

# 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  
MACHINE LEARNING**

[www.panimalar.ac.in](http://www.panimalar.ac.in)

# PANIMALAR ENGINEERING COLLEGE

An Autonomous Institution, Affiliated to Anna University, Chennai

(JAISAKTHI EDUCATIONAL TRUST)

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



**B.Tech. ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING**

**CURRICULUM AND SYLLABUS**

**REGULATION-2023**

## DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

### VISION

- To be a center of excellence in the field of Artificial Intelligence and Machine Learning applications through appropriate use and diffusion of emerging techniques

### MISSION

- To develop students with strong capabilities in Artificial Intelligence by continuously enhancing teaching and learning with state-of-the-art technologies.
- To provide high-quality, value-based education to gain competence in Artificial Intelligence and Machine learning in terms of research and innovation activities.
- To implement engineering solutions for the benefit of society by the use of AI and ML.



## PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

- PEO 1:** To perform well in their professional career by acquiring enough knowledge in the domain of Artificial Intelligence and Machine Learning.
- PEO 2:** To enable graduates to research, design and implement AI/ML products and services with effective Communication and Entrepreneurial Skills.
- PEO 3:** To modernize the students with evolving technology and use it for career Advancement.

## PROGRAM OUTCOMES (PO)

- PO1 (Engineering knowledge):** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- PO2 (Problem Analysis):** Identify, formulate, research literature, and analyze complex engineering problem reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- PO3 (Design/development of solutions):** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- PO4 (Conduct investigations of complex problems):** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- PO5 (Modern tool usage):** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- PO6 (The engineer and society):** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the Professional engineering practice.
- PO7 (Environment and sustainability):** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- PO8 (Ethics):** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
- PO9 (Individual and team work):** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
- PO10 (Communication):** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- PO11 (Project management and finance):** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- PO12 (Life-long learning):** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

## PROGRAMME SPECIFIC OUTCOMES (PSO)

- PSO1:** Develop models in Data Science, Machine learning, Deep learning and Big data technologies, using AI and modern tools.
- PSO2:** Create solutions for interdisciplinary AI problems through acquired programming knowledge in the respective domains fulfilling with real- time constraints.



**B.Tech- Artificial Intelligence and Machine Learning**  
**CHOICE BASED CREDIT SYSTEM (CBCS)**  
**I - VIII SEMESTERS CURRICULUM AND SYLLABI (REGUALTION 2023)**  
(For the Students admitted during 2023-24)

Semester I							
S. No	COURSE CODE	COURSE TITLE	Category	L/T/P	Contact Hours	Credit	Ext / Int Weightage
<b>Theory Courses</b>							
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
<b>TheoryCum Practical Courses</b>							
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
<b>Laboratory Courses</b>							
6.	23ES1111	Problem Solving using C Programming Laboratory	ES	0/0/4	4	2	40/60
<b>Mandatory Course</b>							
7.	23TA1101	தமிழர் மரபு/ Heritage of Tamils	HS	1/0/0	1	1	60/40
<b>TOTAL</b>					<b>25</b>	<b>20</b>	

Semester II							
S. No	COURSE CODE	COURSE TITLE	Category	L/T/P	Contact Hours	Credit	Ext / Int Weightage
<b>Theory Courses</b>							
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
<b>Theory Cum Practical Courses</b>							
5.	23HS1201	Communicative and Aptitude Skills	HS	2/0/2	4	3	50/50
<b>Laboratory Courses</b>							
6.	23ES1211	Python Programming Laboratory	ES	0/0/4	4	2	40/60
7.	23AD1211	Data Structures and Algorithms Laboratory	PC	0/0/4	4	2	40/60
8.	23ES1212	Technical Skill Practices I	EEC	0/0/2	2	1	40/60
<b>Mandatory Course</b>							
9.	23TA1201	தமிழும் தகவல் 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
<b>TOTAL</b>					<b>31</b>	<b>22</b>	

Semester III							
S. No	COURSE CODE	COURSE TITLE	Category	L/T/P	Contact Hours	Credit	Ext / Int Weightage
<b>Theory Courses</b>							
1.	23MA1304	Mathematical Foundations for Artificial Intelligence	BS	3/1/0	4	4	60/40
2.	23AD1302	Artificial Intelligence and Expert Systems	PC	3/0/0	3	3	60/40
3.	23AD1303	Object Oriented Programming Paradigm	PC	3/0/0	3	3	60/40
4.	23CS1301	Digital Principles and Computer Architecture	PC	3/0/0	3	3	60/40
5.	23CS1303	Database Management Systems	PC	3/0/0	3	3	60/40
<b>Laboratory Courses</b>							
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
<b>Mandatory Course</b>							
10		Mandatory Course II	MC	2/0/0	2	0	0/100
<b>TOTAL</b>					<b>32</b>	<b>23</b>	



Semester IV							
S. No	COURSE CODE	COURSE TITLE	Category	L/T/P	Contact Hours	Credit	Ext / Int Weightage
<b>Theory Courses</b>							
1.	23MA1406	Probabilistic Methods and Optimization Techniques in Machine Learning	BS	3/1/0	4	4	60/40
2.	23CS1401	Computer Networks	PC	3/0/0	3	3	60/40
3.	23IT1403	Operating Systems	PC	3/0/0	3	3	60/40
4.	23AD1401	Machine Learning	PC	3/0/0	3	3	60/40
5.	23CB1402	Introduction to Innovation and Entrepreneurship	EEC	0/0/2	2	1	40/60
6.	23AD1403	Software Development and Practices	PC	3/0/0	3	3	60/40
<b>Laboratory Courses</b>							
7.	23CS1411	Computer Networks Laboratory	PC	0/0/4	4	2	40/60
8.	23AD1411	Machine Learning Laboratory	PC	0/0/4	4	2	40/60
9.	23ES1411	Technical Skill Practices III	EEC	0/0/2	2	1	40/60
<b>TOTAL</b>					<b>28</b>	<b>22</b>	

Semester V							
S. No	COURSE CODE	COURSE TITLE	Category	L/T/P	Contact Hours	Credit	Ext / Int Weightage
<b>Theory Courses</b>							
1.	23AD1501	Formal Language and Automata Theory	PC	3/0/0	3	3	60/40
2.	23AD1503	Data Analytics	PC	3/0/0	3	3	60/40
3.	23AD1504	Knowledge Engineering and Intelligent Systems	PC	3/0/0	3	3	60/40
4.		Open Elective I	OE	3/0/0	3	3	60/40
5.		Professional Elective I	PE	3/0/0	3	3	60/40
<b>Theory Cum Practical Courses</b>							
6.	23AD1505	Data Exploration and Visualization	PC	2/0/2	4	3	50/50
<b>Laboratory Courses</b>							
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
<b>TOTAL</b>					<b>29</b>	<b>23</b>	

Semester VI							
S. No	COURSE CODE	COURSE TITLE	Category	L/T/P	Contact Hours	Credit	Ext / Int Weightage
<b>Theory Courses</b>							
1.	23ML1601	Reinforcement and Ensemble Learning	PC	3/0/0	3	3	60/40
2.	23ML1602	Swarm Intelligence	PC	3/0/0	3	3	60/40
3.	23ML1603	Natural Language Processing	PC	3/0/0	3	3	60/40
4.	23AD1601	Deep Learning	PC	3/0/0	3	3	60/40
5.		Open Elective II	PC	3/0/0	3	3	60/40
6.		Professional Elective II	PE	3/0/0	3	3	60/40
<b>Laboratory Courses</b>							
7.	23ML1611	Natural Language Processing Laboratory	PC	0/0/4	4	2	40/60
8.	23AD1611	Deep Learning Laboratory	PC	0/0/4	4	2	40/60
9.	23ES1611	Technical Skill Practices V	EEC	0/0/2	2	1	40/60
<b>TOTAL</b>					<b>28</b>	<b>23</b>	

Semester VII							
S. No	COURSE CODE	COURSE TITLE	Category	L/T/P	Contact Hours	Credit	Ext / Int Weightage
<b>Theory Courses</b>							
1.	23ML1701	Machine Intelligence for Network Sciences	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
<b>Theory Cum Practical Courses</b>							
5.	23AD1703	Artificial Intelligence and Robotics	PC	2/0/2	4	3	50/50
<b>Laboratory Courses</b>							
6.	23ML1711	Design Thinking and Project Development Laboratory	EEC	0/0/2	2	1	40/60
7.	23AD1711	Computer Vision Laboratory	PC	0/0/4	4	2	40/60
<b>TOTAL</b>					<b>22</b>	<b>18</b>	

Semester VIII							
S. No	COURSE CODE	COURSE TITLE	Category	L/T/P	Contact Hours	Credit	Ext / Int Weightage
<b>Theory Courses</b>							
1.		Professional Elective V	PE	3/0/0	3	3	60/40
2.		Professional Elective VI	PE	3/0/0	3	3	60/40
<b>Laboratory Courses</b>							
3.	23ML1811	Project Work	EEC	0/0/16	16	10	40/60
<b>TOTAL</b>					<b>22</b>	<b>16</b>	

**TOTAL CREDITS: 167**



### CREDIT DISTRIBUTION

S.No	Subject Area	Credits Per Semester								Credits Total	Percentage %
		I	II	III	IV	V	VI	VII	VIII		
1	Humanities and Social Studies(HS)	4	4							8	4.8
2	Basic Sciences(BS)	7	4	4	4					19	11.4
3	Engineering Sciences(ES)	9	8							17	10.2
4	Professional Core(PC)		5	18	16	16	19	11		85	50.9
5	Professional Electives(PE)					3	3	6	6	18	10.8
6	Open Electives(OE)					3				3	1.8
7	Project Work (PR/EEC)		1	1	2	1	1	1	10	17	11.4
8	Mandatory Courses	0	0	0						0	0
	<b>Total</b>	<b>20</b>	<b>22</b>	<b>23</b>	<b>22</b>	<b>23</b>	<b>23</b>	<b>18</b>	<b>16</b>	<b>167</b>	<b>100</b>

## SEMESTER – I

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 techniques 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** 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. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44<sup>rd</sup> Edition, 2018.
2. James Stewart, "Calculus: Early Transcendental", Cengage Learning, 9<sup>th</sup> Edition, New Delhi, 2015.
3. Bali N., Goyal M. and Walkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt. Ltd.), New Delhi, 7<sup>th</sup> Edition, 2015.

**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, 10<sup>th</sup> Edition, 2015.
5. Sivaramakrishna Dass, C. Vijayakumari, "Engineering Mathematics", Pearson Education India, 4<sup>th</sup> Edition 2019.
6. Sundar Raj. M and Nagarajan. G , "Engineering Mathematics-I", 3<sup>rd</sup> Edition, Sree Kamalamani Publications, Chennai, 2020.

**ONLINE COURSES / RESOURCES**

1. [https://onlinecourses.nptel.ac.in/noc21\\_ma60/preview](https://onlinecourses.nptel.ac.in/noc21_ma60/preview)
2. [https://onlinecourses.nptel.ac.in/noc21\\_ma58/preview](https://onlinecourses.nptel.ac.in/noc21_ma58/preview)

**CO-PO MAPPING**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>CO1</b>	3	3	3									1
<b>CO2</b>	3	3	3									1
<b>CO3</b>	3	3	3									1
<b>CO4</b>	3	3	3									1
<b>CO5</b>	3	3	3									1



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

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-referential structures - Dynamic memory allocation - 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

**COURSE OUTCOME**

**Upon successful completion of the course student 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.
- CO6** Design applications using sequential and random access file processing.

**TEXTBOOKS**

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 with C",McGraw-Hill Education, 1996.

**WEB REFERENCES**

1. <https://github.com/tscheffl/ThinkC/blob/master/PDF/Think-C.pdf>
2. <https://freecomputerbooks.com/langCBooks.html>

**ONLINE COURSES/RESOURCES**

1. <https://www.programiz.com/c-programming>.
2. <https://www.tutorialspoint.com/cprogramming/index.htm>.
3. <https://www.javatpoint.com/c-programming-language-tutorial>.
4. <https://www.geeksforgeeks.org/c-programming-language/>.
5. [https://en.wikibooks.org/wiki/C\\_Programming](https://en.wikibooks.org/wiki/C_Programming).
6. <https://www.cprogramming.com/tutorial/c-tutorial.html?inl=hp>.

### CO – PO MAPPING

	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						

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
<b>40%</b>				<b>60 %</b>

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 Swan Limited, 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, L. Thomas and Elaine Langlois. English & Communication for Colleges. Cengage Learning, USA:2007
4. Redston, Chris & Gillies Cunningham Face 2Face (Pre-intermediate Student's Book & Workbook) Cambridge University Press, New Delhi: 2005.

## WEB REFERENCES

1. <https://learnenglishteens.britishcouncil.org/exams/grammar-and-vocabulary-exams/> word formation
2. <https://cdn.s3waas.gov.in/s347d1e990583c9c67424d369f3414728e/uploads/2018/02/2018031621.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/2018/02/2018031621.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 fragmented utterances- 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 governments.

**PRACTICAL: 30 PERIODS**  
**TOTAL: 60 PERIODS**

### REFERENCE BOOKS

1. Suresh Kumar.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** The students will be able to 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** To gain understanding of basic grammatical structures and use them in right context.  
**CO6** To use appropriate words in a professional context.

### CO-PO MAPPING

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

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



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

## COURSE OBJECTIVE

- To impart knowledge in basic concepts of physics relevant to engineering applications
- 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 behaviour- Hard and Soft Magnetic materials- Magnetic principle in Computer data storage - Magnetic Hard Disc 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: homojunction and heterojunction— **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 independent and 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.

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 PERIODS**

#### LIST OF EXPERIEMENTS

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 Fibre
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
8. Determine the band gap energy of a semiconductor.

**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 RaiChoudhury, 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 of science and engineering  
<http://www.springer.com/978-3-319-50650-0>

#### 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** Upon completion of this course, the students will understand the basics properties of materials, especially elastic and thermal properties of materials.
- CO2** Upon completion of this course, the students will have adequate knowledge on the concepts of semiconducting and magnetic materials and their applications in memory storage.
- CO3** Upon completion of this course, the students will acquire the knowledge on the concepts of lasers, fiber optics and their technological applications.
- CO4** Upon completion of this course, the students will get knowledge on fundamental concepts of quantum theory, nanoscience its applications
- CO5** Upon completion of this course, the students will 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						

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

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 wiring - 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. 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.

## **REFERENCE BOOKS**

1. Del Toro, "Electrical Engineering Fundamentals" Pearson Education, New Delhi, 2007
2. Smarjit Ghosh, "Fundamentals of Electrical and Electronics Engineering", 2<sup>nd</sup> Edition 2007
3. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things - Key applications and Protocols", Wiley, 2012

## **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](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:
  - (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
3. Measurement of electrical quantities - voltage, current, power & power factor in RLC circuit.
4. Design of Half Wave Rectifier & Full wave Rectifier
5. Simulation of following circuits using suitable software
  - (i) Seven segment LED display
  - (ii) Stepper Motor control
  - (iii) Traffic Light Control
6. 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 AC Machines
- 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

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

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

### COURSE OBJECTIVE

- To write, test, and debug simple C programs.
- To implement C programs with conditional and looping statement
- To develop applications in C using strings, pointers, functions.
- To implement C programs with structures and union.
- To develop applications in C using file processing
- To develop an application in real time situation

### 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 based on 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 shown below  
<10,its weight>,<36,its weight><89,its weight>
7. Populate an array with height of persons and find how many persons are above the average height.
8. Given a string `~a$bcd./fgll` find its reverse without changing the position of special characters. (Example input: `a@gh%; j` and output: `j@hg%; a`)
9. Convert the given decimal number into binary, octal and hexadecimal numbers using userdefined 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.



14.
  - 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 of string 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
15. Compute internal marks of students for five different subjects using structures and functions.
16. Program to demonstrate the difference between unions and structures
17. Insert, update, delete and append telephone details of an individual or a company into a telephone directory using random access file.
18. Count the number of account holders whose balance is less than the minimum balance using sequential access file.
19. **MINI PROJECT**  
Create a Railway reservation system with the following modules
  - a) Booking
  - b) Availability checking
  - c) Cancellation
  - d) Prepare chart

**TOTAL : 60 PERIODS**

### **COURSE OUTCOME**

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

- CO1** Write, test, and debug simple C programs.
- CO2** Implement C programs with conditionals and loops.
- CO3** Develop C programs for simple applications making use arrays and strings.
- CO4** Develop C programs involving functions, recursion, pointers, and structures and union.
- CO5** Design applications using sequential and random access file processing.
- CO6** 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>
6. [https://www.tutorialspoint.com/learn\\_c\\_by\\_examples/simple\\_programs\\_in\\_c.htm](https://www.tutorialspoint.com/learn_c_by_examples/simple_programs_in_c.htm)

### CO-PO MAPPING

	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							

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

23TA1101	HERITAGE OF TAMIL	L	T	P	C
		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 Nayanmars - 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 - Mridhngam, 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 3  
MOVEMENT 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. 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: 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 Civilization 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) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book

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	
<b>40%</b>				<b>60 %</b>

23TA1101	தமிழர் மரபு	L	T	P	C
		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 மேலாண்மைக் கருத்துக்கள் - 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**

3

**ஓவியங்கள் வரை - சிற்பக் கலை**

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

**UNIT - III**

**நாட்டுப்புறக் கலைகள் மற்றும் வீர**

3

**விளையாட்டுகள்**

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஓயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

**UNIT -IV**

**தமிழர்களின் திணைக் கோட்பாடுகள்**

3

தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்கப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் - சங்ககால நகரங்களும் துறை முகங்களும் - சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - கடல் கடந்த நாடுகளில் சோழர்களின் வெற்றி.

**UNIT -V**

**இந்திய தேசிய இயக்கம் மற்றும் இந்திய**

3

**பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு**

இந்திய விடுதலைப் போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்ச 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. சந்திரம். (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 Civilization 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) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book

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	
<b>40%</b>				<b>60 %</b>

## SEMESTER – II

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's conditions - General Fourier series - Odd and even functions - Half range sine series - 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's identity.

### UNIT IV **LAPLACE TRANSFORM** **9+3**

Laplace transform - Sufficient condition for existence - Transform of elementary functions - Basic properties - Transforms of derivatives and integrals of functions - Derivatives and integrals of transforms - 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.



**COURSE OUTCOME**

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

- CO1** 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** To find out Laplace transform for a function using the properties
- CO5** Use the effective mathematical tools for the solutions of partial differential equations by 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 Delhi, 2014.
3. Narayanan.S, Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics For Engineering 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 Company Limited, 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" ,5<sup>th</sup> Edition, SreeKalamani Publications, Chennai, 2020.

### 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

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
<b>40%</b>				<b>60 %</b>

23AD1201	DATA STRUCTURES AND ALGORITHMS	L	T	P	C
		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 - DeQueue - 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- Dijkstra'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 APPROXIMATION ALGORITHMS 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 Successful 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 Jeffrey 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. Thomas H Cormen, Charles E Leiserson, Ronald L Rivest and Clifford Stein, Introduction to Algorithms, Second Edition, Prentice Hall of India, New Delhi, 2012.
5. Ellis Horowitz and Sartaj Sahni, Fundamentals of Data Structures, Galgotia Book Sorce, Gurgaon, 1976.
6. 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/](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										

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

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 0 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 LINES 6+6

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 planes by rotating object method and auxillary plane method.

Projection of simple solids like prisms, pyramids, cylinder, and cone when the axis is inclined 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 one of 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 successful 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/UChkCk0nvNyWhEOLge9JtDLDg>

**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
<b>CO1</b>	3	3	3								3	3
<b>CO2</b>	3	3	3								3	3
<b>CO3</b>	3	3	3								3	3
<b>CO4</b>	3	3	3								3	3
<b>CO5</b>	3	3	3								3	3

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



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

### COURSE OBJECTIVE

- 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 AND CONTROL 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 in loops, 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 and minimum 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 Value Error 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 Type Error exception if the inputs are not numerical, executes an operation on a list and handles an Index Error exception if the index is out of range.

**UNIT -V****PACKAGES & GUI****9**

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

**TOTAL: 45 PERIODS****COURSE OUTCOME**

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, set 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", Pearson Education, 1st Edition, 2021.
2. Reema Thareja, "Problem Solving and Programming with Python", 2<sup>nd</sup> edition, Oxford University Press, New Delhi, 2019.
3. Alan D. Moore, Python GUI Programming with Tkinter, Design and Build Functional and User-friendly GUI Applications, Packt Publishing, 2021.

**REFERENCE BOOKS**

1. Martin C. Brown, "Python: The Complete Reference", 4th Edition, Mc-Graw Hill, 2018
2. Eric Matthes, "Python Crash Course, A Hands - on Project Based Introduction 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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	3	1	2							1
CO2	2	3	3	1	2							1
CO3	2	3	3	1	2							1
CO4	2	3	3	1	2							1
CO5	2	3	3	1	2							1
CO6	2	3	3	1	2							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
<b>40%</b>				<b>60 %</b>

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

## COURSE OBJECTIVE

- To develop linguistic and strategic competence in workplace context and to enhance language proficiency and thereby the employability of budding engineers and technologists.
- 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 and developing 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

**TEXT BOOKS**

1. Board of Editors. English for Engineers and Technologists Volume 2 Orient Black Swan Limited, 2020
2. Richards, C. Jack. Interchange, New Delhi: CUP, 2017
3. Aggarwal R.S. (2017). Quantitative Aptitude for Competitive Examinations 3<sup>rd</sup> (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 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, 7<sup>th</sup> (Ed.). Noida: McGraw Hill Education Pvt. Ltd.

**WEB REFERENCES**

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**

## REFERENCE BOOKS

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, 7<sup>th</sup> (Ed.). Noida: McGraw Hill Education Pvt. Ltd.

## COURSE OUTCOME

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

- CO1** Recognise 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

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

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

## COURSE OBJECTIVE

- 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 of the 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)**



1. Dice roll simulator
2. Guess the number game
3. Random password generator

**TOTAL: 60 PERIODS**

**COURSE OUTCOMES**

Upon 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

**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](https://www.w3schools.com/python/python_examples.asp)

**CO- PO MAPPING**

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

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

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

## COURSE OBJECTIVE

- To impart essential problem solving skills through general problem solving concepts.
- To provide basic knowledge on programming essentials using C as implementation tool.
- 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 OUTCOME

**Upon 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. ReemaThareja, ``Programming in C'', 2nd edition, OXFORD University Press, New Delhi, 2019.
2. Paul Deitel and Harvey Deitel, "C How to Program", Seventh edition, Pearson Publication,2016.

## REFERENCES 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

	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

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

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

### COURSE OBJECTIVE

- 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 using stack. 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 on Red Black Tree.
7. Write a program for Quick sort using Divide and Conquer strategy (without using Built 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 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

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

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 and gold- Coins as source of history - Minting of Coins — Beads making- industries Stone beads -Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram.

**UNIT –IV AGRICULTURE AND IRRIGATION TECHNOLOGY 3**

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoempu 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. பொருறை - 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 Civilization 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) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book

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	
<b>40%</b>				<b>60 %</b>



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

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

சங்க காலத்தில் நெசவுத் தொழில் - பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள்.

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

சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் 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 நீர்பாசனத் தொழில்நுட்பம் 3**

அணை, ஏரி, குளங்கள், மதகு - சோழர்காலக் குமிழித் தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் - வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்துக்குளித்தல் - 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. பொருதை - 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 Civilization 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) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book

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	
<b>40%</b>				<b>60 %</b>

## SEMESTER – III

<b>23MA1304</b>	<b>MATHEMATICAL FOUNDATIONS FOR ARTIFICIAL INTELLIGENCE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		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 9+3 **LOGIC AND PROOFS**

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

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

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 9+3 **GRAPHS**

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 9+3 **TESTING OF HYPOTHESIS**

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 9+3 **NON PARAMETRIC TESTS**

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 analyse structure between graphs

**CO5** Illustrate the concept of testing of hypothesis for small and large samples in real life problem

**CO6** Use the concepts of Non Parametric Testing for Non-Normal Populations.

**TEXT BOOKS:**

1. Rosen, K.H., "Discrete Mathematics and its Applications", 7<sup>th</sup> Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2011.
2. Tremblay, J.P. and Manohar.R, "Discrete Mathematical Structures with Applications Computer Science", Tata McGraw Hill Pub. Co. Ltd, New Delhi, 30<sup>th</sup>Reprint, 2011.
3. Veerarajan T, 'Probability and Statistics, Random Processes and Queueing Theory', First Edition, McGraw Hill, 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, Queueing 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
<b>CO1</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>								<b>1</b>
<b>CO2</b>	<b>3</b>	<b>3</b>										
<b>CO3</b>	<b>3</b>	<b>3</b>	<b>1</b>									<b>1</b>
<b>CO4</b>	<b>3</b>	<b>3</b>	<b>3</b>									
<b>CO5</b>	<b>3</b>			<b>3</b>								
<b>CO6</b>	<b>3</b>			<b>3</b>								

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

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. 2022. Artificial Intelligence - A Modern Approach, 4th edition, Prentice Hall.
2. David L. Poole and Alan K. Mack worth, A. 2023. Artificial Intelligence: Foundations of Computational Agents, Cambridge University Press.
3. Enrique Castillo, Jose M. Gutierrez, Ali S. Hadi,2012. Expert Systems and Probabilistic Network Models, Springer Publishing Company, Incorporated.ISBN:978-1-4612-7481-0
4. Virginia Dignum, 2019.Responsible Artificial Intelligence-How to Develop and use AI in a Responsible Way, Springer. ISBN: 978-3-030-30371-6.

**REFERENCE BOOKS:**

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



### 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)		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
<b>40%</b>				<b>60 %</b>

23AD1303	OBJECT ORIENTED PROGRAMMING PARADIGM	L	T	P	C
		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 MULTITHREADING 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 - Mouse Event, Key Event, Window Event, Action Event, Item Event, 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", 9<sup>th</sup> Edition, Prentice Hall, 2013.
2. Jeffrey C and Jackson, Web Technologies A Computer Science Perspective, Pearson Education, 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)		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
<b>40%</b>				<b>60 %</b>



## **COURSE OUTCOME(S):**

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

- CO1** Relate different number systems and binary codes.
- CO2** Explain the basic structure of computers, operations and instructions.
- CO3** Build digital circuits using simplified Boolean functions.
- CO4** Design and realize simple combinational logic circuits.
- CO5** Evaluate the characteristics and working of various Flip-Flops.
- CO6** Compare and contrast memory hierarchies, I/O systems and Parallel processing.

## **TEXTBOOKS:**

1. M. Morris R. Mano, Michael D. Ciletti, Digital Design: With an Introduction to the Verilog HDL, VHDL, and System Verilog, 6th Edition, Pearson Education, 2018.
2. David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Fifth Edition, Morgan Kaufmann / Elsevier, 2014.

## **REFERENCE BOOKS:**

1. John F. Wakerly, Digital Design Principles and Practices, Fifth Edition, Pearson Education, 2018.
2. Charles H. Roth Jr, Larry L. Kinney, Fundamentals of Logic Design, Sixth Edition, CENGAGE Learning, 2013.
3. William Stallings, "Computer Organization and Architecture - Designing for Performance", Tenth Edition, Pearson Education, 2016.
4. Govindarajalu, "Computer Architecture and Organization, Design Principles and Applications", Second edition, McGraw-Hill Education India Pvt Ltd, 2014.

## **WEB REFERENCES:**

1. <https://www.javatpoint.com/digital-electronics>
2. [https://www.tutorialspoint.com/digital\\_circuits](https://www.tutorialspoint.com/digital_circuits)
3. <https://www.tutorialspoint.com/Computer-System-Architecture>
4. <https://www.geeksforgeeks.org/computer-organization-and-architecture-tutorials/>

## **ONLINECOURSES/RESOURCES:**

1. <https://nptel.ac.in/courses/117105080>
2. <https://www.coursera.org/learn/digital-systems>

### CO - PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2									
CO2	3	2	2									
CO3	3	2	2									
CO4	3	1	1									
CO5	2	1	1									
CO6	2	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	
<b>40%</b>				<b>60 %</b>

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

**COURSE OBJECTIVE:**

- To understand the role of a database management system, relational data model and successfully apply logical database design principles, including E-R diagrams.
- To learn the basic concepts and the applications of database systems.
- To learn SQL and construct queries using SQL.
- To know about Transaction processing and concurrency control.
- To understand 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):**

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

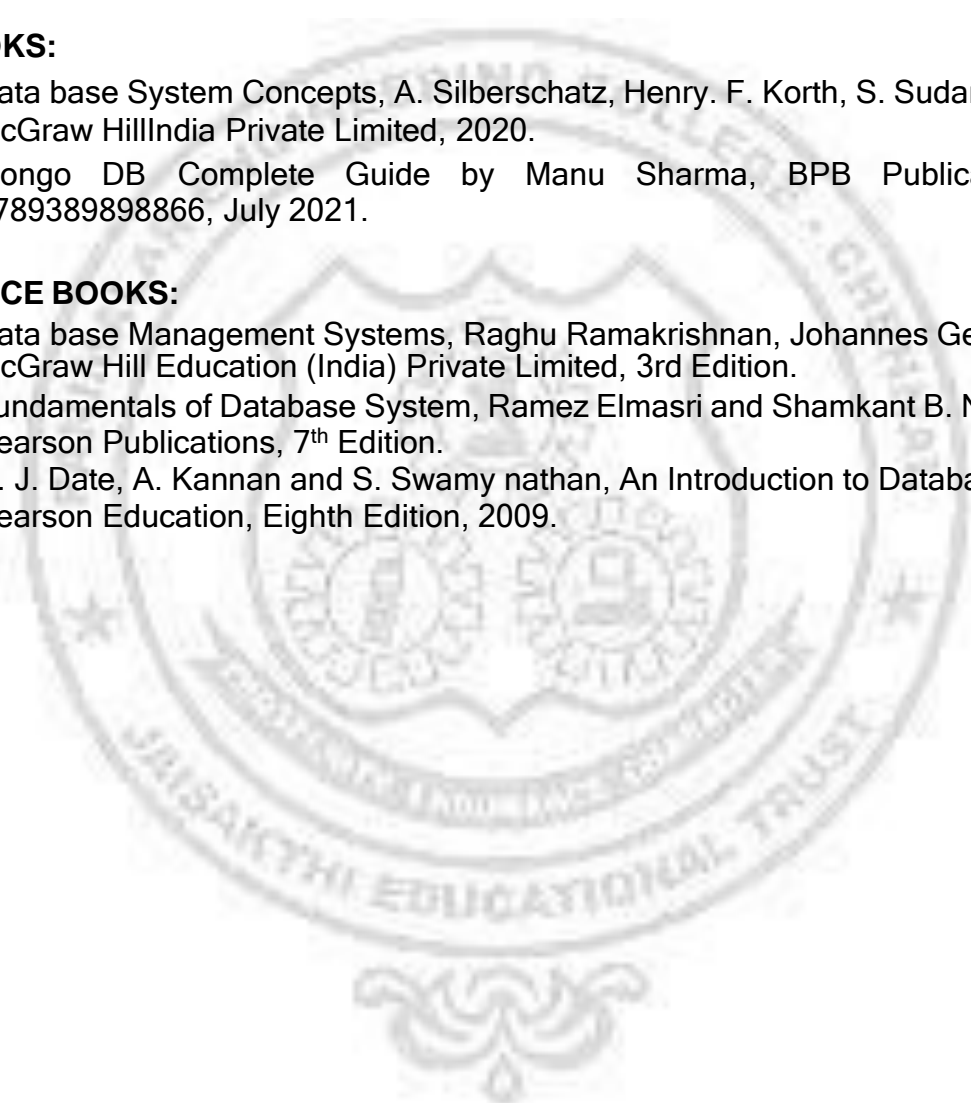
- CO1** Identify and Recognize the Structure of a Database
- CO2** Understand an Entity Relational Model for a database.
- CO3** Apply Relational and Non-Relational database concepts to design a database.
- CO4** Analyze the importance of normalization and functional dependencies in database design.
- CO5** Evaluate the working principles of indexing and hashing.
- CO6** Create a database design using both Relational and Non- Relational models

## **TEXTBOOKS:**

1. Data base System Concepts, A. Silberschatz, Henry. F. Korth, S. Sudarshan, McGraw Hill India 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.
2. Fundamentals of Database System, Ramez Elmasri and Shamkant B. Navathe, Pearson Publications, 7<sup>th</sup> Edition.
3. C. J. Date, A. Kannan and S. Swamy nathan, 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)		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
<b>40%</b>				<b>60 %</b>

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%

23AD1312	OBJECT ORIENTED	L	T	P	C
	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 Command
- 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%

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

**COURSE OBJECTIVE:**

- To understand the concepts of Arrays, List ADT.
- 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. List ADT
3. Queue ADT
4. Stack ADT
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, February 2023.
3. Dr. Harsh Bhasin, "Data Structures with Python", BPB Publications, Delhi, March 2023.
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", 3<sup>rd</sup> Edition, Packt Publishing, July 2022.
2. Narasimha Karumanchi, "Data Structures and Algorithms Made Easy", Career Monk Publications, August 2016.
3. Michael H. Goldwasser, Michael T. Goodrich, and Roberto Tamassia, "Data Structures and Algorithms in Python", Wiley Publications 2013.

**ONLINE COURSES/RESOURCES**

- <https://www.codechef.com/practice>.
- <https://www.simplilearn.com/tutorials/python-tutorial/data-structures>.
- <https://www.simplilearn.com/tutorials/python-tutorial/data-structures>.
- <https://nptel.ac.in/Courses/>

### CO-PO MAPPING

	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

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



1. I.R. Miller, J.E. Freund and R. Johnson, Probability and Statistics for Engineers, 8th Edition, 2015.
2. Ibe, O.C, Fundamentals of Applied Probability and Random Processes, Elsevier, 2nd Indian Reprint, 2014.
3. Veerarajan T, Probability, Statistics and Random Processes with Queueing Theory, McGrawHill, 4th Edition, 2018.
4. Milton. J. S. and Arnold. J.C., Introduction to Probability and Statistics, Tata McGrawHill, 4th Edition, 2007

#### REFERENCE BOOKS:

1. Hwei Hsu Schaums Outline of Theory and Problems of Probability, random variables and Random Processes, Tata McGraw Hill Edition, New Delhi, 2004.
2. Taha, H.A., Operations Research, 9th Edition, Pearson India Education Services, Delhi, 2016.
3. Yates, R.D. and Goodman. D.J., Probability and Stochastic Processes, 2nd Edition, Wiley India Pvt. Ltd., Bangalore, 2012.
4. Devore. J.L., Probability and Statistics for Engineering and the Sciences, Cengage Learning, New Delhi, 8th Edition, 2014.

#### 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)		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
<b>40%</b>				<b>60 %</b>



23CS1401	COMPUTER NETWORKS	L	T	P	C
		3	0	0	3

**COURSE OBJECTIVE:**

- To understand protocol layering and physical level communication
- To be familiar with data link layer and media access control layer functions.
- To learn the various routing protocols used in network layer
- To understand the functions and protocols of the Transport layer.
- To realize the application Layer protocols and attacks.

**UNIT- I INTRODUCTION AND PHYSICAL LAYER 9**

Networks – Network Types – Protocol Layering – TCP/IP Protocol suite – OSI Model – Physical Layer: Performance – Guided transmission media, Wireless transmission – Switching.

**UNIT- II DATA-LINK LAYER & MEDIA ACCESS 9**

Introduction — Link-Layer Addressing — Data-Link Layer Protocols — HDLC — PPP – Media Access Control – Wired LANs: Ethernet – Wireless LANs: IEEE 802.11, The Link-Layer Protocol for Cable Internet Access, Switched Local Area Networks.

**UNIT- III NETWORK LAYER 9**

Introduction – Network Layer Protocols: IPV4, ICMP, IPV6 – Unicast Routing Algorithms– Multicasting Basics, Routing for mobile hosts.

**UNIT- IV TRANSPORT LAYER 9**

Introduction – Transport Layer Protocols – User Datagram Protocol – Transmission Control Protocol – Multiprotocol Label Switching (MPLS).

**UNIT- V APPLICATION LAYER 9**

WWW and HTTP – FTP – Email -Telnet -SSH – DNS – Application layer attacks.

**TOTAL: 45 PERIODS**

**COURSE OUTCOME(S):**

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

- CO1** Define the basic layers and its functions in computer networks.
- CO2** Understand the basics of how data flows from one node to another.
- CO3** Apply routing algorithms to the network.
- CO4** Analyze the difference between the TCP and UDP protocols
- CO5** Evaluate the performance of a network.
- CO6** Compare the principles of the different application layer protocols.

**TEXTBOOKS**

1. Behrouz A. Forouzan, Data Communications and Networking, Fifth Edition TMH, 2017(Reprint)
2. Larry L. Peterson, Bruce S. Davie, Computer Networks: A Systems Approach, Fifth Edition, Morgan Kaufmann Publishers Inc., 2012.

## REFERENCE BOOKS

1. William Stallings, Data and Computer Communications, Tenth Edition, Pearson Education, 2013.
2. Nader F. Mir, Computer and Communication Networks, Second Edition, Prentice Hall, 2014.
3. Ying-Dar Lin, Ren-Hung Hwang and Fred Baker, Computer Networks: An Open Source Approach, McGraw Hill Publisher, 2011.
4. James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Sixth Edition, Pearson Education, 2013.

## WEB REFERENCES

1. [https://www.tutorialspoint.com/computer\\_fundamentals/computer\\_networking.htm](https://www.tutorialspoint.com/computer_fundamentals/computer_networking.htm).
2. <http://www.cs.ccsu.edu/~stan/classes/CS490/Slides/Networks4-Ch4-4.pdf>.
3. [http://ecourses.vtu.ac.in/nptel/courses/Webcourse-contents/IIT-MADRAS/Computer\\_Networks/pdf](http://ecourses.vtu.ac.in/nptel/courses/Webcourse-contents/IIT-MADRAS/Computer_Networks/pdf).



### CO - PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1									2
CO2	2	1	1									2
CO3	2	1	1									2
CO4	2	2	2									2
CO5	2	1	1									2
CO6	1	2	3									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	
<b>40%</b>				<b>60 %</b>

23IT1403	OPERATING SYSTEMS	L	T	P	C
		3	0	0	3

**COURSE OBJECTIVE:**

- Understand the basic concepts and functions of operating systems.
- Understand concepts of Processes and analyze Scheduling algorithms.
- Understand the concept of Deadlocks.
- Analyse various memory management schemes.
- Understand I/O management and File systems.
- Familiar with the basics of Linux system and Mobile OS like iOS and Android.

**UNIT - I OPERATING SYSTEM OVERVIEW 9**

Computer System Overview- Instruction Execution, Interrupts, Multiprocessor and Multicore Organization. Operating system overview - Objectives and functions, Evolution of Operating System - Operating System Structures -Operating- system Services - System Calls - System Services - Operating System Structure -Building and Booting Operating system - Processes - Process Concept, Process Scheduling, Operations on Processes, Inter- process Communication.

**UNIT - II PROCESS MANAGEMENT 9**

CPU Scheduling –Scheduling criteria, Scheduling algorithms, Multiple-processor scheduling, Real time scheduling; Process Synchronization –The critical-section problem, Synchronization hardware, Mutex locks, Semaphores, Classic problems of synchronization, Critical regions, Monitors; Deadlock-System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock

**UNIT - III STORAGE 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 - IV FILE SYSTEMS 9**

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

**UNIT - V MODERN OPERATING SYSTEMS 9**

Linux System-Design Principles, Kernel Modules, Process Management, Scheduling, Memory Management, Input-Output Management, File System, Inter-process Communication; Mobile OS- iOS and Android –Architecture and SDK Framework, Media Layer, Services Layer, Core OS Layer, File System.

**TOTAL: 45 PERIODS**

## **COURSE OUTCOME(S):**

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

- CO1** Understand the basics of Operating System.
- CO2** Articulate the concepts of Process, Process Scheduling, Process Synchronization, and Deadlock.
- CO3** Analyze the various memory management schemes.
- CO4** Examine various file systems
- CO5** Describe Linux OS.
- CO6** Elaborate Mobile OS like Android and iOS

## **TEXT BOOKS:**

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 10th Edition, John Wiley and Sons Inc., 2018.
2. William Stallings, "Operating Systems: Internals and Design Principles", 9th Edition by Pearson, 2017.

## **REFERENCE BOOKS:**

- 1 Ramaz Elmasri, A. Gil Carrick, David Levine, "Operating Systems - A Spiral Approach", Tata McGraw Hill Edition, 2010.
- 2 Achyut S. Godbole, Atul Kahate, "Operating System", Third Edition, McGraw Hill Education, 2017.
- 3 Gary Nutt, "Operating Systems", Third Edition, Pearson Education, 2004.
- 4 Harvey M. Deitel, Paul J Deital, Davis R Choffnes "Operating System, Third Edition, Pearson Education, 2004.
- 5 Daniel P Bovet and Marco Cesati, "Understanding the Linux kernel, 3rd edition, O'Reilly, 2005

## **ONLINE COURSES / RESOURCES:**

1. <https://nptel.ac.in/courses/106108101>
2. <https://www.coursera.org/learn/codio-intro-to-operating-systems-2-memory-management?specialization=codio-introduction-operating-systems>.

### CO - PO MAPPING

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

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
<b>40%</b>				<b>60 %</b>

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 9**

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 9**

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. 2021. Publisher: Springer
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	
40%				60 %

23CB1402	INTRODUCTION TO INNOVATION AND ENTREPRENEURSHIP	L	T	P	C
		3	0	0	3

**COURSE OBJECTIVE:**

- Learn to be familiar with creative and innovative thinking styles.
- Learn to investigate, understand and internalize the process of founding a startup.
- Learn to protect the innovations and intangible assets from exploitation.
- Learn to manage various types of IPR to protect competitive advantage.

**UNIT I INTRODUCTION TO INNOVATION 9**

**Innovation:** What and Why? Innovation as a core business process, Sources of innovation, Knowledge push vs. need pull innovations.

Discussion Topic - Is innovation manageable or just a random gambling activity?

**UNIT II INNOVATIVE ORGANIZATION BUILDING 9**

**Building an Innovative Organization:** Creating new products and services, exploiting open innovation and collaboration, Use of innovation for starting a new venture

Discussion Topic - Innovation: Co-operating across networks vs. 'go-it-alone' approach.

**UNIT III ENTREPRENEURSHIP AND FINANCIAL PLANNING 9**

**Entrepreneurship:** Opportunity recognition and entry strategies, Entrepreneurship as a Style of Management, Maintaining Competitive Advantage- Use of IPR to protect Innovation.

**Financial Planning** -Financial Projections and Valuation, Stages of financing, Debt, Venture Capital and other forms of Financing

**UNIT IV INTELLECTUAL PROPERTY RIGHTS (IPR) 9**

**Intellectual Property Rights (IPR):** Introduction and the economics behind development of IPR: Business Perspective, IPR in India – Genesis and Development, International Context

**UNIT V INTELLECTUAL PROPERTY TYPES 9**

**Types of Intellectual Property:** Patent- Procedure, Licensing and Assignment, Infringement and Penalty, Trademark- Use in marketing, example of trademarks- Domain name, Geographical Indications- What is GI, Why protect them?, Copyright- What is copyright, Industrial Designs- What is design? How to protect?

**Discussion Topic** - Major Court battles regarding violation of patents between corporate companies

**TOTAL: 45 PERIODS**

### **COURSE OUTCOME**

Upon Completion of the course, the students will be able to

- CO1** Create a learning system to enhance the innovation.
- CO2** Develop creative thinking skills.
- CO3** Acquaint themselves with the special challenges of starting new ventures.
- CO4** Use IPR as an effective tool to protect their innovations and intangible assets from exploitation.
- CO5** Identify criteria's to fit one's own intellectual work in particular form of IPRs.
- CO6** Apply statutory provisions to protect particular form of IPRs.

### **TEXT BOOKS:**

1. Joe Tidd, John Bessant. Managing Innovation: Integrating Technological, Market and Organizational Change, 7<sup>th</sup> Edition, 2020

### **REFERENCE BOOKS:**

1. Deborah E. Bouchoux, "Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets", Cengage Learning, Third Edition, 2012.
2. Derek Bosworth and Elizabeth Webster, The Management of Intellectual Property, Edward Elgar Publishing Ltd., 2013.
3. Prabuddha Ganguli, "Intellectual Property Rights: Unleashing the Knowledge Economy", McGraw Hill Education, 2011.
4. EDII "Faulty and External Experts - A Hand Book for New Entrepreneurs Publishers: Entrepreneurship Development", Institute of India, Ahmadabad, 1986.
5. Hisrich R D, Peters M P, "Entrepreneurship" 8<sup>th</sup> Edition, Tata McGraw-Hill, 2013.
6. Mathew J Manimala, "Enterprenuership theory at cross roads: paradigms and praxis" 2<sup>nd</sup> Edition Dream tech, 2005

### CO-PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1		1	1		1	2	1	1	2	2
CO2	1	3	2	1	1	1	2	1	1	2	2	1
CO3				1	1	1		2	1	1	1	
CO4	1						2	2	1	1	2	1
CO5	2	2					2	1	1	1	1	1
CO6	2	2					2	1	1	1	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	
40%				60 %

23AD1403	SOFTWARE DEVELOPMENT 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 Using Cloud 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 Limited, 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)		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
<b>40%</b>				<b>60 %</b>

23CS1411	COMPUTER NETWORKS LABORATORY	L	T	P	C
		0	0	4	2

**COURSE OBJECTIVE:**

- To understand and apply a range of network commands to configure, troubleshoot, and manage network devices effectively.
- To explore various flow control algorithms used in networking protocols
- To gain practical skills in programming with TCP and UDP sockets
- To learn to utilize network simulation tools to model and analyze network behavior,
- To apply routing protocols within network simulation tools to design, configure, and evaluate network

**LIST OF EXPERIMENTS**

1. a) Learn to use commands like tcp dump, net stat, if config, ns lookup and trace route.  
b) Capture ping and trace route PDUs using a network protocol analyzer and examine.
2. Write a code for implementing Stop and Wait Flow Control Technique.
3. Write a code for implementing Sliding Window Flow Control Technique.
4. Write a code for simulating ARP / RARP protocols.
5. Write a code for simulating of error correction code (like CRC).
6. Write a code using TCP sockets for implementing Echo client and Echo server.
7. Write a code using TCP sockets for implementing Chat Client and Chat Server
8. Write a code using TCP sockets for implementing File Transfer between client and server.
9. Write a HTTP web client program to download a web page using TCP sockets.
10. Simulation of DNS using UDP sockets.
11. Study of Network simulator (NS).
12. Simulation of Congestion Control Algorithms using NS.
13. Simulation of Distance Vector Routing algorithm.
14. Simulation of Link State Routing algorithm.
15. Performance evaluation of Routing protocols using Simulation tool.

**TOTAL:60 PERIODS**

**SOFTWARE REQUIRED:** C / PYTHON / JAVA

**COURSE OUTCOME(S):**

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

- CO1** Choose between TCP and UDP.
- CO2** Understand the programs using sockets.
- CO3** Implement error correction codes.
- CO4** Analyze the performance of different protocols.
- CO5** Evaluate the performance of various network protocols using simulation tools.
- CO6** Construct Analyze various routing algorithms.



**WEB REFERENCES:**

1. [https://www.tutorialspoint.com/computer\\_fundamentals/computer\\_networking](https://www.tutorialspoint.com/computer_fundamentals/computer_networking).
2. <https://www.coursera.org/learn/illinois-tech-computer-networking>.
3. [https://onlinecourses.nptel.ac.in/noc22\\_cs19/preview](https://onlinecourses.nptel.ac.in/noc22_cs19/preview).

**CO - PO MAPPING**

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

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

23AD1411	MACHINE LEARNING LABORATORY	L	T	P	C
		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%

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

**COURSE OBJECTIVE:**

- To understanding Java Fundamentals.
- To develop proficiency in flow control statements and Understand the usage of arrays and var-arg types
- To exploring Object-Oriented Programming Concepts through Java Programming
- To develop programs on Exception handling through Java Programming
- To 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>

**CO – PO MAPPING**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>CO1</b>	3	3	3	3	3							3
<b>CO2</b>	3	3	3	3	3							3
<b>CO3</b>	3	3	3	3	3							3
<b>CO4</b>	3	3	3	3	3							3
<b>CO5</b>	3	3	3	3	3							3
<b>CO6</b>	3	3	3	3	3							3

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