATIVE ENGLISH AND LANGUAGE SKILLS	L	T	P	C
		2	0	2	3

COURSE OBJECTIVE

- To induce the basic reading and writing skills among the first year engineering and technology students.
- To assist the learners to develop their listening skills, which will enable them listening to lectures and comprehend them by asking questions and seeking clarifications
- To succor the learners to develop their speaking skills and speak fluently in real contexts.
- To motivate the learners to develop vocabulary of a general kind by developing their reading skills for meeting the competitive exams like GATE, TOFEL, GRE, IELTS, and other exams conducted by Central and State governments
- To learn to use basic grammatical structures in suitable contexts

UNIT I   INFORMAL COMMUNICATION   6

Listening: Listening and filling details, Listening to Speeches by Specialists and Completing Activities such as Answering Questions, Identifying the Main Ideas, Style, etc. **Speaking**: Introducing One-self — Introducing a Friend/ Family. **Reading**: Descriptive Passages (From Newspapers / Magazines).**Writing**: Autobiographical Writing, Developing Hints. **Grammar**: Noun, Pronoun & Adjective. **Vocabulary Development**: One Word Substitution.

UNIT II   CONVERSATIONAL PRACTICE   6

Listening: Listening to Conversations (Asking for and Giving Directions).**Speaking**: Making Conversation Using (Asking for Directions, Making an Enquiry), Role Plays, and Dialogues. **Reading**: Reading a Print Interview and Answering Comprehension Questions. **Writing**: Writing a Checklist, Dialogue Writing **Grammar**: Tenses and Voices, Regular and Irregular Verbs. **Vocabulary Development**: Prefix &Suffix, Word formation.

UNIT III   OFFICIAL COMMUNICATIONS   6

Listening: Listening for specific information. Speaking: Giving Short Talks on a given Topic. **Reading**: Reading Motivational Essays on Famous Engineers and Technologists (Answering Open-Ended and Closed Questions).**Writing**: Writing Permission Letters/Editor, Complaint, and Invitation. Emails and Review Writing-Books, Films. **Grammar**: Adverb, Prepositions & Conjunctions. **Vocabulary Development**: Collocations — Fixed Expressions.

UNIT IV   COMMUNICATION AT WORK PLACE   6

Listening: Listening to Short Talks (5 Minutes Duration and Fill a Table, Gap-Filling Exercise) Note Taking/Note Making .**Speaking**: Small Group Discussion, Giving Recommendations. **Reading**: Reading Problem — Solution Articles/Essays Drawn From Various Sources .**Writing**: Making Recommendations. **Grammar**: Subject-Verb Agreement, Framing Questions. **Vocabulary Development**: Infinitives and Gerunds, Reference Words, Technical Vocabulary.

UNIT V DEFINITIONS AND PRODUCT DESCRIPTION 6

Listening: Listening to a Product Description (Labelling and Gap Filling) Exercises. **Speaking**: Describing a Product and Comparing and Contrasting it with Other Products. **Reading**: Reading Graphical Material for Comparison (Advertisements).**Writing**: Essay Writing. Compare and Contrast Paragraphs, Essay writing. **Grammar**: Phrasal Verbs — Cause and Effect Sentences –Compound Nouns and Definitions. **Vocabulary Development:** Use of Discourse Markers.

THEORY :30 PERIODS

TEXT BOOKS

1. N P Sudharshana & C Savitha. English for Technical Communication Delhi: CUP,2019.
2. Board of Editors. English for Engineers and Technologists Volume 1 Orient Black SwanLimited, 2020.

REFERENCE BOOKS

1. Board of Editors. Using English-A course book for Undergraduate engineers and Technologists Orient Black Swan Limited, 2017
2. Bailey, Stephen. Academic Writing: A Practical Guide for Students. New York: Rutledge, 2011.
3. Comfort, Jeremy, et al. Speaking Effectively: Developing Speaking Skills for Business English. Cambridge University Press, Cambridge: Reprint 2011 3. Means,
4. L. Thomas and Elaine Langlois. English & Communication For Colleges. Cengage Learning, USA:2007.
5. Redston, Chris &Gillies Cunningham Face2Face (Pre-intermediate Student's Book& Workbook) Cambridge University Press, New Delhi: 2005.

WEB REFERENCES

1. https://learnenglishteens.britishcouncil.org/exams/grammar-and-vocabulary -exams/wordformation
2. https://cdn.s3waas.gov.in/s347d1e990583c9c67424d369f3414728e/uploads/2018/02/20180316 21.pdf
3. http://xn--englishclub-ql3f.com/grammar/parts-of-speech.htm
4. https://www.edudose.com/english/grammar-degree-of-comparison-rules/

ONLINE COURSES / RESOURCES

1. https://basicenglishspeaking.com/wh-questions/
2. https://agendaweb.org/verbs/modals-exercises.html
3. https://cdn.s3waas.gov.in/s347d1e990583c9c67424d369f3414728e/uploads/2018/02/20 18031621.pdf
4. https://www.ego4u.com/en/cram-up/grammar/prepositions

LIST OF EXPERIMENTS

1. Listen to lectures- articulate a complete idea as opposed to producing fragmentedutterances- Tedtalks, Science Fiction- My Fair Lady
2. Listening — following, responding to explanations, giving directions and instructions in academic and business contexts- IELTS,TOEFL.
3. Listening to transcripts and answer to the questions.
4. Listening for specific information: accuracy and fluency – BEC.
5. Reading: Different Text Type.
6. Reading: Predicting Content using pictures and titles.
7. Reading: Use of Graphic Organizers to review.

8. Reading: Aid Comprehension.
9. Reading: Speed Reading Techniques.
10. Reading and Comprehending the passages in the competitive exams like GATE, TOEFL,GRE,IELTS and other exams conducted by   Central and state Govern

PRACTICAL : 30 PERIODS
TOTAL : 60 PERIODS

REFERENCE BOOKS

1. SureshKumar.E and et al. Enriching Speaking and Writing Skills. Second Edition. Orient Blackswan: Hyderabad,2012
2. Davis, Jason and Rhonda Liss. Effective Academic Writing (level 3) Oxford University Press: Oxford,2006
3. Withrow, Jeans and et al. Inspired to write. Reading and Tasks to develop writing skills. Cambridge   University Press: Cambridge,2004**.**

COURSE OUTCOME

Upon successful completion of the course, students will be able to:

CO1   Comprehend conversation and short talks delivered in English.
CO2   Participate effectively in informal conversation; introduce themselves and their friends and express opinions English.
CO3   Read articles of a general kind in magazines and newspaper
CO4   Write short essays of a general kind and personal letters and emails in English.
CO5   Gain understanding of basic grammatical structures and use them in right context.
CO6   Use appropriate words in a professional context.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	3	3	-	2
CO2	-	-	-	-	-	-	-	-	3	3	-	2
CO3	-	-	-	-	-	-	-	-	2	3	-	2
CO4	-	-	-	-	-	-	-	-	2	3	-	2
CO5	-	-	-	-	-	-	-	-	2	3	-	2
CO6	-	-	-	-	-	-	-	-	3	3	-	2

23PH1101	ENGINEERING PHYSICS	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES

- To impart knowledge in basic concepts of physics relevant to engineeringapplications
- To introduce advances in technology for engineering applications

UNIT – I   PROPERTIES OF MATTERS   6

Elasticity: Stress, strain, Hooke's law and elastic moduli – stress-strain diagram – twisting couple per unit twist for solid cylinder – torsional pendulum (theory) – bending moment of beam – non-uniform and uniform bending (theory)– I-shape girder.

Thermal Physics: Mode of heat transfer: conduction, convection and radiation – thermal expansion of solids – bimetallic strips – thermal conductivity – Forbe's method and Lee's disc method; theory and experiment – thermal insulation – applications.

UNIT – II   SEMICONDUCTING AND MAGNETIC MATERIALS   6

Semiconducting Materials: Intrinsic Semiconductors – energy band diagram – carrier concentration in intrinsic semiconductors – extrinsic semiconductors (N-type & P-type) – variation of carrier concentration with temperature – variation of Fermi level with temperature and impurity concentration – Zener and avalanche breakdown in p-n junctions – Ohmic contacts – Schottky diode – tunnel diode.

Magnetic Materials: Magnetism in materials – Basic definitions – Classifications of Magnetic Materials- Ferromagnetic Domain theory – M versus H behavior- Hard and Soft Magnetic materials- Magnetic principle in Computer data storage – Magnetic HardDisc and Embedded systems**.**

UNIT – III   MODERN OPTICS   6

Laser: Population of energy levels, Einstein's A and B coefficients derivation — optical amplification (qualitative) — Semiconductor lasers: homo junction and hetero junction **– Fiber Optics**: components and principle of fiber optics — numerical aperture and acceptance angle derivation — types of optical fibers (material, refractive index, mode) —losses associated with optical fibers– fiber as pressure and displacement sensors.

UNIT –IV   QUANTUM PHYSICS AND NANOSCIENCE   6

Quantum Physics: Blackbody radiation – Planck's hypothesis and derivation – wave particle duality of light: concepts of photon – de Broglie hypotheses – concept of wave function and its physical significance – Schrödinger's wave equation – time independentand time dependent equations.

Nanoscience: Introduction – Classification of nanomaterials – preparation (bottom up and top-down approaches), mechanical, optical and electrical properties – applications: NEMS and MEMS– carbon nanotubes: types.

UNIT –V   ELECTROMAGNETIC WAVES   6

Divergence – curl – integral calculus – Gauss divergence theorem – Stoke's theorem – equation of continuity – displacement current – Maxwell's equations – Gauss's laws – Faraday's law –Ampere-Maxwell law – mechanism of electromagnetic wave propagation
– Hertz observation – production and detection of electromagnetic wave – properties of electromagnetic waves.

THEORY: 30

LIST OF EXPERIMENTS

1. Determination of Moment of Inertia of the disc and Rigidity Modulus of the material of the wire – Torsional Pendulum.

2. Determination of Young's Modulus – Non - Uniform Bending.

3. Determination of Thermal Conductivity of the Bad Conductor – Lee's Disc Method.

4. Determination of thickness of a thin wire – Air wedge method.

5. i) Determination of wavelength of Laser using Grating and Particle size determination.
   ii) Determination of Numerical Aperture and Acceptance angle of an Optical Fiber.

6. Determination of Velocity of ultrasonic waves in a liquid and compressibility of the liquid – Ultrasonic Interferometer.

7. Determination of wavelength of Hg source using grating by normal incidence method using spectrometer.

PRACTICAL : 30 PERIODS
TOTAL : 60 PERIODS

TEXT BOOKS

1.Ajoy Ghatak, Optics, 5th Ed., Tata McGraw Hill, 2012

2.Arthur Beiser, Shobhit Mahajan and S Rai Choudhury, Concepts of Modern Physics, 6th Edition, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2014.

3.B. K. Pandey and S. Chaturvedi, Engineering Physics, 1st edition, Cengage Learning India Pvt Ltd., New Delhi, 2017.

4.Basics of laser physics: for students http://www.springer.com/978-3- 319- 50650-0 of science and engineering

REFERENCE BOOKS

1.Halliday, D., Resnick, R. & Walker, J.—Principles of Physics, Wiley, 2015.
2.Tipler, P.A. & Mosca, G. –– Physics for Scientists and Engineers with Modern Physics'. W.H.Freeman, 2007.
3.Ruby Das, C.S. Robinson, Rajesh Kumar, Prashant Kumar Sahu, A Textbook of Engineering Physics Practical, University Science Press, Delhi, II Edition (2016),ISBN 978-93-80386-86-7

COURSE OUTCOME
Upon successful completion of the course, students will be able to:

CO1   Understand the basics properties of materials, especially elastic and thermal properties of materials.

CO2 Adequate knowledge on the concepts of semiconducting and magnetic materials and their applications in memory storage.

CO3 Acquire the knowledge on the concepts of lasers, fiber optics and their technological applications.

CO4 Get knowledge on fundamental concepts of quantum theory, Nano science its applications

CO5 Gain knowledge on the basics of electromagnetic waves and its properties.

CO-PO MAPPING

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

23ES1102	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	L	T	P	C
		3	0	2	4

COURSE OBJECTIVE
- To learn the concepts related with Electrical circuits and Wiring.
- To study the concept of electrical machines.
- To understand basics of Semiconductor Devices.
- To understand the basics of Sensors and Actuators
- To develop IOT infrastructure for Real time applications

UNIT I	BASIC ELECTRICAL CIRCUITS AND HOUSE WIRING	9

Electrical Quantities — Ohms Law — Kirchhoff's Law — Series and Parallel Connections — Earthing and its Types- basic house wring - tools and components, different types of wiring, safety measures at home and industry. **Case Study** -staircase Wiring and ceiling fan Wiring.

UNIT II	ELECTRICAL MACHINES	9

Construction, Working Principle of Dc motors, Brushless dc motor, Permanent magnet DC Motor, stepper motor, Servo Motor(No Problems). -Application of motor in Industrial automation.

UNIT III	SEMICONDUCTOR DEVICES AND CIRCUITS	9

PN junction diode -Zener diode – Half wave and Full wave rectifier, - BJT, MOSFET,IGBT-Characteristics- **Case Study**: SMPS in computer and UPS in Residential Application.

UNIT IV	SENSORS AND ACTUATORS	9

Sensors: Temperature Sensor- Pressure Sensor-Proximity Sensor, Ultrasonic sensors. Actuators: Actuation using thermal forces, Actuation using shape memory Alloys, Actuation using piezoelectric crystals. **Case Study**: Integrated sensor and actuator systems in automation.

UNIT V	EMERGING TECHNOLOGIES	9

Solar PV system- solar and battery powered Electric Vehicle - IOT Concept and its Functional blocks- Introduction to Arduino Uno. Case Study: Smart and Connected Cities: Smart Lighting-Smart Parking Architecture - Smart Traffic Control.

THEORY :45 PERIODS

TEXT BOOKS
1. Hughes revised by Mckenzie Smith with John Hilcy and Keith Brown, Electrical and Electronics Technology, 8th Edition, Pearson, 2012.
2. R.J. Smith, R.C. Dorf, Circuits Devices and Systems, 5th Edition, John Wiley and sons,2001.
3. P. S. Dhogal, Basic Electrical Engineering – Vol. I & II, 42nd Reprint, McGraw Hill,2012.
4. Clarence W. de Silva, "Sensors and Actuators: Engineering System Instrumentation", 2nd Edition, CRC Press, 2015
5. Clarence W. de Silva, "Sensors and Actuators: Engineering System Instrumentation", 2nd Edition, CRC Press, 2015
6. David Hanes, Gonzalo Salgueiro, Patrick Grossetete. Rob Barton and Jerome Henry, "IOT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017.

WEB REFERENCES

1. https://electrical-engineering-portal.com/download-center/books-and-guides/electrical-engineering/basic-course
2. https://www.infoq.com/articles/internet-of-things-reference-architecture/

ONLINE COURSES / RESOURCES

1. https://archive.nptel.ac.in/courses/117/106/117106108/
2. https://archive.nptel.ac.in/courses/108/105/108105155/
3. https://onlinecourses.nptel.ac.in/noc22_cs53/preview

LIST OF EXPERIMENTS

1. i. Study of Electronic components and equipment's – Resistor, colour coding
   ii. Soldering practice – Components Devices and Circuits–Using general purpose PCB
2. Electrical House Wiring:
3. i. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
   ii. Fluorescent lamp wiring
   iii. Stair case wiring
   iv. Study of Home Appliances- wiring and assembly
4. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
5. Design of Half wave Rectifier & Full wave Rectifier
6. Simulation of following circuits using suitable software
   i.Seven segment LED display
   ii. Stepper Motor control
   iii.Traffic Light Control
7. 2D & 3D Electrical wiring Model using suitable Software.

SOFTWARE REQUIRED: Keil/Proteus/Fusion 360

PRACTICAL: 30 PERIODS

TOTAL: 75 PERIODS

COURSE OUTCOME

On Successful Completion of the course student will be able to:

CO1   Acquire basic knowledge on Basic Electrical circuits and House Wiring.

CO2   Understand the construction, working principle and applications of DC and ACMachines

CO3   Acquire basic knowledge on semiconductor devices and their applications

CO4   Illustrate the concepts of Sensors and Actuators

CO5   Identify and analyse Various Emerging Technologies.

CO6   Analyse the applications of IOT in real time scenario.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	1		1					1
CO2	3	2	2	2	1		1					1
CO3	3	2	2	2	1		1					1
CO4	3	2	2	2	1		1					1
CO5	3	2	2	2	1		1					1
CO6	3	2	3	3	3		1					1

		L	T	P	C
23ES1111	**PROBLEM SOLVING USING C PROGRAMMING LABORATORY**	0	0	4	2

COURSE OBJECTIVES
- To write, test, and debug simple Python programs
- .To implement Python programs with conditions and loops
- To use functions for structuring Python programs.
- To represent compound data using Python lists, tuples, dictionaries.
- To learn to implement string functions and file operations
- To understand python packages and GUI development.

LIST OF EXPERIMENTS
1. Programs using I/O statements and expressions.

2. Programs using decision-making constructs

3. Write a program to find whether the given year is leap year or Not? (Hint: not every centurion year is a leap. For example 1700, 1800 and 1900 is not a leap year)

4. Design a calculator to perform the operations, namely, addition, subtraction, multiplication, division and square of a number.

5. Check whether a given number is Armstrong number or not?

6. Given a set of numbers like <10, 36, 54, 89, 12, 27>, find sum of weights basedon the following conditions

   a) if it is a perfect cube

   b) if it is a multiple of 4 and divisible by 6

   c) if it is a prime number

   d) Sort the numbers based on the weight in the increasing order as shownbelow

   <10,its weight>,<36,its weight><89,its weight>

7. Populate an array with height of persons and find how many persons are abovethe average height.

8. Given a string —a$bcd./fg‖ find its reverse without changing the position ofspecial characters. (Example input:a@gh%;j and output:j@hg%;a)

9. Convert the given decimal number into binary, octal and hexadecimal numbersusing user defined functions.

10. From a given paragraph perform the following using built-in functions:
    a) Find the total number of words.
    b) Capitalize the first word of each sentence.
    c) Replace a given word with another word.

11. a) Sort the list of numbers using Selection sort and insertion sort
    b) Sort the list of numbers using pass by reference.

12. a) Search an element from an unsorted array using linear search
    b) Search an element in an array using Binary search recursion call.

13. Generate salary slip of employees using structures and pointers.
    a) Programs using Pointers

b) Pointer demonstration the use of & and *

c) Access Elements of an Array Using Pointer

d) Perform the string operations like Length of the String , Concatenation ofstring and compare the string using Pointer

e) Count number of words, digits, vowels using pointers

f) Add two matrices using Multidimensional Arrays with pointers

g) Multiply two matrices using pointers

h) Multiply two numbers using Function Pointers

14. Compute internal marks of students for five different subjects using structuresand functions

15. Program to demonstrate the difference between unions and structures

16. Insert, update, delete and append telephone details of an individual or acompany into a telephone directory using random access file.

17. Count the number of account holders whose balance is less than the minimumbalance using sequential access file.

TOTAL: 60 PERIODS

COURSE OUTCOMES
On successful completion of the course, student will be able to:
1. Write, test, and debug simple C programs.
2. Implement C programs with conditionals and loops.
3. Develop C programs for simple applications making use arrays and strings.
4. Develop C programs involving functions, recursion, pointers, and structuresand union.
5. Design applications using sequential and random access file processing.
6. Perform task as an individual and / or team member to manage the task in time

WEB REFERENCES
1. https://www.programiz.com/c-programming/examples
2. https://beginnersbook.com/2015/02/simple-c-programs/
3. https://www.programmingsimplified.com/c-program-examples
4. https://www.tutorialgateway.org/c-programming-examples/
5. https://www.javatpoint.com/c-programs

CO-PO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2								
CO2	3	2	2	1	3							
CO3	3	3	3	2	3							
CO4	3	2	2	1	3							
CO5	3	3	3	2	3							
CO6	3	2	2	1	3							

		L	T	P	C
23TA1101	**HERITAGE OF TAMILS**	1	0	0	1

UNIT – I   **LANGUAGE AND LITERATURE**   **3**

Language Families in India - Dravidian Languages — Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land Bakthi Literature Azhwars and N ayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

UNIT – II   **HERITAGE - ROCK ART PAINTINGS TO MODERN ART –**   **3**
                            SCULPTURE

Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.

UNIT – III   **FOLK AND MARTIAL ARTS**   **3**

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

UNIT –IV   **THINAI CONCEPT OF TAMILS**   **3**

Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.

UNIT –V   **CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT**   **3**
                        AND INDIAN CULTURE

Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India —— Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books

                                  TOTAL: 15 PERIODS

TEXT-CUM REFERENCE BOOKS:

1. தமிழக வரலாறு – மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).

2. கணினித்தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).

3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)

4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை)

5. Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL — (in print)

6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies

7. Historical by: International Institute of Tamil Studies).

8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)

9. Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation,Tamil Nadu)

10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Publishedby: The Author)

11. Porunai Civilization (Jointly Published by: Department of Archaeology &Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)

12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by:RMRL) — Reference Book

		L	T	P	C
23TA1101	**தமிழர் மரபு**	1	0	0	1

UNIT – I   **மொழி மற்றும் இலக்கியம்**   **3**

இந்திய மொழிக் குடும்பங்கள் – திராவிட மொழிகள் – தமிழ் ஒரு செம்மொழி – தமிழ் செவ்விலக்கியங்கள் – சங்க இலக்கியத்தின் சமய சார்பற்ற தன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில் மேலாண்மைக்கருத்துக்கள் – தமிழ் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் – பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலக்கியங்கள் – தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி – தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

UNIT – II   **மரபு-பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை - சிற்பக்கலை**   **3**

நடுகல் முதல் நவீன சிற்பங்கள் வரை – ஐம்பொன் சிலைகள் – பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் – தேர் செய்யும் கலை – சுடுமண் சிற்பங்கள் – நாட்டுப்புறத் தெய்வங்கள் – குமரி முனையில் திருவள்ளுவர் சிலை - இசைக்கருவிகள் - மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

UNIT – III   **நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்**   **3**

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான்கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

UNIT –IV   **தமிழர்களின் திணைக் கோட்பாடுகள்**   **3**

தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்கப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக்கோட்பாடுகள் – தமிழர்கள் போற்றிய அறக்கோட்பாடு – சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் – சங்க கால நகரங்களும் துறைமுகங்களும் – சங்க காலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல் கடந்த நாடுகளில் சோழர்களின் வெற்றி

UNIT –V   **இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட் தமிழர்களின் பங்களிப்பு**   **3**

இந்திய விடுதலைப் போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறப்பகுதிகளில் தமிழ் பண்பாட்டின் தாக்கம் – சுயமரியாதை இயக்கம் – இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப்படிகள் – தமிழ் புத்தகங்களின் அச்சு வரலாறு.

TOTAL: 15 PERIODS

TEXT-CUM REFERENCE BOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).

2. கணினித் தமிழ் – முனைவர்.இல. சுந்தரம். (விகடன் பிரசுரம்).

3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)

4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை)

5. Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL — (in print)

6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: InternationalInstitute of Tamil Studies

7. Historical by: International Institute of Tamil Studies).

8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)

9. Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation,Tamil Nadu)

10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Publishedby: The Author)

11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)

12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book

23MA1203	TRANSFORMS AND VECTOR CALCULUS	L	T	P	C
		3	1	0	4

COURSE OBJECTIVE

- To acquaint the student with the concepts of vector calculus needed for problems in AI&DS discipline.
- Introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.
- To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.
- To develop Z transform techniques for discrete time systems

UNIT I   VECTOR CALCULUS   9+3

Gradient, divergence and curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stokes' theorem(excluding proofs) – Simple applications involving cubes and rectangular parallelepipeds

UNIT II   FOURIER SERIES   9+3

Dirichlet'sconditions – General Fourier series – Odd and even functions – Half range sineseries – Half range cosine series – Complex form of Fourier series – Harmonic analysis.

UNIT III   FOURIER TRANSFORMS   9+3

Statement of Fourier integral theorem – Fourier transform pair – Fourier sine and cosine transforms — Properties — Transforms of simple functions — Convolution theorem — Parseval'sidentity.

UNIT IV   LAPLACE TRANSFORM   9+3

Laplace transform – Sufficient condition for existence – Transform of elementary functions– Basicproperties – Transforms of derivatives and integrals of functions - Derivatives and integralsoftransforms - Transforms of unit step function and impulse functions – Transform of periodic functions.Inverse Laplace transforms -Statement of Convolution theorem – Initial and final value theorems.

UNIT IV   Z-TRANSFORMS AND DIFFERENCE EQUATIONS   9+3

Z- Transforms - Elementary properties – Inverse Z - transform (using partial fraction and residues) – Convolution theorem - Formation of difference equations – Solution of difference equations using Z - transform.

TOTAL :60 PERIODS

COURSE OUTCOME

Upon successful completion of the course, students will be able to

CO1 Solve gradient, divergence and curl of a vector point function and related identities. Evaluation of line, surface and volume integrals using Gauss, Stokes and Green's theorems and their verification.

CO2 Solve differential equations using Fourier series analysis which plays a vital role in engineering applications.

CO3 Determine the Fourier transforms for a function and evaluates special integrals.

CO4 Find out Laplace transform for a function using the properties

CO5 Use the effective mathematical tools for the solutions of partial differential equationsby using Z transform techniques for discrete time systems.

TEXT BOOKS

1. Veerarajan. T., "Transforms and Partial Differential Equations", Tata McGraw Hill Education Pvt. Ltd., Second reprint, New Delhi, 2012.
2. Grewal B.S., "Higher Engineering Mathematics", 43rd Edition, Khanna Publishers, New
3. Delhi, 2014.
4. Narayanan.S, ManicavachagomPillay.T.K and Ramanaiah.G "Advanced Mathematics ForEngineering Students" Vol. II & III, S.Viswanathan Publishers Pvt Ltd. 1998.

REFERENCE BOOKS

1. Bali.N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 7th Edition, Laxmi Publications Pvt Ltd, 2007.
2. Ramana.B.V., "Higher Engineering Mathematics", Tata Mc-Graw Hill Publishing CompanyLimited, New Delhi, 2008.
3. Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education,2007.
4. Erwin Kreyszig, "Advanced Engineering Mathematics", 8th Edition, Wiley India, 2007.
5. Ray Wylie. C and Barrett.L.C, "Advanced Engineering Mathematics", Sixth Edition, Tata McGraw Hill Education Pvt Ltd, New Delhi, 2012.
6. Datta.K.B., "Mathematical Methods of Science and Engineering", Cengage Learning India Pvt Ltd, Delhi, 2013.
7. Nagarajan. G and Sundar Raj. M, "Transforms and Partial Differential Equations" ,5thEdition, SreeKamalamani Publications, Chennai, 2020.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3									1
O2	3	3	3									1
CO3	3	3	3									1
CO4	3	3	3									1
CO5	3	3	3									1

		L	T	P	C
23AD1201	**DATA STRUCTURES AND ALGORITHMS**	3	0	0	3

COURSE OBJECTIVE

- To design linear data structures – lists, stacks, and queues.
- To understand non-linear data structures – trees.
- To learn sorting, searching and indexing methods to increase the knowledge of usage of datastructures in algorithmic perspective.
- To select and design data structures and algorithms that is appropriate for problems.
- To understand the concepts behind NP Completeness, Approximation algorithms.

UNIT I   ABSTRACT DATA TYPES AND LINEAR DATA STRUCTURES   9

Abstract Data Types (ADTs) - **Stack ADT** ─ Operations ─ Applications ─ Balancing Symbols – Evaluating arithmetic expressions Infix to Postfix conversion – **Queue ADT** – Operations – Circular Queue – DE Queue – Applications of Queues.

UNIT II   NON-LINEAR DATA STRUCTURES   9

Tree – Binary tree ADT-Tree -Traversals Algorithms –Search Tree – Binary Search Trees-AVL Trees (Insertion, Deletion) –Splay Trees (Insertion, Deletion, Searching)-Red-Black Trees**.**

UNIT III   DIVIDE AND CONQUER STRATEGY AND GREEDYSTRATEGY   9

Divide and Conquer Strategy: Quick Sort-Multiplication of large integers and Strassen's Matrix Multiplication**. Greedy Technique**: Prim's Algorithm - Kruskal's Algorithm- Dijkistra's Algorithm - Huffman Trees and Code.

UNIT IV   DYNAMIC PROGRAMMING AND BACKTRACKING   9

Dynamic Programming: Computing binomial coefficient - Warshall's and Floyd's algorithm. **Backtracking:** General method – N Queens Problem – Hamiltonian Circuits .Exhaustive search: DFS, BFS.

UNIT V   BRANCH-AND-BOUND,NP PROBLEMS AND APPROXIMATIONALGORITHMS   9

Branch and Bound-Assignment -Knapsack problem – Traveling salesman problem - NP-Complete and NP-Hard problems. **Approximation Algorithms** - NP Hard Problems- Knapsack and Travelling Sales Man Problem.

TOTAL :45 PERIODS

COURSE OUTCOME
Upon completion of the course, students will be able to

CO1   Design, implement, and analyse linear data structures, such as lists, queues, and stacks, according to the needs of different applications.

CO2   Implement, and analyse efficient tree structures to meet requirements such as searching, indexing, and sorting.

CO3   Analyse and design various problems using divide and conquer and greedy strategy

CO4   Create the algorithms using dynamic programming and backtracking and to solve problems.

CO5   Apply Branch and Bound technique to different real time applications.

CO6   Solve problems using approximation algorithms.

TEXT BOOKS

1. Michael T. Goodrich, Roberto Tamassia, and Michael H. Goldwasser, —Data Structures & Algorithms in Python‖, John Wiley & Sons Inc., 2021
2. Anany Levitin, "Introduction to design and analysis of algorithms",3rd Edition,Pearson Education,2017.
3. Thomas H Cormen, Charles E Leiserson, Ronald L Rivest and Clifford Stein, Introduction to Algorithms, Second Edition, Prentice Hall of India, New Delhi, 2012.

REFERENCE BOOKS

1. Alfred V. Aho, John E. Hopcroft and Jeffry D. Ullman, Data Structures and Algorithms, Pearson Education, New Delhi, 2006.
2. Mark Allen Weiss, —Data Structures and Algorithm Analysis in C++‖, Fourth Edition,Pearson Education, 2014.
3. Sara Baase and Allen Van Gelder, Computer Algorithms – Introduction to Design & Analysis, Third Edition, Pearson Education, New Delhi, 2000.
4. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Fundamentals of Computer Algorithms,Second Edition, Universities Press, Hyderabad, 2008.

WEB REFERENCES

1.https://www.geeksforgeeks.org/c-language-set-1-introduction/

2.https://www.codechef.com/certification/data-structures-and-algorithms/prepare

3.https://www.w3schools.in/data-structures-tutorial/intro/

ONLINE COURSES / RESOURCES

1.https://nptel.ac.in/courses/

2.https://www.w3schools.in/data-structures-tutorial/

3.https://www.tutorialspoint.com/data_structures_algorithms**/**

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	1	2					1	1	1	2
CO2	2	3	1	2					2	2	1	2
CO3	2	1		1					2	1	1	2
CO4	1	2	3	1								
CO5	1	1										
CO6	1	1										

23ES1103	ENGINEERING GRAPHICS	L	T	P	C
		2	0	2	3

COURSE OBJECTIVE

- Drawing Engineering curves
- Drawing orthographic projections of lines and planes
- Drawing orthographic projections of solids
- Drawing section and development of the surfaces of objects
- Drawing isometric views and intersection curves of simple solids
- Drawing free hand sketches of basic geometrical shapes, multiple views of objects and Applications of Engineering Graphics

UNIT 1   CONCEPTS AND CONVENTIONS (Not for Examination)   2

Importance of drawing in engineering applications - Use of drafting instruments - BIS conventions and specifications - Size, layout and folding of drawing sheets - Lettering and dimensioning - Introduction to Scales - Geometric construction - to draw perpendiculars, parallel lines, divide a line and circle, to draw equilateral triangle, square, regular polygons. Introduction to drafting packages like CAD and demonstration of their use in engineering fields.

UNIT I   ENGINEERING CURVES AND PROJECTION OF POINTS AND   6+6
LINES

Basic construction of cycloid, epicycloid and hypocycloid - Drawing of tangents and normal to the above curves. Construction of involutes of square, pentagon and circle - Drawing of tangents and normal to the above involutes.

Orthographic projection — Introduction to Principal Planes of projections - First angle projection - Projection of points. Projections of straight lines (only in First angle projections) inclined to both the principal planes - Determination of true lengths, true inclinations and traces by rotating line method

UNIT II   PROJECTIONS OF PLANES AND PROJECTIONS OF SOLIDS   6+6

Projection of planes (polygonal and circular surfaces) inclined to both the principal planesby rotating object method and auxillary plane method.

Projection of simple solids like prisms, pyramids, cylinder, and cone when the axis isinclined to one principle planes by rotating object method.

UNIT III   SECTIONS OF SOLIDS AND DEVELOPMENT OF SURFACES   6+6

Sectioning of solids in simple vertical position when the cutting plane is inclined to the oneof the principal planes and perpendicular to the other – obtaining true shape of section.

Development of lateral surfaces of simple solids and frustum and truncated solids – Prisms,pyramids cylinders and cones.

UNIT IV   INTERSECTION OF SOLIDS AND ISOMETRIC PROJECTIONS   6+6

Line of intersection - Determining the line of intersection between surfaces of two interpenetrating two square prisms and Intersection of two cylinders with axes of the solids intersecting each other perpendicularly, using line method.

Principles of isometric projection — isometric scale –Isometric projections and isometric views of simple solids and frustum and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions.

UNIT V   FREE-HAND SKETCHING   5+5

Steps in free hand sketching - Orthographic views (front, top and side views) of simple blocks from their Isometric view, Isometric view of simple blocks from their Orthographic views (front, top and side views)

TOTAL :60 PERIODS

COURSE OUTCOME

Upon completion of the course, students will be able to:

CO1   Draw the engineering curves and draw orthographic projections of lines and planes

CO2   Draw orthographic projections of planes and solids

CO3   Draw the sections and development of the surfaces of objects

CO4   Draw isometric projections and intersection of curves of simple solids.

CO5   Draw free hand sketching of basic geometrical shapes, multiple views of objects

TEXT BOOKS

1. Natarajan, K. V., "A text book of Engineering Graphics", 28thEd.,Dhanalakshmi Publishers, Chennai, 2015.
2. Venugopal, K. and Prabhu Raja, V., "Engineering Graphics", New Age Publications,2008.

REFERENCE BOOKS

1. Bhatt, N.D.,Panchal V M and Pramod R. Ingle, "Engineering Drawing", Charotar Publishing House, 53rd Edition, 2014.
2. Parthasarathy, N. S. and Vela Murali, "Engineering Drawing", Oxford University Press, 2015.
3. Agrawal, B. and Agrawal C.M., "Engineering Drawing", Tata McGraw, N.Delhi, 2008.

WEB REFERENCES

1. https://nptel.ac.in/courses/105/104/105104148/

2. https://www.youtube.com/channel/UCkCk0nvNyWhEOLge9JtDLDg

ONLINE COURSES / RESOURCES

1.https://nptel.ac.in/courses/112/103/112103019/

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3								3	3
CO2	3	3	3								3	3
CO3	3	3	3								3	3
CO4	3	3	3								3	3
CO5	3	3	3								3	3

23ES1201	PYTHON PROGRAMMING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To know the basic programming constructs and control structures in python
- To use python data structures – Lists, Tuples and Dictionary
- To define Python functions and use Strings
- To learn about input/output with files in Python.
- To understand python packages and GUI concepts

UNIT - I   INTRODUCTION TO PYTHON PROGRAMMING ANDCONTROL STRUCTURES   9

Introduction to Python, Demo of Interactive and script mode, Tokens in Python — Variables, Keywords, Comments, Literals, Data types, Indentation, Operators and its precedence, Expressions, Input and Print functions, Type Casting. Illustrative problems: find minimum in a list, guess an integer number in a range, Towers of Hanoi.

Control Structures: Selective statements — if, if-else, nested if, if — elif ladder statements ; Iterative statements - while, for, range functions, nested loops, else inloops, break, continue and pass statements. Illustrative programs: exchange the values of two variables,circulate the values of n variables, distance between two points.

UNIT - II   FUNCTIONS AND STRINGS   9

Functions: Types, parameters, arguments: positional arguments, keyword arguments, parameters with default values, functions with arbitrary arguments, Scope of variables: Local and global scope, Recursion and Lambda functions.Illustrative programs:power of a number,sorting,Fibonacci series using lambda.

Strings: Formatting, Comparison, Slicing, Splitting, Stripping, Negative indices, String functions, Regular expression: Matching the patterns, Search and replace. Illustrative programs:check whether the string is symmetrical,reverse a string,length of a string.

UNIT – III   COLLECTIONS   9

List: Create, Access, Slicing, Negative Indices, List Methods, and comprehensions Tuples: Create, Indexing and Slicing, Operations on tuples.Dictionary: Create, add, and replace values, operations on dictionaries.Sets: Create and operations on set. Illustrative programs: Interchange first and last element in a list, maximum andminimum N elements in a tuple, sort dictionary by key or value, size of a set.

UNIT –IV   FILES AND EXCEPTION HANDLING   9

Files: Open, Read, Write, Append and Close. Tell and seek methods. Illustrative programs: word count, copy file.

Command line arguments, Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, Exception Chaining, User-defined Exceptions, Defining Clean-Up actions.

Illustrative programs: prompt the user to input an integer and raises a ValueError exception if the input is not a valid integer, open a file and handles a FileNotFoundError exception if the file does not exist, prompt the user to input two numbers and raises a TypeError exception if the inputs are not numerical, executes an operation on a list and handles an IndexError exception if the index is out of range.

Python packages: Simple programs using the built-in functions of packages matplotlib, numpy, pandas etc. Illustrative programs:create a pandas series using numpy,make a pandas dataframe with 2D list.

GUI Programming: Tkinter introduction, Tkinter and PythonProgramming, Tk Widgets, Tkinter examples. Python programming with IDE. Illustrative programs:create a GUI marksheet,calendar,file explorer using Tkinter,

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1 Develop and execute simple Python programs using conditionals and loops for solving problems.

CO2 Express proficiency in the handling of strings and functions

CO3 Represent compound data using Python lists, tuples, dictionaries,sets etc

CO4 Read and write data from/to files and handle exceptions in Python programs

CO5 Implement python packages in data analysis and design GUI

CO6 Examine various problem solving concepts in python to develop real time applications.

TEXT BOOKS
1. Paul Deitel and Harvey Deitel, "Python for Programmers", PearsonEducation, 1st Edition, 2021.
2. Reema Thareja,"Problem Solving and Programming with Python'', 2ndedition, Oxford University Press, New Delhi, 2019.
3. Alan D. Moore, Python GUI Programming with Tkinter, Design and BuildFunctional and User-friendly GUI Applications, Packt Publishing, 2021.

REFERENCE BOOKS
1. Martin C. Brown, "Python: The Complete Reference", 4th Edition, Mc-GrawHill, 2018
2. Eric Matthes, "Python Crash Course, A Hands - on Project BasedIntroduction to Programming", 2nd Edition, No Starch Press, 2019.
3. Allen B. Downey, "Think Python: How to Think like a Computer Scientist",2nd Edition, O'Reilly Publishers, 2016.

ONLINE COURSES / RESOURCES
1. https://docs.python.org/3/tutorial/
2. https://www.w3schools.com/python/
3. https://www.tutorialspoint.com/python/index.htm
4. https://www.javatpoint.com/python-tutorial
5. https://nptel.ac.in/courses/

CO-PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	1	1			
CO2	3	3	3	3	3	1	1			
CO3	3	3	3	3	3	1	1			
CO4	3	3	3	3	3	1	1			
CO5	3	3	3	3	3	1	1	1		
CO6	3	3	3	3	3	1	1	1	3	2

23HS1201	COMMUNICATIVE AND APTITUDE SKILLS	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES

- To develop linguistic and strategic competence in workplace context and to enhance language proficiency and thereby the employability of budding engineers andtechnologists.
- To improve the relevant language skills necessary for professional communication.
- To help learners to develop their listening skills, which will, enable them to listen to lectures and comprehend them by asking questions; seeking clarification anddeveloping their speaking skills and to speak fluently in real contexts.
- To improve the verbal ability skill and communicative skill of the students.
- To enhance the analytical and problem solving skills of the students.
- To prepare them for various public and private sector exams & placement drives.

UNIT I   **INTERPERSONAL COMMUNICATION**   **6**

Listening: Listening to Telephone Etiquettes and Conversations. **Speaking**: Role Play Exercises Based on Workplace Contexts, Introducing Oneself - PEP Talks. **Reading**: Reading the Interview of an Achiever and Completing Exercises (Skimming, Scanning and Predicting). **Writing**: Writing a Short Biography of an Achiever Based on Given Hints, **Grammar**: Comparative Adjective, Numerical Expressions and Sentence pattern. **Vocabulary Development**: Idioms and Phrases

UNIT II   **TECHNICAL COMMUNICATION**   **6**

Listening: Listening to Talks/Lectures Both General and Technical and Summarizing the Main Points. **Speaking**: Participating in Debates, TED Talks. **Reading**: Reading Technical Essays/ Articles and Answering Comprehension Questions. **Writing**: Summary Writing, Minutes of the meeting. **Grammar**: Prepositional Phrases and Relative Clauses. **Vocabulary Development:** Abbreviations and Acronyms.

UNIT III   **PROCESS DESCRIPTION**   **6**

Listening: Listening to a Process Description and Drawing a Flowchart. **Speaking**: Participating in Group Discussions, Giving Instructions, Presentation. **Reading**: Reading Instruction Manuals **Writing**: Process Descriptions — Writing Instructions **Grammar**: Use of Imperatives, Tenses, Impersonal Passive Voice and Phrasal verbs **Vocabulary Development**: Misspelt words. Homophones and Homonyms.

UNIT IV   **REPORT WRITING**   **6**

Listening: Listening to a Presentation and Completing Gap-Filling Exercises. **Speaking**: Making Formal Presentations, **Reading**: Reading and Interpreting Charts/Tables and diagrams. **Writing**: Interpreting Charts/Tables and Diagrams, Writing a Report. **Grammar**: Reported Speech; Interrogatives- Question Tags and Articles — omission of articles **Vocabulary Development**: Technical Jargon.

UNIT V   **INTERVIEW SKILLS**   **6**

Listening: Listening to a Job Interview and Completing Gap-Filling Exercises **Speaking**: Mock Interview, Telephone Interviews & Etiquette, and Group Discussion .**Reading: Reading** a Job Interview, SOP, Company Profile and Completing Comprehension Exercises **Writing**: Job Applications and Resume. **Grammar**: Conditional Clauses, Modal verbs **Vocabulary Development:** Technical Vocabulary, Purpose Statement.

APTITUDE SKILLS

Ratio and Proportion – Ratio, Proportion, Simple equations, Problems on Ages, **Percentages** - Percentages increase/decrease, Simple and Compound interest, **Number system -** Factors, Multiples - HCF and LCM, **Permutation** - Combination and Probability

THEORY : 30 PERIODS

TEXT BOOKS

1. Board of Editors. English for Engineers and Technologists Volume 2 Orient BlackSwan Limited, 2020
2. Richards, C. Jack. Interchange, New Delhi: CUP, 2017
3. Aggarwal R.S. (2017). Quantitative Aptitude for Competitive Examinations 3rd (Ed.) New Delhi: S.Chand Publishing.

REFERENCE BOOKS

1. Kumar, Suresh. E. Engineering English. Orient Blackswan: Hyderabad,2015
2. Raman, Meenakshi and Sharma, Sangeetha- Technical Communication Principlesand Practice. Oxford University Press: New Delhi, 2014.
3. Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford:2007.
4. Means, L. Thomas and Elaine Langlois, English & Communication For Colleges.Cengage Learning, USA: 2007.
5. Sharma Arun.(2016). Quantitative Aptitude, 7th (Ed.). Noida: McGraw Hill Education Pvt.Ltd.

WEB REFERENCE

1. https://learnenglishteens.britishcouncil.org/exams/grammar-and- vocabularyexams/word-formation.
2. https://cdn.s3waas.gov.in/s347d1e990583c9c67424d369f3414728e/uploads/2018.
3. http://xn--englishclub-ql3f.com/grammar/parts-of-speech.htm .
4. https://www.edudose.com/english/grammar-degree-of-comparison-rules/
5. https://www.math-only-math.com/practice-test-on-ratio-and-proportion.html
6. https://www.hitbullseye.com/Simple-Interest-and-Compound-Interest.php

ONLINE COURSES / RESOURCES

1. https://basicenglishspeaking.com/wh-questions/
2. https://agendaweb.org/verbs/modals-exercises.html
3. https://cdn.s3waas.gov.in/s347d1e990583c9c67424d369f3414728e/uploads/2018 /02/2018031621.pdf.
4. https://www.ego4u.com/en/cram-up/grammar/prepositions.
5. https://www.classcentral.com/course/quantitative-methods-4340
6. https://www.classcentral.com/subject/qualitative-research

LIST OF EXPERIMENTS

1. Speaking- sharing personal information- self introduction
2. Speaking- Group Discussion, Small talk or Peb Talk
3. Speaking- Presentation- Formal and Informal
4. Speaking- Mock Interview
5. Speaking- FAQ's on Job Interview
6. Speaking – JAM
7. Speaking- Debate and Story Narration

8.Writing: Error Detection- Spotting and reasoning the errors from the passages in competitive exams.

9. Writing: Letter of recommendation

10.Writing: Elements of a good essay

11.Writing: Types of essays. Descriptive – Narrative-Issue based.

PRACTICAL : 30 PERIODS

TOTAL :60 PERIODS

REFERENCES

1. Kumar, Suresh. E. Engineering English. Orient Blackswan: Hyderabad,2015
2. Raman, Meenakshi and Sharma, Sangeetha- Technical Communication Principles and Practice. Oxford University Press: New Delhi, 2014.
3. Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford:2007.
4. Means, L. Thomas and Elaine Langlois, English & Communication For Colleges. Cengage Learning, USA: 2007.
5. Sharma Arun.(2016). Quantitative Aptitude, 7th (Ed.). Noida: McGraw Hill Education Pvt.Ltd.

COURSE OUTCOME	
Upon completion of the course, students will be able to	
CO1	Recognize the need for life skills; apply them to different situations, the basic communication practices in different types of communication.
CO2	Gain confidence to communicate effectively in various situations to acquire employability skills.
CO3	Develop knowledge, skills, and judgment around human communication that facilitate their ability to work collaboratively with others.
CO4	Communicate effectively & appropriately in real life situation and enhance student's problem solving skill.
CO5	Prepare for various public and private sector exams & placement drives.
CO6	Enhance students' problem solving skills.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1									3	3		2
CO2									3	3		2
CO3									2	3		2
CO4									2	3		2
CO5									2	3		2
CO6									3	1		3

23ES1212	TECHNICAL SKILL PRACTICES - I	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES

- To impart essential problem solving skills through general problem solving concepts.
- To provide basic knowledge on programming essentials using C as implementationtool.
- To introduce various programming methods using C.

LIST OF EXPERIMENTS

1. Data Types, Variables, Operators

2. Expressions, Precedence , Operators

3. Conditional Statements , Switch Statements

4. Looping, Nested Loops

5. Problems on Bit Manipulation

6. Patterns

7. Number Problems

8. Array Basics , Static vs Dynamic Array, Two Dimensional Matrix

9. Structure , Union ,Storage Classes

10. Function , Parameters passing

11. Recursion

12. Strings

13. Pointers

14. Command Line Arguments, Pre-processors

15. File Handling & Exception Handling.

TOTAL: 30 PERIODS

COURSE OUTCOMES

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

CO1   Propose solutions for a given problem.
CO2   Infer the fundamental programming elements in C language and learn to apply basic
      control structures in C.
CO3   Demonstrate the applications of structures and unions.
CO4   Visualize the capabilities of modular programming approach in C.
CO5   Understand the basic principles of pointers and their association during
      implementations.
CO6   Apply various input, output and error handling functions in C.

TEXT BOOKS

1. Reema Thareja, ``Programming in C"", 2nd edition, OXFORD University Press, New
   Delhi, 2019.

2. Paul Deitel and Harvey Deitel, "C How to Program", Seventh edition, PearsonPublication,
   2016.

REFERENCE BOOKS

1. Stephen G. Kochan, "Programming in C", 3rd edition, Pearson Education,2014.
2. Herbert Schildt, "C: The Complete Reference", Fourth Edition, McGraw Hill, 2000.

ONLINE COURSES / RESOURCES

1. https://www.javatpoint.com/c-programming-language-tutorial
2. https://www.tutorialspoint.com/cprogramming/
3. https://nptel.ac.in/Courses/

CO – PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	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
CO5	3	3	3	3	3							3
CO6	3	3	3	3	3							3

23AD1211	DATA STRUCTURES AND ALGORITHMS LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES
- To demonstrate array implementation of linear data structure algorithms
- To design and implement the Application of Stack and Queue
- To understand the complex data structures such as tree.
- To solve real time problems.

LIST OF EXPERIMENTS
1. Write a program for Array based implementation of stack.
2. Design a program for Implementation of Evaluating Postfix Expressions.
3. Design, develop and execute a program to evaluate a valid postfix expression usingstack. Assume that the postfix expression is read as a single line consisting of non- negative single digit operands and binary arithmetic operators. The operators are + (add), - (subtract), *(multiply), /(divide).
4. Write a program to perform Binary search tree operations.
5. Write a program for implementation of AVL tree.
6. Design a program for implementation of various operations that can be performed onRed Black Tree.
7. Write a program for Quick sort using Divide and Conquer strategy (without usingBuilt in Function).
8. Write a program for Minimum cost spanning tree using Greedy approach.
9. Write a program for Huffman Coding.
10. Design, develop and execute a program to read a sparse matrix of integer values. and make a transpose of it. Use the triple to represent an element in sparse matrix.
11. Write a program for All pairs shortest path problem using dynamic programming.
12. Design a program Backtracking – N Queens Problem.
13. Design a program Branch and Bound – Travelling salesman problem.
14. Design a program using Approximation algorithms for knapsack problems.
15. Mini Project on Real time Applications.

Software Requirement:
   PYTHON 3.11.4

TOTAL: 60 PERIODS

COURSE OUTCOME
Upon Successful completion of the course, students will be able to:

CO1 Develop programs to implement linear data structures algorithms.

CO2 Implement applications using Stacks and Linked lists.

CO3 Understand the concept of trees in real world scenarios.

CO4 Decide on the data structure for any practical problem.

CO5 Apply backtracking technique to real time applications.

CO6 Solve approximation algorithms in case study.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	1					2	1	2	2
CO2	3	3	1	1					1	1	1	3
CO3	2	1	3	1					1	1	2	3
CO4	3	1	3	3					1	2	3	3
CO5	1	1							3	3	3	1
CO6	1	1							2	2	2	2

23ES1211	PYTHON PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES

- To write, test, and debug simple Python programs
- To implement Python programs with conditions and loops
- To use functions for structuring Python programs.
- To represent compound data using Python lists, tuples, dictionaries.
- To learn to implement string functions and file operations
- To understand python packages and GUI development.

LIST OF EXPERIMENTS

1. Basic Python Programs
2. Write programs to demonstrate different number data types in python
3. Develop python programs to demonstrate various conditional statements
4. Implement user defined functions using python
5. Develop python scripts to demonstrate built-in functions
6. Develop python programs to perform various string operations like slicing, indexing &formatting
7. Develop python programs to perform operations on List & Tuple
8. Demonstrate the concept of Dictionary with python programs
9. Develop python programs to perform operations on Sets.
10. Develop python codes to perform matrix addition, subtraction and transpose ofthe given matrix
11. Develop python codes to demonstrate the concept of function composition and anonymous functions.
12. Demonstrate python codes to print try, except and finally block statements
13. Implement python programs to perform file operations
14. Write a python code to raise and handle various built in exceptions.
15. Implement python programs using packages numpy and pandas
16. UI development using tkinter

Mini Project :Suggested Topics(but not limited to)

- Dice roll simulator
- Guess the number game
- Random password generator

TOTAL: 60 PERIODS

COURSE OUTCOMES
On Successful Completion of the course student will be able to

CO1 Develop and execute simple Python programs

CO2 Implement programs in Python using conditionals and loops for solving problems.

CO3 Deploy functions to decompose a Python program.

CO4 Develop programs using string operations.

CO5 Utilize Python packages in data analysis

CO6 Create GUI for python applications

CO5 Utilize Python packages in data analysis

CO6 Create GUI for python applications

WEB REFERENCES

1. https://www.programiz.com/python-programming/examples
2. https://www.geeksforgeeks.org/python-programming-examples/
3. https://beginnersbook.com/2018/02/python-programs/

4. https://www.javatpoint.com/python-programs
5. https://www.w3schools.com/python/python_examples.asp
6. https://www.sanfoundry.com/python-problems-solutions/

CO- PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3							
CO2	3	3	3	3	3							
CO3	3	3	3	3	3							
CO4	3	3	3	3	3							
CO5	3	3	3	3	3							
CO6	3	3	3	3	3							

23TA1201	TAMILS AND TECHNOLOGY	L	T	P	C
		1	0	0	1

UNIT – I   WEAVING AND CERAMIC TECHNOLOGY   3

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) — Graffiti on Potteries.

UNIT – II   DESIGN AND CONSTRUCTION TECHNOLOGY   3

Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age —— Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.

UNIT – III   MANUFACTURING TECHNOLOGY   3

Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper andgold- Coins as source of history - Minting of Coins — Beads making-industries Stone beads -Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gemstone types described in Silappathikaram.

UNIT –IV   AGRICULTURE AND IRRIGATION TECHNOLOGY   3

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea – Fisheries- Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.

UNIT –V   SCIENTIFIC TAMIL & TAMIL COMPUTING   3

Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software — Tamil Virtual Academy — Tamil Digital Library — Online Tamil Dictionaries — Sorkuvai Project.

Total : 15 PERIODS

TEXT CUM REFERENCE BOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை)
5. Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESCand RMRL — (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: InternationalInstitute of Tamil Studies
7. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: InternationalInstitute of Tamil Studies
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation,Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Publishedby: The Author)

11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by:RMRL) – Reference Book

23TA1201	தமிழரும் தொழில்நுட்பமும்	L	T	P	C
		1	0	0	1

UNIT – I   நெசவு மற்றும் பானைத் தொழில்நுட்பம்   **3**

சங்ககாலத்தில் நெசவுத் தொழில் – பானைத் தொழில்நுட்பம் – கருப்பு சிவப்பு பாணைடங்கள் – பாண்டங்களில் கீறல் குறியீடுகள்.

UNIT – II   வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்   **3**

சங்ககாலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்ககாலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு – சங்ககாலத்தில் கட்டுமானப் பொருட்களும் நடுகல்லும் – சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் – மாமல்லபுரச் சிற்பங்களும், கோவில்களும் – சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் – நாயக்கர் காலக் கோயில்கள் – மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் – செட்டிநாடு வீடுகள் – பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ-சாரோசோனிக் கட்டிடக் கலை.

UNIT – III   உற்பத்தி தொழில்நுட்பம்   **3**

கப்பல் கட்டும் கலை - உலோகவியல் – இரும்புத் தொழிற்சாலை – இரும்பை உருக்குதல், எஃகு – வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் – நாணயங்கள் அச்சடித்தல் – மணி உருவாக்கும் தொழிற்சாலைகள் – கல்மணிகள், கண்ணாடி மணிகள் – சுடுமண் மணிகள் – சங்கு மணிகள் – எலும்புத் துண்டுகள் – தொல்லியல் சான்றுகள் – சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

UNIT –IV   வேளாண்மை மற்றும் நீர் பாசனத் தொழில்நுட்பம்   **3**

அணை, ஏரி, குளங்கள், மதகு – சோழர் காலக் குமிழித் தூம்பின் முக்கியத்துவம் – கால்நடை பராமரிப்பு – கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் – வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் – கடல்சார் அறிவு – மீன் வளம் – முத்து மற்றும் முத்துக் குளித்தல் – பெருங்கடல் குறித்த பண்டைய அறிவு – அறிவுசார் சமூகம்.

UNIT –V   அறிவியல் தமிழ் மற்றும் கணினித்தமிழ்   **3**

அறிவியல் தமிழின் வளர்ச்சி - கணினித்தமிழ் – தமிழ் நூல்களை மின்பதிப்பு செய்தல் – தமிழ் மென்பொருட்கள் உருவாக்கம் – தமிழ் இணையக் கல்விக் கழகம் – தமிழ் மின் நூலகம் – இணையத்தில் தமிழ் அகராதிகள் – சொற்குவைத் திட்டம்.

                                           Total : 15 PERIODS

TEXT CUM REFERENCE BOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை)

5. Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL — (inprint)

6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: InternationalInstitute of Tamil Studies

7. Historical by: International Institute of Tamil Studies).

8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by:International Institute of Tamil Studies.)

9. Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation,Tamil Nadu)

10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Publishedby: The Author)

11. Porunai Civilization (Jointly Published by: Department of Archaeology & TamilNadu Text Bookand Educational Services Corporation, Tamil Nadu)

12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book

23MA1304	MATHEMATICAL FOUNDATIONS FOR ARTIFICIAL INTELLIGENCE	L	T	P	C
		3	1	0	4

COURSE OBJECTIVE:

- To extend student's logical and mathematical maturity and ability to deal with abstraction
- To introduce most of the basic terminologies used in computer science courses and application of ideas to solve practical problems.
- To understand the basic concepts of combinatorics and graph theory
- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
- To gain the knowledge of sampling techniques and use testing of hypothesis for Non parameter test.

UNIT I   **LOGIC AND PROOFS**   **9+3**

Propositional logic – Propositional equivalences - Predicates and quantifiers – Nested quantifiers –Rules of inference - Introduction to proofs – Proof methods and strategy.

UNIT II   **COMBINATORICS**   **9+3**

Mathematical induction – Strong induction and well ordering – The pigeonhole principle – Recurrence relations – Solving linear recurrence relations – Generating functions – Inclusion and exclusion principle and its applications.

UNIT III   **GRAPHS**   **9+3**

Graphs and graph models – Graph terminology and special types of graphs – Matrix representation of graphs-Shortest path - Dijkstra's algorithms - graph isomorphism – Connectivity – Euler and Hamilton paths.

UNIT IV   **TESTING OF HYPOTHESIS**   **9+3**

Statistical hypothesis - Large sample test based on Normal distribution for single mean and difference of means -Tests based on t, F and Chi-square test for single sample standard deviation. Chi-square tests for independence of attributes and goodness of fit.

UNIT V   **NON PARAMETRIC TESTS**   **9+3**

Sign test for paired data, Mann-Whitney U test, Kruskal-Wallis H test, Run test, Kolmogorov-Smirnov test.

TOTAL :60 PERIODS

COURSE OUTCOME(S):
Upon completion of the course, students will be able to:

CO1   Apply concept of Predicate Calculus in computer science like design of computing machines, artificial intelligence, and have the knowledge to test the logic of a program

CO2   Describe the concepts of the counting principles.

CO3	Understand the concepts of graph terminology in designing computer networks.	
CO4	Identify isomorphism and analyses structure between graphs	
CO5	Illustrate the concept of testing of hypothesis for small and large samples in real life problems.	
CO6	Use the concepts of Non Parametric Testing for Non-Normal Populations.	

TEXT BOOKS:

1. Rosen, K.H., "Discrete Mathematics and its Applications", 7th Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2011.

2. Tremblay, J.P. and Manohar.R, " Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Pub. Co. Ltd, New Delhi, 30thReprint, 2011.

3. Veerarajan T, 'Probability and Statistics, Random Processes and Queueing Theory', First edition, McGrawHill,2018.

4. I.R. Miller, J.E. Freund and R. Johnson, Probability and Statistics for Engineers, 8th Edition, 2015

REFERENCE BOOKS:

1. Grimaldi, R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", 4thEdition, Pearson Education Asia, Delhi, 2007.

2. Lipschutz, S. and Mark Lipson., "Discrete Mathematics", Schaum's Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3rdEdition, 2010.

3. Trivedi.K.S., "Probability and Statistics with Reliability, Queuing and Computer Science Applications", 2nd Edition, John Wiley and Sons, 2008.

4. Yates R.D. and Goodman. D. J., "Probability and Stochastic Processes", 2nd Edition, Wiley India Pvt. Ltd., Bangalore, 2012.

5. A. Goon, M. Gupta and B. Dasgupta, Fundamentals of Statistics, vol. I & II, World Press, 2016

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	-	-	-	-	-	-	-	1
CO2	3	3	-	-	-	-	-	-	-	-	-	-
CO3	3	3	1	-	-	-	-	-	-	-	-	1
CO4	3	3	3	-	-	-	-	-	-	-	-	-
CO5	3	-	-	3	-	-	-	-	-	-	-	-
CO6	3	-	-	3	-	-	-	-	-	-	-	-

Internal Assessment				End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		Written Examinations
Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Individual Assignment / Case Study / Seminar / Mini Project	Written Test	
40	60	40	60	100
40%				**60 %**

		L	T	P	C
23AD1301	**INTERNALS OF COMPUTER SYSTEMS**	3	0	0	3

COURSE OBJECTIVE:

- To design digital circuits using simplified Boolean functions
- To analyze and design combinational and synchronous sequential circuits
- To learn the basic structure and operations of a computer
- To learn the basics of pipelined execution
- To understand the concept of various memories and I/O interfacing.

UNIT - I   DIGITAL FUNDAMENTALS   9

Digital Systems – Features of Digital Systems- Binary Numbers – Octal – Hexadecimal Conversions – Signed Binary Numbers – Complements – Logic Gates – Boolean Algebra– Standard Forms – NAND – NOR Implementation– K-Maps

UNIT - II   COMBINATIONAL AND SEQUENTIAL CIRCUITS   9

Combinational circuits – Adder – Subtractor – ALU Design – Decoder – Encoder – Multiplexers– Introduction to Sequential Circuits – Flip-Flops – operation and excitation tables – Shift registers and their types – Counters.

UNIT - III   COMPUTER FUNDAMENTALS   9

Functional Units of a Digital Computer: Von Neumann Architecture – Operation and Operands of Computer Hardware Instruction – Instruction Set Architecture (ISA): Memory Location, Address and Operation – Instruction and Instruction Sequencing – Addressing Modes, Encoding of Machine Instruction – Interaction between Assembly and High Level Language.

UNIT - IV   PROCESSOR BASICS   9

Design Convention of a Processor-Instruction Execution – Building a MIPS Datapath and Designing a Control Unit – Hardwired Control and Microprogrammed Control – Pipelining – Data Hazard – Control Hazards

UNIT - V   MEMORY AND I/O   9

Memory Concepts and Hierarchy – Memory Management – Cache Memories: Mapping and Replacement Techniques – Virtual Memory – DMA – I/O – Accessing I/O: Parallel and Serial Interface – Interrupt I/O – Interconnection Standards: USB, SATA

TOTAL :   45 PERIODS

COURSE OUTCOME(S):

Upon completion of the course, students will be able to:

- **CO1** Simplify complex Boolean functions using K-Map
- **CO2** Design and Analyze Combinational Circuits
- **CO3** Analyze the design of Sequential Circuits
- **CO4** State the fundamentals of computer systems and analyze the execution of an instruction
- **CO5** Analyze different types of control design and identify hazards .
- **CO6** Identify the characteristics of various memory systems and I/O communication

TEXT BOOKS:

1. Digital Principles and Applications – Donald P Leach, Albert Paul Malvino, GoutamSaha, 8th edition,McGraw-Hill Education, 3rd reprint 2015.
2. David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Fifth Edition, Morgan Kaufmann / Elsevier, 2014.
3. Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian, Computer Organization and Embedded Systems, Sixth Edition, Tata McGraw Hill, 2012.

REFERENCE BOOKS:

1. Digital design, R.Anantha Natarajan, PHI Learning, 2015.
2. Principles of digital Electronics, K.Meena, PHI Learning, 2013.
3. Digital Computer Fundamentals, Thomas C. Bartee TMH 2007.
4. John P. Hayes, Computer Architecture and Organization, Third Edition, Tata McGraw Hill, 2012.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	3	1	-	-	-	-	-	-	-	-	-
CO4	3	2	1	-	-	-	-	-	-	-	-	-
CO5	3	3	1	-	-	-	-	-	-	-	-	-
CO6	3	1	1	-	-	-	-		-	-	-	-

Internal Assessment				End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		
Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Written Examinations
40	60	40	60	100
40%				**60 %**

23AD1302	**ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS**	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To understand artificial intelligence principles, history and various Intelligent Agent.
- To learn about different problem-solving strategies using heuristic function.
- To analyze problems by identifying constraints and finding solutions that satisfy those constraints.
- To understand knowledge representation and planning.
- To introduce the concepts of Expert system and Responsible AI.

UNIT - I   INTRODUCTION TO ARTIFICIAL INTELLIGENCE   9

Definitions – Importance of AI, Foundation of AI, Intelligent Agents–Agent and Environment–Concept of Rationality– Classification of AI Systems with Respect to Environment, Problem Solving Agents, Application of AI, Future of AI.

UNIT - II   PROBLEM SOLVING AGENTS   9

Search Algorithms, Heuristic Search–Heuristic Functions Local Search and Optimization Problems – Local Search in Continuous Space – Search with Non–Deterministic Actions – Search in Partially Observable Environments – Online Search Agents and Unknown Environments.

UNIT - III   CONSTRAINT SATISFACTION PROBLEMS AND GAME THEORY   9

Constraint Satisfaction Problems – Constraint Propagation – Backtracking Search for CSP – Local Search for CSP –Structure of CSP–Game Playing – Mini–Max Algorithm – Optimal Decisions in Games – Alpha–Beta Search – Cutting of Search – Forward Pruning –Monte–Carlo Search for Games – Stochastic Games, Partially Observable Game, Card Game.

UNIT - IV   KNOWLEDGE REPRESENTATION AND PLANNING   9

Logical Agents: Knowledge–Based Agents–Propositional Logic–Propositional Theorem, First– Order Logic: Knowledge Engineering in First order Logic– Interference, Knowledge Representation: Categories and Objects–Events–Reasoning Systems and Default Information, Planning – Algorithms– Heuristics for Planning – Hierarchical Planning – Non–Deterministic Domains – Time, schedule, and Resources – Analysis.

UNIT - V   EXPERT SYSTEM AND RESPONSIBLE AI   9

Expert Systems – Stages in the Development of an Expert System – Probability Based Expert Systems – Expert System Tools – Difficulties in Developing Expert Systems – Applications of Expert Systems– Responsible AI – Ethical Decision Making–Need for Responsible AI–Approaches to Ethical Reasoning– Ensuring Responsible AI in Practice.

TOTAL :   45 PERIODS

COURSE OUTCOME(S):

Upon completion of the course, students will be able to:
- **CO1**   Analyze various Intelligent agent environment
- **CO2**   Describe search strategies in problem solving and game playing using heuristic function
- **CO3**   Apply the CSP concepts for a scenario.
- **CO4**   Implement logical agents and first-order logic problems.
- **CO5**   Create problem-solving strategies with knowledge representation mechanism for solving hard

problems.

CO6   Demonstrate the basics of expert systems and responsible AI to develop models.

TEXT BOOKS:

1. Russell, S. and Norvig, P, "Artificial Intelligence - A Modern Approach", 4th edition, Prentice Hall. 2022.

2. David L. Poole and Alan K. Mackworth. A, "Artificial Intelligence: Foundations of Computational Agents", Cambridge University Press.2023.

3. Enrique Castillo,Jose M. Gutierrez,Ali S. Hadi, "Expert Systems and Probabilistic Network Models, Springer Publishing Company", Incorporated.ISBN:978-1-4612-7481-0, 2012

4. Virginia Dignum, Responsible Artificial Intelligence-How to Develop and use AI in a Responsible Way, Springer. ISBN: 978-3-030-30371-6, 2019.

REFERENCE BOOKS:

1. Elaine Rich, Kevin Knight and B.Nair, "Artificial Intelligence 3rd Edition, McGraw Hill", 2017.
2. Luger, G.F, "Artificial Intelligence -Structures and Strategies for Complex Problem Solving", 6th edition, Pearson, 2008.
3. Brachman, R. and Levesque H, "Knowledge Representation and Reasoning", Morgan Kaufmann, 2004.
4. Alpaydin, E, "Introduction to Machine Learning", 2nd edition, 2010.
5. Sutton R.S. and Barto, A.G, "Reinforcement Learning: An Introduction", MIT Press, 1998.
6. Padhy, N.P, "Artificial Intelligence and Intelligent Systems", Oxford University Press, 2009.

CO-PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	-	-	1	-	-	-	-	-	-
CO2	2	2	1	-	2	-	-	-	-	-	-	-
CO3	2	2	1	-	2	-	-	-	-	-	-	-
CO4	2	1	1	-	-	2	-	-	-	-	-	-
CO5	2	2	1	-	-	2	-	-	-	-	-	-
CO6	2	2	2	-	2	-	-	-	-	-	-	-

Internal Assessment				End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		
Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Written Examinations
40	60	40	60	100
40%				60 %

		L	T	P	C
23AD1303	**OBJECT ORIENTED PROGRAMMING PARADIGM**	3	0	0	3

COURSE OBJECTIVE:

- To understand basic characteristics and structure of Java.
- To implement Object Oriented Programming Concepts using Java.
- To develop Java applications using exception handling and threads.
- To design generic solutions to a problem and build simple GUI applications using Java AWT.
- To understand the dynamic web page creation using DHTML.

UNIT I   INTRODUCTION TO OBJECT ORIENTED PROGRAMMING AND JAVA   9

Introduction to Object Oriented Programming concepts: Class, Object, Encapsulation, Polymorphism, Inheritance, Abstraction; Overview of Java - Difference between C and Java - Java Buzzwords —— Programming Structures in Java - Data Types, Variables and Arrays – Operators – Control Statements —— Defining classes in Java – Constructors: Types of constructors – Constructor Overloading – Constructor Chaining - Methods - Access specifiers – this keyword - Static members - Packages – Packages and Member Access – Importing Packages.

UNIT II   INHERITANCE, ABSTRACT CLASSES AND INTERFACES   9

Overloading Methods - Inheritance: Basics – Types of Inheritance - Constructors and Inheritance - Super keyword - Method Overriding – Dynamic Method Dispatch – Abstract Classes and Methods – final keyword - Interfaces: Defining an interface – implementing an interface – Multiple Inheritance through interface.

UNIT III   EXCEPTION HANDLING AND MULTTITHREADING   9

Exception Handling basics – Multiple catch Clauses – Nested try Statements – Java's Built-in Exceptions – User-defined Exceptions; Multithreaded Programming: Differences between multi-threading and multitasking - Thread Life Cycle – Creating Threads – Thread Priorities – Thread Synchronization – Inter-Thread Communication.

UNIT IV   GENERIC PROGRAMMING AND EVENT DRIVEN PROGRAMMING   9

Introduction to Generic Programming – Generic classes – Generic Methods – Bounded Types – Restrictions and Limitations. Graphics Programming using AWT: Frame – Components - Working with Color, Font, and Image – Layout Management - Basics of event handling – Java Event classes and Listener interfaces - Adaptor classes – MouseEvent, KeyEvent, WindowEvent, ActionEvent, ItemEvent, Dialog Boxes.

UNIT V   DHTML: HTML, CSS AND JAVASCRIPT   9

HTML 5: Introduction – Formatting Tags – Tables – Lists – Hyperlinks – Images – Forms; CSS3 – Introduction and core syntax – Types of Selector Strings – Types of CSS – Backgrounds – Box Model; JavaScript: An introduction to JavaScript – Functions – Built-in Objects – Document Object Model - Event Handling – Form Validation using Regular Expression.

TOTAL: 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Understand and write programs by applying fundamental programming structures of Java

CO2 Apply Object Oriented Programming Concepts using Java.

CO3 Inspect various runtime exceptions and handle them using exception handling mechanism.

CO4 Implement the concept of concurrency using multithreading.

CO5 Design generic structures to solve a given problem and develop interactive GUI applications using Java AWT.

CO6 Create dynamic web pages using DHTML..

TEXT BOOKS:

1. Herbert Schildt, Java: The Complete Reference, Eleventh Edition, McGraw Hill Education, 2018.
2. Paul J. Deitel, Abbey Deitel and Harvey M. Deitel, Internet and World Wide Web: How to Program, 5/e, Pearson Education, 2018.

REFERENCE BOOKS:

1. Cay S. Horstmann, Gary cornell, "Core Java Volume – I Fundamentals", 9th Edition, Prentice Hall, 2013.
2. Jeffrey C and Jackson, — Web Technologies A Computer Science Perspective, Pearson Education, 2011.
3. UttamK.Roy, —Web Technologies, Oxford University Press, 2011.

CO-PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	-	-	-	-	-	-	-	-	-
CO2	3	3	3	3	-	-	-	-	-	-	-	-
CO3	3	3	3	2	-	-	-	-	-	-	-	-
CO4	3	3	2	2	-	-	-	-	-	-	-	-
CO5	3	3	3	2	-	-	-	-	-	-	-	2
CO6	3	3	3	3	-	-	-	2	-	-	-	2

Internal Assessment				End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		
Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Written Examinations
40	60	40	60	100
40%				60 %

23CS1303	DATABASE MANAGEMENT SYSTEMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- Role of a database management system, relational data model and successfully apply logical database design principles, including E-R diagrams.
- Basic concepts and the applications of database systems.
- SQL and construct queries using SQL.
- Transaction processing and concurrency control.
- Database storage structures and access techniques.

UNIT- I   **DATABASE FUNDAMENTALS**   **9**

Introduction: Database System Applications, Purpose of Database Systems, View of Data, Components and Structure, Database Users and Administrator, History of Database Systems. Data models: ER model, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model, Enhanced E-R Model- Mapping ER Model to Relational Model.

UNIT- II   **RELATIONAL DATABASE**   **9**

Relational Data Model - Concept of Relations, Schema-Instance distinction, Keys, Referential integrity and Foreign keys, Relational algebra operators, SQL - Introduction, Data Definition in SQL, Table, Key and Foreign key definitions, Update behaviours. Querying in SQL, Notion of aggregation, Aggregation functions Group by and Having clauses, Embedded SQL, Query Processing.

UNIT- III   **DATABASE DESIGN**   **9**

Schema Refinement and Normal Forms: Introduction to Schema Refinement, Functional Dependencies, Properties of Decompositions. Normalization: First, Second, Third Normal Forms, Dependency Preservation, Boyce-Codd Normal Form – Multivalued Dependencies – Fourth Normal Form – Join Dependencies – Fifth Normal Form.

UNIT- IV   **TRANSACTION MANAGEMENT**   **9**

Transaction Concept – State – ACID Properties – Concurrency control - Serializability – Recoverability – Locking based protocols –Timestamp Based Protocol - Deadlock handling.

UNIT- V   IMPLEMENTATION TECHNIQUES AND NON-RELATIONAL MODEL   9

Data on External Storage – RAID- File Organizations – Indexing and Hashing -Trees– B+ tree and B- Tree index files. Introduction to NoSQL & MongoDB: Advantages, Architecture, Data Models MongoDB Data types and CRUD Operations-Working of NoSQL Using MONGODB/CASSANDRA.

TOTAL: 45 PERIODS

COURSE OUTCOME(S):
Upon completion of the course, students will be able to:
  CO1   Identify and Recognize the Structure of a Database
  CO2   Understand an Entity Relational Model for a database.
  CO3   Apply Relational and Non-Relational database concepts to design a database.

CO4   Analyze the importance of normalization and functional dependencies in database design.

CO5   Evaluate the working principles of indexing and hashing.

CO6   Create a database design using both Relational and Non- Relational models

TEXT BOOKS:

1. Data base System Concepts, A. Silberschatz, Henry. F. Korth, S. Sudarshan, McGraw HillIndia Private Limited, 2020.

2. Mongo DB Complete Guide by Manu Sharma, BPB Publications, ISBN: 9789389898866, July 2021.

REFERENCE BOOKS:

1. Data base Management Systems, Raghu Ramakrishnan, Johannes Gehrke, McGraw Hill Education (India) Private Limited, 3rd Edition, 2003

2. Fundamentals of Database System, Ramez Elmasri and Shamkant B. Navathe, Pearson Publications, 7th Edition, 2016

3. C. J. Date, A. Kannan and S. Swamynathan, An Introduction to Database Systems, Pearson Education, Eighth Edition, 2009.

CO - PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	-	-	-	-	-	-	-	-
CO2	2	1	1	1	-	-	-	-	-	-	-	-
CO3	2	1	1	1	1	-	-	-	-	-	-	-
CO4	2	1	1	1	1	-	-	-	-	-	-	-
CO5	2	1	1	1	1	-	-	-	-	-	-	-
CO6	2	1	1	1	2	-	-	-	-	-	-	-

Internal Assessment				End Semester Examinations
Assessment I (100 Marks)		**Assessment II (100 Marks)**		
Individual Assignment / Case Study / Seminar / Mini Project	**Written Test**	**Individual Assignment / Case Study / Seminar / Mini Project**	**Written Test**	**Written Examinations**
40	60	40	60	100
40%				**60 %**

23AD1311	ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVE:
- To design and implement different techniques to develop simple autonomous agents that Make effective decisions in fully informed, and partially observable, settings.
- To apply appropriate algorithms for solving given AI problems.
- To design and implement logical reasoning agents.
- To design and implement agents that can reason under uncertainty.
- To understand the Implementation of the reasoning systems using backward or forward Inference mechanisms.

LIST OF EXPERIMENTS
1. Write a program to solve N Queens problem using branch and bound algorithm.
2. Implementation of Depth-First Search (DFS)
3. Implementation of Best first search.
4. Write a program to implement towers of Hanoi
5. Write a program to implement water jug problem using 3 jugs.
6. Program to implement A* algorithm.
7. Implement Minimax algorithm & Alpha-Beta pruning for game playing.
8. Write a program to implement heuristic search procedure using 8-Queens problem.
9. Write a program to implement CSP using map coloring.
10. Write a program to implement Hangman game using python.
11. Write a program to implement tic tac toe game for 0 and X.
12. Implement Unification algorithm for the given logic.
    Unify{King(x), King(John)}
13. Implement forward chaining and backward chaining using Python.
14. Implementation of rule based expert system for memory loss disease.
15. Implementation of expert system for diagnosis of influenza.
16. Write a case study to implement the code that demonstrates key principles of responsible AI- fairness and transparency using loan approval system.

TOTAL: 60 PERIODS

COURSE OUTCOME(S):
Upon successful completion of the course, students will be able to:
  CO1 Implement simple PEAS descriptions for given AI tasks
  CO2 Develop programs to implement simulated annealing and genetic algorithms
  CO3 Demonstrate the ability to solve problems using searching and backtracking
  CO4 Ability to implement simple reasoning systems using either backward or forward Inference mechanisms
  CO5 Will be able to choose and implement a suitable technic for a given AI task.
  CO6 Demonstrates key principles of responsible AI

SOFTWARE:

Anaconda Python Distribution.

REFERENCE BOOKS:

1. Russell, S. and Norvig, P. 2022. Artificial Intelligence - A Modern Approach, 4th edition, Prentice Hall.
2. Stuart Russel and Peter Norvig, "Artificial Intelligence: A Modern Approach", Fourth Edition, Pearson Education, 2020.
3. Greg Michaelson, " A Practical Course in Functional Programming Using Standard ML", UCL Press,1995.
4. Richard Bosworth, "A Practical Course in Functional Programming Using Standard ML",McGrawHill,1995.
5. Rachel Harrison, "Abstract Data Types in Standard ML", John Wiley & Sons,1993.
6. Adnan Masood, Heather Dawe, Dr. EhsanAdeli,"Responsible AI in the Enterprise",Packt Publishing,2023.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	-	1	1	-	-	-	-	-	-
CO2	2	2	1	-	2	-	-	-	-	-	-	-
CO3	2	1	1	-	2	-	-	-	-	-	-	-
CO4	2	1	1	-	2	-	-	-	-	-	-	-
CO5	2	2	2	-	2	-	-	-	-	-	-	-
CO6	2	1	1	-	1	-	-	-	-	-	-	-

Internal Assessment		End Semester Examination
Evaluation of Laboratory Observation, Record	Test	Practical
75	25	100
60 %		40%

		L	T	P	C
23AD1312	**OBJECT ORIENTED PROGRAMMING PARADIGM LABORATORY**	0	0	4	2

COURSE OBJECTIVE:

- To develop simple Java applications.
- To implement Object Oriented Programming Concepts using Java.
- To develop Java applications using exception handling and multithreading.
- To develop application using Java generics and GUI applications using Java AWT.
- To create dynamic web pages using DHTML.

LIST OF EXPERIMENTS

1. Develop a java application to implement currency converter (Dollar to INR, EURO to INR, Yen to INR and vice versa), distance converter (meter to KM, miles to KM and vice versa),time converter (hours to minutes, seconds and vice versa) using packages.
2. Develop a java application with Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club fund. Generate pay slips for the employees with their gross and net salary.
3. Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named printArea(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method printArea() that prints the area of the given shape.
4. Design a Java interface for ADT Stack. Implement this interface using array. Provide necessary exception handling.
5. Write a java program that implements a multi-threaded application that has three threads. First thread generates a random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.
6. Write a java program to find the maximum value from the given type of elements using a generic function.
7. Develop a Java program to create a color palette for selecting foreground and background colors. Include the steps to import packages, define classes, declare buttons and checkboxes, add panels, and handle button clicks and checkbox selection to set the foreground and background colors.
8. Create a web page using the following HTML constructs: Tables, Images, Lists, Frames and Hyperlinks.
9. Create a web site using different types of Style Sheets.
10. Create a web page to display a form with the following: Name, DOB, E-mail id, Phone Number, Qualification, Hobbies. Write a JavaScript to collect and validate all the data entered in the form fields. Finally, display the entered data through alert box.
11. Mini Project.

TOTAL: 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Develop applications by applying basic programming structures of Java.

CO2 Implement the Object Oriented concepts like inheritance, abstract classes and interfaces.

CO3 Inspect various runtime exceptions and handle them using custom exceptions..

CO4 Develop concurrent programs using the concepts of multithreading.

CO5 Design generic structure to solve a given problem and develop interactive GUI applications using Java AWT.

CO6 Create responsive web pages using DHTML.

REFERENCE BOOKS:

1. Herbert Schildt, Java: The Complete Reference, Eleventh Edition, McGraw Hill Education, 2018.
2. Paul J. Deitel, Abbey Deitel and Harvey M. Deitel, Internet and World Wide Web: How to Program, 5/e, Pearson Education, 2018.
3. Cay S. Horstmann, Gary cornell, "Core Java Volume –I Fundamentals", 9th Edition, Prentice Hall, 2013.
4. David Flanagan, ―JavaScript: The Definitive Guide, Seventh Edition‖, O'Reilly Media, 2020.
5. UttamK.Roy, ―Web Technologies‖, Oxford University Press, 2011.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	-	-	-	-	-	-	-	-	-
CO2	3	3	3	3	-	-	-	-	-	-	-	-
CO3	3	3	3	3	-	-	-	-	-	-	-	-
CO4	3	3	3	3	-	-	-	-	-	-	-	-
CO5	3	3	3	3	2	-	-	-	-	-	-	3
CO6	3	3	3	3	3	-	-	3	1	1	-	3

Internal Assessment		End Semester Examination
Evaluation of Laboratory Observation, Record	Test	Practical
75	25	100
60 %		40%

23CS1312	DATABASE MANAGEMENT SYSTEMS LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVE:

- To learn to create and use a database
- To be familiarized with a query language.
- To have hands on experience on DDL Commands.
- To understand of DML Commands and DCL Commands.
- To learn advanced SQL queries.
- To be exposed to different applications.

LIST OF EXPERIMENTS

1. Introduction SQL-SQL*Plus: DDL,DML,DCL,TCL.SQL clause :SELECT FROM WHERE GROUPBY,HAVING,ORDERBY Using SQLite/MySQL/Oracle.
2. Creation of Views, Synonyms, Sequence, Indexes, Save point
3. Creating relationship between the databases and retrieve records using joins for the below relations:

Salesman Relation:

salesman_id	name	city	commission
5001	James Hoog	New York	0.15
5002	Nail Knite	Paris	0.13
5005	Pit Alex	London	0.11
5006	Mc Lyon	Paris	0.14
5007	Paul Adam	Rome	0.13
5003	Lauson Hen	San Jose	0.12

Customer Relation:

customer_id	cust_name	city	grade	salesman_id
3002	Nick Rimando	New York	100	5001
3007	Brad Davis	New York	200	5001
3005	Graham Zusi	London	300	5002
3004	Fabian	Paris	300	5006
3009	Geoff Cameron	Rome	100	5007
3003	Jozy	San Jose	300	5003

4. Write a PL/SQL block to specify constraints by accepting input from the user.
5. Implementation of PL/SQL Procedure (IN, OUT, INOUT) with Exception Handling.
6. Implementation of PL/SQL Function.
7. Implementation of PL/SQL Cursor.
8. Implementation of PL/SQL Trigger, Packages.
9. Implementation of NoSQL basic commands using Cassandra/Mongo DB.
10. Implementation of Data Model in NoSQL.
11. Implementation of Aggregation, Indexes in NoSQL
12. MINI PROJECT (Suggested topics, but not limited to)
    Software Requirement : Database Connectivity with Front End Tools (Python/C/C++/JAVA) and
    Back End Tools (MySQL/SQLite/CASSANDRA/MONGO DB)
    i) Inventory Control System.

ii) Material Requirement Processing.
iii) Hospital Management System.
iv) Railway Reservation System.
v) Personal Information System.
vi) Timetable Management System.
vii) Hotel Management System

TOTAL:60 PERIODS

COURSE OUTCOME(S):
Upon successful completion of the course, the students will be able to:

CO1   Define the relationship between databases.
CO2   Understand various query execution such as relational constraints, joins, set operations, aggregate functions, trigger, views.
CO3   Apply the basic concepts of Database Systems and Applications
CO4   Analyze stored functions, stored procedures, cursor, trigger using PL/SQL block.
CO5   Relate the different models of NoSQL databases.
CO6   Design and implement database applications on their own.

WEB REFERENCES:
1.   https://livesql.oracle.com/apex
2.   https://www.jdoodle.com/online-mongodb-terminal

CO - PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	2	-	-	-	-	-	-	2
CO2	2	1	1	1	-	-	-	-	-	-	-	2
CO3	2	1	1	1	1	-	-	-	-	-	-	2
CO4	2	1	1	1	1	-	-	-	-	-	-	2
CO5	2	1	1	1	1	-	-	-	-	-	-	2
CO6	2	1	1	1	2	-	-	-	-	-	-	2

Internal Assessment		End Semester Examination
Evaluation of Laboratory Observation, Record	Test	Practical
75	25	100
60 %		40%

			L	T	P	C	C
23ES1311	**TECHNICAL SKILL PRACTICES II**		0	0	2	1	1

COURSE OBJECTIVE:
- To understand the concepts of Arrays, ListADT.
- To learn linear data structures–stacks and queues ADTs.
- To understand and apply Tree data structures.
- To analyze sorting and searching algorithms.
- To understand and apply Graph structures and hashing techniques.

LIST OF TOPICS

1. Arrays
2. ListADT
3. Queue ADT
4. StackADT
5. Problems on Postfix and Infix expressions
6. BinaryTreeTraversal
7. Binary Search Tree
8. B-Tree
9. Binary Heaps
10. Linear search algorithm & Binary search algorithm
11. Sorting algorithms
    i. Bubble Sort
    ii. Selection Sort
    iii. Insertion Sort
    iv. Merge Sort
    v. Quick sort
    vi. Radix Sort
    vii. Bucket Sort
    viii. Heap Sort
    ix. Shell Sort
12. Graph Traversal algorithms
    i. BFS
    ii. DFS
    iii. Topological Sorting
13. Shortest Path algorithm
    i. Dijkstra Algorithm
    ii. Bellman-Ford Algorithm
14. Minimum Spanning tree
    i. Kruskal Algorithm
    ii. Prim's Algorithm
15. All pairs shortest paths using Floyd's Algorithm
16. Hashing using open addressing technique

TOTAL: 30 PERIODS

COURSE OUTCOME(S):

Upon successful completion of the course, students will be able to:

CO1 Implement arrays and abstract data types for list.

CO2 Solve real world problems using appropriate linear data structures.

CO3 Apply appropriate tree data structures in problem solving.

CO4 Implement various searching and sorting algorithms.

CO5 Implement appropriate Graph representations and solve real-world applications.

CO6 Apply various hashing operations.

SOFTWARE REQUIREMENTS:

Anaconda Python Distribution/ TURBO C.

TEXT BOOKS:

1. G. A. Vijayalakshmi Pai," A Textbook of Data Structures and Algorithms, Volume 1", Wiley-ISTE,January 2023.

2. G. A. Vijayalakshmi Pai,"A Textbook of Data Structures and Algorithms, Volume 2: Mastering Nonlinear Data Structures", Wiley-ISTE,February2023.

3. Dr.Harsh Bhasin,"Data Structures with Python", BPB Publications,Delhi,March2023.

4. John Canning ,Alan Broder,Robert Lafore, 'Data Structures & Algorithms in Python', Addison-Wesley Professional, October 2022.

5. Y Daniel Liang, "Introduction To Python Programming And Data Structures", Global Edition 3rd Edition ,Pearson Publications ,November 2022.

REFERENCE BOOKS:

1. Dr.Basant Agarwal,"Hands-On Data Structures and Algorithms with Python",3rd Edition, Packt Publishing, July 2022.

2. Narasimha Karumanchi, "Data Structures and Algorithms Made Easy", Career Monk Publications, August 2016.

3. MichaelH.Gold wasser, Michae IT.Good rich, and Roberto Tamassia," Data Structures and Algorithms in Python", Wiley Publications 2013.

ONLINE COURSES/RESOURCES:

1. https://www.codechef.com/practice.
2. https://www.simplilearn.com/tutorials/python-tutorial/data-structures.
3. https://www.simplilearn.com/tutorials/python-tutorial/data-structures.
4. https://nptel.ac.in/Courses/

Internal Assessment		End Semester Examination
Evaluation of Laboratory Observation, Record	Test	Practical
75	25	100
60 %		40%

23MA1405	PROBABILITY AND STATISTICAL TECHNIQUES FOR DATA SCIENCE	L	T	P	C
		3	1	0	4

COURSE OBJECTIVE:

- To introduce probability concepts and some standard distributions
- To introduce multi-dimensional random variables
- To find difference between treatments in the output using ANOVA
- Apply the basic concepts of classifications of design of experiments in the field of agriculture and statistical quality control.
- To mention some of the models used in Time series for forecasting

UNIT - I   **Random variables**   **9+3**

Discrete and continuous random variables–Moments–Moment generating functions–Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions.

UNIT - II   **Two- dimensional random variables**   **9+3**

Joint distributions–Marginal and conditional distributions– Covariance–Correlation - linear regression and its applications in data science – Transformation of random variables -Central limit theorem (Without Proof).

UNIT - III   **Design of experiments**   **9+3**

One way and Two way classifications- Completely randomized design–Randomized block design–Latin square design.

UNIT - IV   **Statistical quality control**   **9+3**

Control charts for measurements ($\bar{X}$ and R charts)–Control charts for attributes(p, cand np charts) –Tolerance limits-Acceptance sampling.

UNIT - V   **Time series analysis**   **9+3**

Definition-Components-Secular trend–Least squares method –Moving averages-Exponential smoothing method-Seasonal indices-Method of simple averages-Ratio to moving average method-Ratio to trend method.

TOTAL :   60 PERIODS

COURSE OUTCOME(S):
Upon completion of the course, students will be able to:

CO1   Use probability functions to find moments
CO2   Classify probability distributions underlying   in   a particular situation and find related probabilities
CO3   To introduce two dimensional random variables and find relationship between them
CO4   Analyse variance between treatments in the output using ANOVA
CO5   Demonstrate stability of a process using control charts
CO6   Forecast/predict values from a given data set considering components of time series.

TEXT BOOKS:

1. Trivedi,K.S.,"Probability and Statistics with Reliability,Queueing and Computer Science Applications", 2nd Edition, John Wiley and Sons,2002.
2. T.Veerarajan, "Probability,Statistics And Random Processes",3rdEdition, Tata McGraw-Hill Education,2008.
3. Ibe,O.C.,"Fundamentals of Applied Probability and Random Processes",Elsevier,1st Indian Reprint,2007.
4. I.R. Miller, J.E. Freund and R. Johnson, Probability and Statistics for Engineers, 8th Edition, 2011.

REFERENCE BOOKS:

1. Devore,J.L.,—Probability and Statistics for Engineering and the Sciences,8thEdition,Cengage Learning,2014.
2. Dallas E. Johnson, —Applied Multivariate Methods for Data Analysis, Thomson and Duxbury press,1998.
3. GuptaS.C. and KapoorV.K., Fundamentals of Mathematical Statistics, Sultan and Sons,NewDelhi,2001.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	2	-	-	-	-	-	-	2
CO2	3	3	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	2	-	-	-	-	-	-	2
CO4	3	-	-	3	-	-	-	-	-	-	-	-
CO5	3	-	-	3	-	-	-	-	-	-	-	-
CO6	3	-	-	3	-	-	-	-	-	-	-	-

Internal Assessment				End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		
Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Written Examinations
40	60	40	60	100
40%				60 %

23AD1401	MACHINE LEARNING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- Understand the basics of Machine Learning (ML)
- Illustrate supervised Learning Models
- Build ensemble learning models
- Analyze unsupervised learning models
- Evaluate use cases of ML

UNIT - I   MACHINE LEARNING BASICS   8

Introduction to Machine Learning - Essential concepts of ML – Types of learning – Machine learning methods based on Time – Dimensionality – Linearity and Non linearity – Early trends in Machine learning – Data Understanding Representation and visualization.

UNIT - II   SUPERVISED LEARNING   9

Learning a Class from Examples, Linear, Non-linear, Multi-class and Multi-label classification, Decision Trees: ID3, Classification and Regression Trees, Regression: Linear Regression, Multiple Linear Regression, Logistic Regression, Bayesian Network, Bayesian Classifier

UNIT - III   ADVANCED SUPERVISED AND ENSEMBLE LEARNING   10

Neural Networks: Introduction, Perceptron, Multilayer Perceptron, Support vector machines: Linear and Non-Linear, Kernel Functions, K-Nearest Neighbors, Ensemble Learning Model Combination Schemes, Voting, Error-Correcting Output Codes, Bagging: Random Forest Trees, Boosting: Adaboost, XGboost, Stacking.

UNIT - IV   UNSUPERVISED LEARNING   9

Introduction to clustering, Hierarchical: AGNES, DIANA, Partitional: K-means clustering, K-Mode Clustering, Self-Organizing Map, Expectation Maximization, Gaussian Mixture Models, Principal Component Analysis, Locally Linear Embedding, Factor Analysis, Fuzzy Modeling, Genetic Modeling.

UNIT - V   MACHINE LEARNING IN PRACTICE AND APPLICATIONS   9

Performance Measurement, Azure Machine Learning. Applications: Image Recognition – Email spam and Malware Filtering – Online fraud detection- Medical Diagnosis.

TOTAL :   45 PERIODS

COURSE OUTCOME(S):
Upon completion of the course, students will be able to:

CO1	Explain the basics of ML.
CO2	Illustrate supervised learning models.
CO3	Build ensemble learning models.
CO4	Analyze unsupervised learning models.
CO5	Evaluate performance metrics of various real time applications.

CO6   Construct various learning methods for appropriate problems.

TEXT BOOKS:

1. Ameet V Joshi, "Machine Learning and Artificial Intelligence", Springer Publications, 2020.
2. Taeho Jo "Machine Learning Foundations: Supervised, Unsupervised, and Advanced Learning", First Edition, Publisher: Springer, 2021.
3. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Fourth Edition, 2020.

REFERENCE BOOKS:

1. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar, "Foundations of Machine Learning", Second Edition, MIT Press, 2018.
2. John Paul Muller, Luca Massaron "Machine Learning Dummies", Wiley Publications, 2021.
3. Marc Peter Deisenroth, A. Aldo Faisal, Cheng Soon Ong, "Mathematics for Machine Learning", Cambridge University Press, 2019.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	1	-	-	-	-	-	-	-
CO2	3	2	2	2	2	-	-	-	-	-	-	1
CO3	1	1	1	3	1	1	-	-	-	-	-	-
CO4	3	3	1	3	1	-	-	-	-	-	-	-
CO5	2	2	2	2	3	1	-	1	-	-	-	-
CO6	2	2	2	2	3	1	-	1	-	-	-	-

Internal Assessment				End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		
Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Written Examinations
40	60	40	60	100
40%				60 %

23AD1402	BASICS OF DATA SCIENCE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To acquire skills in data preparatory and preprocessing steps.
- To understand the mathematical concepts in statistics.
- To learn the tools and packages in Python for data science.
- To gain understanding of how the data is distributed.
- To acquire knowledge in data interpretation and visualization techniques.

UNIT - I   **INTRODUCTION**   **9**

Need for data science – benefits and uses – facets of data – data science process – setting the research goal – retrieving data – cleansing, integrating, and transforming data – exploratory data analysis –build the models–presenting and building applications.

UNIT - II   **DESCRIBING DATA ANALYSIS**   **9**

Frequency distributions– Outliers – relative frequency distributions –cumulative frequency distributions –frequency distributions for nominal data – interpreting distributions – graphs – averages –mode – median – mean – averages for qualitative and ranked data – describing variability – range –variance – standard deviation – degrees of freedom – interquartile range – variability for qualitative and ranked data.

UNIT - III   **PYTHON FOR DATA HANDLING**   **9**

Basics of Numpy arrays–aggregations–computations on arrays–comparisons, masks, boolean logic fancy indexing – structured arrays – Data manipulation with Pandas – data indexing and selection –operating on data– missing data–hierarchical indexing–combining datasets – aggregation and grouping–pivot tables – Working with time series data.

UNIT - IV   **DESCRIBING DATA ANALYSIS II**   **9**

Normal distributions – z scores – normal curve problems – finding proportions – finding scores –more about z scores – correlation – scatter plots – correlation coefficient for quantitative data –computational formula for correlation coefficient– regression – regression line – least squares regression line –standard error of estimate–interpretation of r2–Population–Analysis of variance.

UNIT - V   **PYTHON FOR DATA VISUALIZATION**   **9**
Visualization with matplotlib – lineplots– scatterplots– visualizing errors– density and contour plots–histograms, binnings, and density – Customizing Plot Legends and Colorbars- three dimensional plotting – geographic data –data analysis using statmodels and seaborn–graph plotting using Plotly–interactive data visualization using Bokeh.

                                      TOTAL : 45 PERIODS

COURSE OUTCOME(S):
Upon completion of the course, students will be able to:
- **CO1**   Apply the skills of data analysis and cleansing.
- **CO2**   Determine the relationship between data dependencies using statistics.
- **CO3**   Analyze to handle data using primary functions used for data science in Python.
- **CO4**   Illustrate how to use the python concepts for data manipulation.

CO5   Represent the useful information with the concept of distributions.

CO6   Use the knowledge for describing data and visualizing data.

TEXT BOOKS:

1. David Cielen, Arno D.B.Meysman,and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016
2. Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, Wiley Publications, 2017.
3. Jake Vander Plas, "Python Data Science Handbook",O'Reilly,2022.

REFERENCE BOOKS:

1. Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press,2014.
2. Chirag Shah, "A Hands-On Introduction to Data Science", Cambridge University Press, 2020.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	1	-	-	-	-	-	-	1
CO2	2	3	1	1	1	-	-	-	-	-	-	-
CO3	2	1	1	1	2	-	-	-	-	-	-	1
CO4	2	2	1	1	2	-	-	-	-	-	-	1
CO5	2	3	1	3	1	-	-	-	-	-	-	-
CO6	3	3	1	3	3	-	-	-	-	-	-	1

Internal Assessment				End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		
Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Written Examinations
40	60	40	60	100
40%				**60 %**

23AD1403	SOFTWARE DEVLOPMENT AND PRACTICES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To understand the phases in a software project, estimate cost and effort.
- To describe fundamental concepts of requirements engineering and Analysis Modeling.
- To use the various software design methodologies
- To learn various testing techniques and maintenance measures.
- To analyze agile development and Devops

UNIT - I   SOFTWARE PROCESS AND PLANNING   9

Introduction to Software Engineering; Objectives, Principles and Practices; The Software Development Life Cycle : Pre-development phases of the SDLC – Development specific phases of the SDLC – Post- development phases of the SDLC; Methodologies Paradigm and Practices : Process methodologies – Development paradigms – Development practices; Project Planning Process; Software Project Estimation: Decomposition techniques – Empirical estimation models – The make/buy decision – Project scheduling; Risk Management; Handling Ethical Dilemmas.

UNIT - II   REQUIREMENTS ANALYSIS AND SPECIFICATION   9

Software Requirements: Functional and non-functional – Security requirements – User requirements – System requirements – Software requirements document; Requirement Engineering Process: Feasibility studies – Requirements elicitation and analysis – Requirements validation – Requirements Management; Classical Analysis: Structured system analysis; Requirement modelling tools

UNIT - III   SOFTWARE DESIGN   9

Design Concepts: Design process – Design concepts – Modularity, Coupling and cohesion – Design model – Modeling principles; Structured Design; Architectural Design: Architectural styles; Architecture for Network based Applications – Decentralized Architectures.

UNIT - IV   SOFTWARE TESTING   9

Software Testing Fundamentals; Internal and External Views of Testing: White box testing – Basis path testing – Control structure testing– Black box testing – Unit testing – Integration testing – Regression testing – Validation testing – System testing – Security testing; Testing Tool; Debugging; Software Implementation: Coding Practices and Principles; Maintenance: Types.

UNIT - V   AGILE DEVELOPMENT AND DEVOPS   9

Agile Development: Agile Teams – Team and Scrum – Branches – Pull Requests – Reviews – Integration- Agile Iterations – Reporting and fixing bugs; Dev/Ops: From development to deployment – Three-Tier-Responsiveness, Service level objectives, and Apdex – Releases and feature flags – Monitoring and finding bottlenecks – Improving rendering and database performance with caching; Security: Defending customer data in application

TOTAL :   45 PERIODS

COURSE OUTCOME(S):

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

CO1 Identify the key activities in process model and estimate project cost and effort required by applying software engineering principles

CO2 Understand and analyze the requirements and construct their models

CO3 Apply systematic procedure for software design

CO4 Estimate and contrast the various testing and maintenance activities

CO5 Identify and Analysis agile development and Devops

CO6 Adapt unethical issues and apply ethical practices for a given case study

TEXT BOOKS:

1. Roger S Pressman, Bruce R Maxin "Software Engineering – A Practitioner's Approach", McGrawHill International Edition, Eighth Edition, 2015.
2. Armando Fox and David Patterson, Engineering Software as a Service: An Agile Approach UsingCloud Computing", Strawberry Canyon LLC, Second Beta Edition, 2021.

REFERENCE BOOKS:

1. Ian Sommerville, "Software Engineering", Pearson Education Asia,Tenth Edition, 2015.
2. Stephen R Schach, "Software Engineering", Tata McGraw-Hill Publishing Company Lim-ited,2007.
3. Brian Albee, Hands-On Software Engineering with Python, Packt Publishing, 2018.
4. Kelkar S A,"Software Engineering", Prentice Hall of India, 2007.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	3	3	-	3	2	3		3	3	3	
CO3	3	2	2	-	-	-	-	-	-	-	-	-
CO4	3	2	2	-	-	-	-	-	-	-	-	-
CO5	3	-	-	-	-	-	-	-	-	-	-	-
CO6	3	-	-	-	-	-	-	-	-	-	-	-

Internal Assessment				End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		
Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Written Examinations
40	60	40	60	100
40%				60 %

23AD1404	SYSTEM SOFTWARE AND OPERATING SYSTEMS	L	T	P	C
		2	0	2	3

COURSE OBJECTIVE:

- To understand the concepts of various system software like Assembler, Linker, Loader and Macro pre-processor.
- To demonstrate the functions and concepts of process scheduling algorithms within an operating system
- To analyze the concepts of deadlocks and the prevention methodologies.
- To explore the principles of memory management within an operating system.
- To formulate the techniques involved in storage management and file systems.

UNIT I INTRODUCTION TO SYSTEM SOFTWARE AND ASSEMBLER DESIGN OPTIONS 9

System software Vs. Application software, Different types of system software – Assembler, Linker, Loader, Debugger, Device driver, Compiler, Interpreter, Operating System (Basic Concepts only); Machine Architecture of SIC and SIC/XE – instruction format, addressing mode, instruction set; Basic functions of assembler, machine dependent assembler features, machine independent assembler features; assembler design options – one pass assembler, multi-pass assembler.

UNIT II DESIGN LOADER, LINKER AND MACROS 9

Basic loader functions – Design of an Absolute Loader – A Simple Bootstrap Loader - Machine dependent loader features – Relocation – Program Linking – Algorithm and data structures of two pass Linking Loader; Machine-independent loader features – Automatic Library Search – Loader Options – Loader design options – Linkage Editors – Dynamic Linking; Macro Instruction Definition and Expansion- One pass Macro processor Algorithm and data structures, Machine Independent Macro Processor Features, Macro processor design options.

UNIT III INTRODUCTION TO OPERATING SYSTEM AND PROCESS MANAGEMENT 9

Computer System – Organization, Basic elements - Instruction Execution, Interrupts, Memory Hierarchy, Cache Memory, Direct Memory Access, Multiprocessor and Multi-core Organization. Operating system overview- Objectives and Functions – Evolution of Operating System - Operating System Structures – Operating System Services , Processes - Process Concept, Process Scheduling, Operations on Processes, Inter-process Communication; CPU Scheduling — Scheduling criteria, Scheduling algorithms, Multi-processor scheduling, Real time scheduling; Deadlock – System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.

UNIT IV   MEMORY MANAGEMENT   9

Main Memory — Background, Swapping, Contiguous Memory Allocation, Paging, Segmentation, Segmentation with paging, 32 and 64 bit architecture Examples; Virtual Memory — Background, Demand Paging, Page Replacement, Allocation, Thrashing; Allocating Kernel Memory, OS Examples.

UNIT V   STORAGE MANAGEMENT AND FILE SYSTEMS   9

Mass Storage system – Overview of Mass Storage Structure, Disk Structure, Disk Scheduling and Management – swap space management, File-System Interface – File concept, Access methods, Directory Structure, Directory organization, File system mounting, File Sharing and Protection; File System Implementation- File System Structure, Directory implementation, Allocation Methods, Free Space Management-Efficiency and Performance, Recovery

TOTAL :45 PERIODS

COURSE OUTCOME(S):
Upon completion of the course, students will be able to:

CO1	Understand the applications of various system softwares and assemblers.
CO2	Develop and implement loader, linker and Macro processor
CO3	Distinguish various techniques involved in process management and understand scheduling algorithms.
CO4	Describe the approach towards identification, analysis, detection and prevention of deadlocks.
CO5	Demonstrate various memory management concepts.
CO6	Classify storage management and file management methodologies.

TEXT BOOKS:

1. Leland L. Beck, System Software: An Introduction to Systems Programming, 3/E, Pearson Education, Asia.
2. Abraham Silberschatz (Author), Peter Baer Galvin (Author), Greg Gagne (Author), Operating
System Concepts, 10/E John Wiley & Sons Inc,, February 2021.

REFERENCE BOOKS:

1. A.A.Puntambekar,I.A.Dhotre , Rupesh Mahajan ,System Programming and Operating Systems, 1/E Technical Publications, January 2022.
2. William Stallings , Operating Systems ,Pearson Education,2018

LIST OF EXPERIMENTS   15 Hours

1. Write a program to insert, search and update the identifiers in the symbol table.
2. Implement a single pass assembler.
3. Implement a two pass assembler.
4. Implement Pass-I of a macro processor and generate all the required tables.
5. Implement an absolute loader.
6. Implement a relocating loader.
7. Implement a CPU scheduling algorithm
8. Implement a Page Replacement Algorithm
9. Illustrate a program for a disk scheduling algorithm.
10. Implementation of the following Memory Allocation Methods for fixed partition
11. Implementation of the various File Organization Techniques

12. Imagine you're developing an operating system that heavily relies on threads for concurrent processing. Discuss how you would enable effective communication between these threads. Compare three methods of thread communication, highlighting their strengths, weaknesses, and when each is most suitable. Additionally, propose strategies for ensuring the security and reliability of thread communication within the operating system.
13. Design an operating system for a busy computer lab. How do you plan to prevent situations where computers get stuck waiting forever for each other? Describe your strategy for creating a system that can detect and avoid these issues, ensuring smooth usage for everyone in the lab

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	2	3	-	-	-	-	-	-	3
CO2	3	2	-	2	1	-	-	-	-	-	-	3
CO3	3	3	2	1	1	-	-	-	-	-	-	2
CO4	3	3	2	2	2	-	-	-	-	-	-	2
CO5	3	3	2	2	2	-	-	-	-	-	-	2
CO6	3	3	1	-	-	-	-	-	-	-	-	-

Assessment (40% weightage) (Theory Component)		Assessment (60% weightage) (Laboratory Component)		End Semester Examination
Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Evaluation of Laboratory Observation, Record	Test	Written Examination
40	60	75	25	
100				100
50 %				50 %

	L	T	P	C
23AD1411 **MACHINE LEARNING LABORATORY**	0	0	4	2

COURSE OBJECTIVES:

- Understand the data sets and apply suitable algorithms for selecting the appropriate features for analysis
- Illustrate supervised machine learning algorithms on standard datasets and evaluate the performance
- Develop ensemble learning techniques.
- Analyze unsupervised machine learning algorithms on standard datasets and evaluate the performance
- Evaluate ML algorithms performance for real time applications.

LIST OF EXPERIMENTS

1. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
2. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
3. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.
4. Write a program for detecting spam mails using Support Vector Machine.
5. Implement naïve Bayesian Classifier model to classify a set of documents and measure the accuracy, precision, and recall.
6. Write a program to construct a Bayesian network to diagnose CORONA infection using standard WHO Data Set.
7. Apply 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. Compare the results of these two algorithms.
8. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions
9. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select an appropriate data set for your experiment and draw graphs.
10. Mini Project. Students work in team on any socially relevant problem that needs a machine learning based solution, and evaluate the model performance

TOTAL: 60 PERIODS

COURSE OUTCOME(S):
Upon successful completion of the course, students will be able to:

CO1	Understand suitable algorithms for selecting the appropriate features for analysis.
CO2	Illustrate and Implement supervised machine learning algorithms on standard datasets and evaluate the performance.
CO3	Develop ensemble learning techniques.
CO4	Analyze unsupervised machine learning algorithms on standard datasets..
CO5	Evaluate the performance for real time applications
CO6	Construct and compare the performance of different ML algorithms and select the suitable one based on the application

WEB REFERENCES:
1. https://www.geeksforgeeks.org/machine-learning/

2. https://pythongeeks.org/what-is-machine-learning/
3. https://www.simplilearn.com/10-algorithms-machine-learning-engineers-need-to-know-article

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	1	-	-	-	-	-	-	-
CO2	3	2	2	2	2	-	-	-	-	-	-	1
CO3	1	1	1	3	1	1	-	-	-	-	-	-
CO4	2	3	1	2	1		-	-	-	-	-	-
CO5	2	2	2	2	3	1	-	1	-	-	-	-
CO6	2	2	2	2	3	1	-	1	-	-	-	-

Internal Assessment		End Semester Examination
Evaluation of Laboratory Observation, Record	**Test**	**Practical**
75	25	100
60 %		**40%**

		L	T	P	C
23AD1412	**DATA SCIENCE LABORATORY**	0	0	4	2

COURSE OBJECTIVE:

- To use python libraries for handling data.
- To be able to use the mathematical concepts of statistics.
- To acquire knowledge in plotting using visualization tools.
- To prepare data for data analysis through understanding its distribution.
- To learn to implement real time applications.

LIST OF EXPERIMENTS

1. Create an empty and a full NumPy array.
2. Program to remove rows in Numpy array that contains non-numeric values.
3. Program to build an array of all combinations of two NumPy arrays.
4. Program to add a border around a NumPy array.
5. Program to perform matrix operations using NumPy.
6. Write a Pandas program to create and display a DataFrame from a specified dictionary data which has the index labels.
7. Write a Pandas program to get the first 3 rows of a given DataFrame.
8. Write a Python program to set the date column as the index and plot time series data.
9. Write a Python program to draw a line with suitable label in the x axis, y axis and a title.
10. Write a Python program to draw linecharts of the financial data of AlphabetInc. between October3,2016 to October 7,2016.
11. The table below gives the values of runs scored by ViratKohli in last 25T -20 matches. Represent the data in the form of less than type cumulative frequency distribution:

45	34	50	75	22
56	63	70	49	33
08	14	39	86	52
92	88	70	56	50
57	45	42	12	39

12. Program to find the sum and average of n integer numbers.
13. Program to find the variance and standard deviation of set of elements.
14. Program to plot a normal distribution in python.
15. Program to plot a Correlation and scatterplots.
16. Program for Linear Regression and Logistic Regression.
17. Mini project on real time applications.
18. Write a python program to load a dataset, train and visualize the results.

TOTAL: 60 PERIODS

COURSE OUTCOME(S):

Upon successful completion of the course, students will be able to:

CO1 Understand programming skills to handle data using Numpy and pandas.

CO2 Demonstrate knowledge of statistical data analysis techniques.

CO3 Perform data exploration using Matplotlib.

CO4 Demonstrate how data is distributed and can prepare it for analysis.

CO5 Create and assess data-based models.

CO6 Apply data science concepts and methods to solve problems in real-world contexts.

REFERENCE BOOKS:

1. Jake Vander Plas,"Python Data Science Handbook",O'Reilly,2022.
2. Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press, 2014.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	1	1	-	-	-	-	-	-	1
CO2	1	1	1	1	1	-	-	-	-	-	-	1
CO3	3	2	2	2	2	-	-	-	-	-	-	2
CO4	3	2	2	2	1	-	-	-	-	-	-	1
CO5	2	2	3	1	2	-	-	-	-	-	-	2
CO6	2	1	1	1	2	-	-	-	-	-	-	1

Internal Assessment		End Semester Examination
Evaluation of Laboratory Observation, Record	Test	Practical
75	25	100
60 %		40%

23ES1411	TECHNICAL SKILL PRACTICES III	L	T	P	C
		0	0	2	1

COURSE OBJECTIVE:

- Understanding Java Fundamentals.
- Develop proficiency in flow control statements and Understand the usage of arrays and var-arg types
- Exploring Object-Oriented Programming Concepts through Java Programming
- Develop programs on Exception handling through Java Programming
- Understand the usage of wrapper classes and Utilizing Standard Java Libraries

LIST OF TOPICS

1. Java Tokens- Comments, Identifiers, Keywords, Separators, Data types
2. Scoping and Parameter passing (by value & by reference)
3. Flow Control Statements
4. Arrays and Var-arg types
5. Operators & their Precedence & Associativity
6. Conversions: Narrowing & Widening Conversions
7. Access Modifiers for Class & Class Members
8. Non Access Modifiers for Class & Class Members
9. Packages with Static imports
10. Creating Classes and Instances
11. Method and Types of methods
12. Inheritance
13. Polymorphism(Method Overloading & Overriding) Abstract classes and Interfaces
14. Constructors and Initialization
15. Static data and methods
16. Exception Handling Framework- User defined Exceptions
17. Java Thread Model

TOTAL: 30 PERIODS

COURSE OUTCOME(S):
Upon successful completion of the course, students will be able to:
CO1 Understanding the fundamental programming elements of Java and learn to apply basic control structures in Java.
CO2 Apply scoping rules and demonstrate an understanding of parameter passing in Java
CO3 Analyze and create effective flow control statements in Java
CO4 Evaluate the usage of arrays, var-args, and enums in Java, based on program requirements and design considerations.
CO5 Develop Java programs to implement object-oriented design principles.
CO6 Apply exception handling techniques in Java, including the creation of user-defined exceptions

TEXT BOOKS:

1. Herbert Schildt, "Java The complete reference", 12th Edition, McGraw Hill Education, 2022.
2. Cay S. Horstmann, Gary cornell, "Core Java Volume –I Fundamentals", 11th Edition, Prentice Hall, 2020.

REFERENCE BOOKS:

1. Paul Deitel, Harvey Deitel, "Java SE 8 for programmers", 3rd Edition, Pearson, 2015.
2. Timothy Budd, "Understanding Object-oriented programming with Java", Updated Edition, Pearson Education, 2000.

WEB REFERENCES:

1. https://www.javatpoint.com/java-tutorial
2. https://www.tutorialspoint.com/java/index.htm