PANIMALAR
ENGINEERING COLLEGE

An Autonomous Institution

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

CURRICULUM & SYLLABUS
REGULATION 2023

B.TECH - COMPUTER SCIENCE AND BUSINESS SYSTEMS

www.panimalar.ac.in

PANIMALAR ENGINEERING COLLEGE

(An Autonomous Institution, Affiliated to Anna University, Chennai) Bangalore Trunk Road, Varadharajapuram,

Poonamallee, Chennai–600123.

DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEMS

B.TECH - COMPUTER SCIENCE AND BUSINESS SYSTEMS

CURRICULUM AND SYLLABUS

REGULATION-2023

(For the Students admitted during 2024-25)

B.TECH. COMPUTER SCIENCE AND BUSINESS SYSTEMS

CHOICE BASED CREDIT SYSTEM

VISION

To envision the technology and business trends in teaching, research and service that advances the economic strength of our nation, contribute significantly towards being a center of excellence in providing globally standard education that responds swiftly to the challenges of the ever changing world.

MISSION

M1: To produce graduates as unique individuals equipped with quality and depth of information in the diverse fields of Computer Science empowered by inspiring intellectual curiosity, critical thinking and creativity.

M2: To generate new knowledge by engaging in cutting-edge research in alliances with industry and research organizations.

M3: To inculcate moral values and ethical responsibilities among students throughout reach programs.

Programme Educational Objectives(PEO)

PEO 1: To acquire technical knowledge and proficiency required for the employment and lifelong learning and recognized as a valued professional and effective communicator in industries related to computer science and computing technologies.

PEO 2: To engage in lifelong learning and Practice their profession in a cooperative, team- oriented manner that holds the multidisciplinary and multicultural environment of suits the current business world.

PEO 3: To Function as a responsible member of society and an understanding of the ethics and responsibility of their work in a global context

Program Outcomes (PO)

PO1 (Engineering Knowledge): Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.

PO2 (Problem Analysis): Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4).

PO3 (Design/Development of Solutions): Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5).

PO4 (Conduct Investigations of Complex Problems): Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).

PO5 (Engineering Tool Usage): Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6).

PO6 (**The Engineer and The World)**: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).

PO7 (Ethics): Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9).

PO8 (Individual and Collaborative Team work): Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO9: (**Communication**): Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.

PO10 (Project Management and Finance): Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11 (Life-Long Learning): Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8).

Programme Specific Outcomes(PSO)

PSO 1: Ability to apply the analytical and business skills to provide sustainable solutions as an engineer/researcher for the real-world problems using core topics in Computer Science with equal appreciation to IT Management.

PSO 2: Ability to understand the evolutionary changes in computing, apply innovative ideas by adapting to a rapidly changing environment by applying their knowledge in technology abstraction and common business principles to solve the real world problems and meet the challenges of the future.

PSO 3: Ability to practice high ethical, human values and professional standards with soft-skills qualities in computer science and business disciplines and to emerge as an entrepreneur for the growth and development of the society.

PANIMALAR ENGINEERING COLLEGE

(An Autonomous Institution)

B. TECH COMPUTER SCIENCE AND BUSINESS SYSTEMS

REGULATIONS 2023

CHOICE BASED CREDIT SYSTEM

I - VIII SEMESTERS CURRICULUM AND SYLLABI (REGUALTION 2023)

Semester I							
S. No	**COURSE CODE**	**COURSE TITLE**	**Category**	**L/T/P**	**Contac Hours**	**Credit**	**Ext / Int Weightage**
Theory Courses							
1	23MA1103	Introductory Topics in Statistics, Probability and Calculus	BS	3/0/0	3	3	60/40
2	23ES1104	Fundamentals of Computer Science	ES	3/0/0	3	3	60/40
3	23HS1102	Business Communication and Value Science I	HS	2/0/2	4	3	60/40
Theory Cum Practical Courses							
4	23PH1102	Physics for Compu Science	BS	2/0/2	4	3	50/50
5	23ES1105	Principles of Electrical Engineering	BS	2/0/2	4	3	50/50
6	23MA1102	Discrete Mathematics for Computer Science	BS	3/0/2	5	4	50/50
Laboratory Course							
7	23ES1112	Fundamentals of Computer Science Laboratory	ES	0/0/4	4	2	40/60
Mandatory Course							
8	23TA1101	தமிழர் மரபு /Heritage of Tamils	HS	1/0/0	1	1	60/40
9	23HS1104	Interpersonal Communication skills I	EEC	0/0/2	2	0	100
10	23HS1105	Quantitative Aptitude Practices I	EEC	0/0/1	1	0	100
			TOTAL		**31**	**22**	

Semester II							
S. No	**COURSE CODE**	**COURSE TITLE**	**Category**	**L/T/P**	**Contact Hours**	**Credit**	**Ext / Int Weightage**
Theory Courses							
1	23CB1201	Data Structures and Algorithms	PC	3/0/0	3	3	60/40
2	23CB1202	Fundamentals of Economics	PC	3/0/0	3	3	60/40
3	23HS1202	Business Communication and Value Science II	HS	2/0/2	4	3	60/40
Theory Cum Practical Courses							
4	23EE1204	Principles of Electronics Engineering	ES	2/0/2	4	3	50/50
5	23MA1204	Linear Algebra	BS	3/0/2	5	4	50/50
6	23MA1205	Statistical Methods and Modelling	BS	3/0/2	5	4	50/50
Laboratory Courses							
7	23CB1211	Data Structures and Algorithms Laboratory	PC	0/0/4	4	2	40/60
8	23ES1212	Technical Skill Practices I	EEC	0/0/2	2	0	40/60
Mandatory Courses							
9	23TA1201	தமிழரும் தொழில் நுட்பமும் / Tamils and Technology	HS	1/0/0	1	1	60/40
10		Mandatory course	MC	2/0/0	2	0	0/100
11	23HS1204	Interpersonal Communication skills II	EEC	0/0/2	2	0	100
12	23HS1205	Quantitative Aptitude Practices II	EEC	0/0/1	1	0	100
			TOTAL		**36**	**23**	

Semester III							
S. No	**COURSE CODE**	**COURSE TITLE**	**Category**	**L/T/P**	**Contact Hours**	**Credit**	**Ext / Int Weightage**
Theory Courses							
1	23CB1301	Object Oriented Programming	PC	3/0/0	3	3	60/40
2	23CB1302	Formal Language and Automata Theory	PC	3/0/0	3	3	60/40
Theory Cum Practical Courses							
3	23MA1305	Computational Statistics	BS	3/0/2	5	4	50/50
4	23CB1303	Software Engineering	PC	2/0/2	4	3	50/50
5	23CB1304	Computer Organization and Architecture	PC	3/0/2	5	4	50/50
Laboratory Courses							
6	23CB1311	Object Oriented Programming Laboratory	PC	0/0/4	4	2	40/60
7	23ES1311	Technical Skill Practices II	EEC	0/0/2	2	0	40/60
Mandatory Courses							
8		Mandatory course	MC	2/0/0	2	0	0/100
9	23HS1301	Skills for Career Building and Development I	EEC	0/0/2	2	0	100
10	23HS1302	Quantitative Aptitude Practices III	EEC	0/0/1	1	0	100
			TOTAL		**31**	**19**	

Semester IV							
S. No	**COURSE CODE**	**COURSE TITLE**	**Category**	**L/T/P**	**Contact Hours**	**Credit**	**Ext / Int Weightage**
Theory Courses							
1	23CB1401	Database Management Systems	PC	3/0/0	3	3	60/40
2	23CB1402	Introduction to Innovation and Entrepreneurship	EEC	3/0/0	3	3	60/40
Theory Cum Practical Courses							
3	23MA1407	Operations Research	BS	3/0/2	5	4	50/50
4	23CB1403	Operating Systems	PC	3/0/2	5	4	50/50
5	23CB1404	Software Design with UML	PC	3/0/2	5	4	50/50
6	23CB1405	Design Thinking	EEC	2/0/2	4	3	50/50
Laboratory Courses							
7	23CB1411	Database Management Systems Laboratory	PC	0/0/4	4	2	40/60
8	23ES1411	Technical Skill Practices III	EEC	0/0/2	2	0	40/60
Mandatory Courses							
	23HS1401	Skills for Career Building and Development II	EEC	0/0/2	2	0	100
	23HS1402	Quantitative Aptitude Practices IV	EEC	0/0/1	1	0	100
			TOTAL		**34**	**23**	

Semester V							
S. No	**COURSE CODE**	**COURSE TITLE**	**Category**	**L/T/P**	**Contact Hours**	**Credit**	**Ext / Int Weightage**
Theory Courses							
1	23CB1501	Design and Analysis of Computer Algorithms	PC	3/0/0	3	3	60/40
2	23CB1502	Computer Networks	PC	3/0/0	3	3	60/40
3	23CB1503	Fundamentals of Management	PC	3/0/0	3	3	60/40
4	23CB1504	Java Programming	PC	3/0/0	3	3	60/40
5		Professional Elective - I	PE	3/0/0	3	3	60/40
6		Open Elective - I	OE	3/0/0	3	3	60/40
Laboratory Courses							
7	23CB1511	Java Programming Laboratory	PC	0/0/4	4	2	40/60
8	23ES1511	Technical Skill Practices IV	EEC	0/0/2	2	0	40/60
			TOTAL		**24**	**20**	

Semester VI							
S. No	**COURSE CODE**	**COURSE TITLE**	**Category**	**L/T/P**	**Contact Hours**	**Credit**	**Ext / Int Weightage**
Theory Courses							
1.	23CB1601	Cloud Computing	PC	3/0/0	3	3	60/40
2.	23CB1602	Human Resource Management	PC	2/0/0	2	2	60/40
3.	23CS1501	Full Stack Development	PC	3/0/0	3	3	60/40
4.	23CS1602	Compiler Design	PC	3/0/0	3	3	60/40
5.	23IT1703	software testing and Quality Assurance	PC	3/0/0	3	3	60/40
6.		Professional Elective -II	PE	3/0/0	3	3	60/40
Theory Cum Practical Courses							
7.	23CS1503	Artificial Intelligence and Machine Learning	PC	3/0/2	5	4	50/50
Laboratory Courses							
8.	23ES1611	Technical Skill Practices V	EEC	0/0/2	2	1	40/60
9.	23CB1611	Socially Relevant Mini Project	EEC	0/0/4	4	2	40/60
			TOTAL		**28**	**24**	

Semester VII							
S. No	**COURSE CODE**	**COURSE TITLE**	**Category**	**L/T/P**	**Contact Hours**	**Credit**	**Ext / Int Weightage**
Theory Courses							
1.	23CB1701	Financial Management	PC	3/0/0	3	3	60/40
2.	23IT1604	Modern DevOps and Practices	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
5.		Open Elective - II	OE	3/0/0	3	3	60/40
Laboratory Courses							
6.	23CB1712	IT Workshop Laboratory Using Scilab	PC	0/0/4	4	2	40/60
Employment Enhancement Courses							
7.	23CB1703	Industrial training / Internship #	EEC			2	0/100
8.		Value Added Course ##	EEC			0	0/100
			TOTAL		**19**	**19**	

The Students shall undergo One 4-week or Two 2-week internship / Industrial Training during the summer / winter vocation from semester 03 to 06. The same will be evaluated in semester 07. Two weeks of Internship / Industrial Training carries one credit.

Value added course to be completed between III to VII Semester.

Semester VIII							
S. No	**COURSE CODE**	**COURSE TITLE**	**Category**	**L/T/P**	**Contact Hours**	**Credit**	**Ext / Int Weightage**
Theory Courses							
1.		Professional Elective -V	PE	3/0/0	3	3	60/40
2.		Professional Elective - VI	PE	3/0/0	3	3	60/40
Laboratory Courses							
3.	23CB1811	Project Work	EEC	0/0/20	20	10	40/60
			TOTAL		**26**	**16**	

TOTALNO.OFCREDITS:166

CREDIT DISTRIBUTION

Sl. No	Subject Area / Semester	Credits Per Semester								Credits Total	Percentage
		I	II	III	IV	V	VI	VII	VIII		
1.	Humanities and Social Studies(HS)	**4**	**4**							**8**	**4.82**
2.	Basic Sciences(BS)	**13**	**8**	**4**	**4**					**29**	**17.46**
3.	Engineering Sciences(ES)	**5**	**3**							**8**	**4.82**
4.	Professional Core (PC)		**8**	**15**	**13**	**14**	**18**	**8**		**76**	**45.78**
5.	Professional Electives(PE)					**3**	**3**	**6**	**6**	**18**	**10.84**
6.	Open Electives(OE)					**3**		**3**		**6**	**3.63**
7.	Project Work (PR/EEC)				**6**		**3**	**2**	**10**	**21**	**12.65**
8.	Non-Credit/ (Mandatory)										
	Total	**22**	**23**	**19**	**23**	**20**	**24**	**19**	**16**	**166**	**100 %**

PROFESSIONAL ELECTIVES: VERTICALS

Vertical I	Vertical II	Vertical III	Vertical IV	Vertical V	Vertical VI
Data Science	**Full Stack Development**	**Cloud Computing and Data Centre Technologies**	**Cyber Security and Data Privacy**	**Creative Media Technologies**	**Management**
Exploratory Data Analysis **23AD1902**	NextGen Web Development **23IT1901**	Storage Technologies **23CS1901**	Ethical Hacking **23IT1909**	Video Creation and Editing **23CS1909**	Customer Relation Management **23CB1901**
Data Visualization **23AD1909**	Open Source Technologies **23IT1902**	Cloud Tools and Techniques **23CS1902**	Modern Cryptography **23IT1910**	Digital Marketing **23CS1910**	Marketing Research and Marketing Management **23CB1902**
Business Analytics **23AD1918**	App Development **23IT1903**	Virtualization **23CS1903**	Digital and Mobile Forensics **23IT1911**	Multimedia and Animation **23CS1911**	Computational Finance and Modeling **23CB1903**
Text Analytics **23AD1904**	UI and UX Design **23IT1904**	Cloud Services Management **23CS1904**	Social Network Security **23IT1912**	Streaming Media Tools and Technologies **23CS1912**	Industrial Psychology **23CB1904**
Recommender Systems **23AD1905**	Cloud Native Development **23IT1921**	Security and Privacy in Cloud **23CS1905**	Cryptocurrency and Blockchain Technologies **23IT1913**	Visual Effects **23CS1913**	IT Project Management **23CB1905**
Image and Video Analytics **23AD1910**	Microservices Architecture **23IT1922**	Stream Processing **23CS1906**	Engineering Secure Software Systems **23IT1914**	3D Printing and Design **23CS1914**	Entrepreneurship Development **23CB1906**

Speech Processing and Analytics **23AD1911**	Web Application Security **23IT1907**	Site Reliability Engineering **23CS1907**	Cyber Physical Systems Security **23IT1915**	Game Development **23CS1915**	Business Strategy Management **23CB1907**
Computer Vision Techniques **23AD1919**	Project Management and Agile Technologies **(23IT1908)**	Quantum Computing **23CS1908**	Threat Detection and Incident Response **23IT1916**	Augmented Reality and Virtual Reality **23CS1916**	Behavioral Economics **23CB1908**

SEMESTER - I

23MA1103	INTRODUCTORY TOPICS IN STATISTICS, PROBABILITY AND CALCULUS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- Analyse the various data by different statistical sampling techniques.
- Understand the basic concepts of probability and the distributions with characteristics of one and two-dimensional random variables.
- Develop enough confidence to identify and model mathematical patterns in real world and offer appropriate solutions, using the skills learned in their interactive and supporting environment.

UNIT I STATISTICS 9

Definition of Statistics. Basic course objectives, Applications in various branches of science with examples. Collection of Data: Internal and external data, Primary and secondary Data. Population and sample, Representative sample

UNIT II DESCRIPTIVES STATISTICS 9

Classification and tabulation of univariate data, graphical representation, Frequency curves. Descriptive measures - central tendency and dispersion. Bivariate data. Summarization, marginal and conditional frequency distribution

UNIT III PROBABILIY AND MOMENTS 9

Probability: Concept of experiments, sample space, event. Definition of Combinatorial Probability, Conditional Probability, Bayes Theorem. Expected values: moments, and their properties, Moment generating function

UNIT IV PROBABILITY DISTRIBUTIONS 9

Discrete Probability distributions: Binomial, Poisson and Geometric distributions. Continuous Probability distributions: Uniform, Exponential, Normal distributions

UNIT V CALCULUS 9

Basic concepts of Differential and integral calculus, application of double and triple integral

TOTAL :45 PERIODS

COURSE OUTCOME

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

CO1 Demonstrate and apply the basic probability axioms and concepts in their core areas of random phenomena

CO2 Execute the concepts of probability distributions in an appropriate place of science and Engineering

CO3 Exemplify the basics concepts of statistics through various representations of data

CO4 Analyze the various collections of data in science / engineering problems using statistical inference techniques

TEXT BOOKS

1. Introduction of Probability Models, S. M. Ross, Academic Press, N.Y, 1997.

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

REFERENCE BOOKS

1. A first course in Probability, S. M. Ross, Prentice Hall, 2010.
2. Probability and Statistics for Engineers, (Fourth Edition), I. R. Miller, J.E. Freund and R. Johnson, PHI, 2023
3. Introduction to the Theory of Statistics, A. M. Mood, F.A. Graybill and D.C. Boes, McGraw Hill Education, 1974.
4. Advanced Engineering Mathematics, (Seventh Edition), Peter V. O'Neil, Thomson Learning, 7th edition, 2012.
5. Advanced Engineering Mathematics, (Second Edition) M. D. Greenberg, , Pearson Education.2nd edition,1998.
6. Applied Mathematics, Vol. I & II, P. N. Wartikar and J. N. Wartikar, Vidyarthi Prakashan. 2014.

ONLINE COURSES / RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc21_ma74/preview
2. https://onlinecourses.nptel.ac.in/noc23_ma86/preview

CO-PO AND PSO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO11	PSO1	PSO2	PSO3
CO1	3	3	3								3	3	
CO2	3	3	3								3	3	
CO3	3	3	3								3	3	
CO4	3	3	3								3	3	
CO5	3	3	3								3	3	

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

23ES1104	FUNDAMENTALS OF COMPUTER SCIENCE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To develop simple algorithms for arithmetic and logical problems.
- To develop C Programs using basic programming constructs.
- To develop C programs using arrays and strings.
- To develop applications in C using functions, pointers and structures.
- To do input/output and file handling in C.
- To learn some basic Unix system interface.

UNIT - I GENERAL PROBLEM-SOLVING CONCEPTS AND 9

Algorithm, and Flowchart for problem solving with Sequential Logic Structure, Decisions and Loops.

Imperative languages: Introduction to imperative language; syntax and constructs of a specific language (ANSI C). Types Operator and Expressions with discussion of variable naming and Hungarian Notation: Variable Names, Data Type and Sizes (Little Endian Big Endian), Constants, Declarations.

UNIT - II TYPES OF OPERATOR, EXPRESSIONS AND CONTROL FLOW 9

Arithmetic Operators, Relational Operators, Logical Operators, Type Conversion, Increment and Decrement Operators, Bitwise Operators, Assignment Operators and Expressions, Precedence and Order of Evaluation proper variable naming and Hungarian Notation. If- Else-If, Switch, Loops — while, do, for, break and continue, goto Labels-structured and unstructured programming.

UNIT - III FUNCTIONS, ARRAYS AND POINTERS 9

Functions and Program Structure with discussion on standard library: Basics of functions, parameter passing and returning type, C main return as integer, External, Auto, Local, Static, Register Variables, Scope Rules, Block structure, Initialisation, Recursion, Pre- processor, Standard Library Functions and return types.

Pointers and Arrays: Pointers and address, Pointers and Function Arguments, Pointers and Arrays, Address Arithmetic, character Pointers and Functions, Pointer Arrays, Pointer to Pointer, Multi-dimensional array and Row/column major formats, Initialisation of Pointer Arrays, Command line arguments, Pointer to functions, complicated declarations and how they are evaluated.

UNIT -IV STRUCTURES, INPUT AND OUTPUT 9

Structures: Basic Structures, Structures and Functions, Array of structures, Pointer of structures, Self-referral structures, Table look up, typedef, unions, Bit-fields

Input and Output: Standard I/O, Formatted Output – printf, Formated Input – scanf, Variable length argument list, file access including FILE structure, fopen, stdin, sdtout and stderr, Error Handling including exit, perror and error.h, Line I/O, related miscellaneous functions.

UNIT -V INTRODUCTION TO UNIX 9

Unix system Interface: File Descriptor, Low level I/O – read and write, open, create, close and unlink, Random access – lseek, Discussions on Listing Directory, Storage allocator.

TOTAL: 45 PERIODS

COURSE OUTCOME

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

CO1 Ability to implement the algorithms and flow chart for solving Mathematical and Engineering problems

CO2 Develop C programs for real world/technical application using basic constructs

CO3 Explore the usage of arrays, pointers and functions in C.

CO4 Implement Programs with structures and union in C.

CO5 Design applications using sequential and random access file processing.

CO6 Identify and use UNIX utilities to create and manage simple file processing operations, organize directory structures.

TEXT BOOKS

1. Herbert Schildt, C: The Complete Reference, Fourth Edition, , McGraw Hill, 2017
2. Paul Love, Joe Merlino, Craig Zimmerman, Jeremy C. Reed, and Paul Weinstein, Beginning Unix, Wiley Publishing, In, 2005
3. Reema Thareja, —Programming in C, Oxford University Press, Second Edition, 2016.

REFERENCE BOOKS

1. B. Gottfried, Programming in C, Third Edition, Schaum Outline Series, 2017
2. Kernighan, B.W and Ritchie,D.M, —The C Programming language, Second Edition, Pearson Education, 2006
3. W.Richard Stevens, Stephen A.Rago, Advanced Programming in the UNIX Environment, Addison-Wesley , 2013

CO-PO AND PSO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	2	1						2	3	3	
CO2	3	2	2	1	1						2	2	2	
CO3	1	1	2	2	2						1	2	2	
CO4	1	1	2	2	2						1	2	2	
CO5	2	2	3	2	1						2	2	3	
CO6	1	1	2	1	1						1	2	2	

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

23HS1102	BUSINESS COMMUNICATION AND VALUE SCIENCE - I	L	T	P	C
		2	0	2	3

COURSE OBJECTIVE:

- Understand what life skills are and their importance in leading a happy and well-adjusted life.
- Motivate students to look within and create a better version of self.
- Understand and apply the key concepts of values of life skills and business communication.
- Improve the language proficiency of students in English with an emphasis on Vocabulary and Grammar.
- Improve the relevant technical writing skills necessary for Business Communication.

UNIT - I HUMAN VALUES 6+6

Values – Self exploration – Values of individuals: Presentation on favourite personality and the skills and values they demonstrate – interviewing a maid, watchman, sweeper, cab driver,beggar and narrate what you think are the values that drive them

Writing: newspaper report on an IPL match – record conversation between a celebrity and an interviewer

UNIT - II GRAMMAR AND LANGUAGE DEVELOPMENT 6+6

Parts of Speech - Applications of tenses - Sentence formation, sentence structure, show sequence - Voices – Questioning –Vocabulary

Word formation: - Synonyms, antonyms, abbreviations - compound words –single word substitution.

UNIT -III ESSENTIALS OF TECHNICAL COMMUNICATION 6+6

Email -: Formal and informal emails - words from General Service List (GSL) by West, Academic word list (AWL) - technical specific terms related to the field of technology - phrases, idioms, significant abbreviations - formal business vocabulary.

UNIT -IV BASIC WRITING SKILLS 6+6

Reading articles – Summary writing, story writing - **writing your comprehensive CV** -Create a podcast on a topic.

UNIT -V APPLICATION OF LIFE SKILLS 6+6

Life Skills: Movie based learning – identifying skills and values - critical life skills - appreciation of diversity - **Community service** – work with an NGO and makes a presentation.

TOTAL : 60 PERIODS

COURSE OUTCOME

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

CO1 Recognize the need for life skills and values

CO2 Recognize own strengths and opportunities
CO3 Apply the life skills to different situations
CO4 Understand the basic tenets of communication
CO5 To gain understanding of basic grammatical structures and use them in right context.
CO6 Apply the basic communication practices in different types of communication

TEXT BOOKS

1. Alan Mccarthy and O'dell, “English vocabulary in use”, Cambridge.
2. Ashraf Rizvi. M, “Effective Technical Communication”, Second Edition, McGraw Hill, New Delhi, 2018.
3. Dhanavel, S.P., “English and Communication Skills for Students of Science and Engineering”, Orient Blackswan, Chennai, 2011
4. Dr. Alex K, Soft Skills, S. Chand Publications, New Delhi, 1997.
5. Dr.Saroj Hiremath, “Business Communication”

WEB REFERENCES

1. Train your mind to perform under pressure- Simon sinek
2. Brilliant way one CEO rallied his team in the middle of layoffs
3. Will Smith's Top Ten rules for success
4. APAART: Speak Well 1 (English language and communication)
5. APAART: Speak Well 2 (Soft Skills)

ONLINE RESOURCES

1. https://www.coursera.org/learn/learning-how-to-learn
2. https://www.coursera.org/specializations/effective-business-communication

CO-PO AND PSO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1								2	3	3				
CO2								2	3	3				
CO3								2	2	3				
CO4									3	3				
CO5									2	3				
CO6									3	3				

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

23PH1102	PHYSICS FOR COMPUTING SCIENCE	L	T	P	C
		2	0	2	3

COURSE OBJECTIVE:

- Understand the characteristics of simple and damped harmonic motion andillustrate the interference, diffraction and polarization of light.
- Exemplify the dual nature of matter and apply the Schrodinger wave equation to determine the wave function of particle in one dimensional box and assess the crystallographic parameters of seven crystal systems
- Compare the different types of lasers based on pumping method, active medium and energy levels and analyze the laws of thermodynamics and different thermodynamic processes

UNIT - I OSCILLATIONS 6

Periodic motion-simple harmonic motion-characteristics of simple harmonic motion-vibration of simple spring mass system. Resonance-definition. damped harmonic oscillator - heavy, critical and light damping, energy decay in a damped harmonic oscillator, quality factor, forced mechanical and electrical oscillators — analogy with LCR circuits and mechanical oscillation.

UNIT - II INTERFERENCE-PRINCIPLE OF SUPERPOSITION -YOUNG'S EXPERIMENT 6

Theory of interference fringes-types of interference-Fresnel's prism-Newton's rings, Diffraction-Two kinds of diffraction-Difference between interference and diffraction-Fresnel's half period zone and zone plate-Fraunhofer diffraction at single slit-plane diffraction grating. Temporal and Spatial Coherence. Polarization of light: Polarization - Concept of production of polarized beam of light from two SHM acting at right angle; plane, elliptical and circularly polarized light, Brewster's law, double refraction.

UNIT - III BASIC IDEA OF ELECTROMAGNETISMS AND SEMICONDUCTOR PHYSICS 6

Basic Idea of Electromagnetisms: Continuity equation for current densities, Maxwell"s equation in vacuum and non-conducting medium.

Semiconductor Physics: Conductor, Semiconductor and Insulator; Basic concept of Band theory.

UNIT -IV LASER AND FIBER OPTICS 6

Einstein"s theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, different types of lasers: Ruby Laser, CO_2 and Neodymium lasers; Properties of laser beams: monochromaticity, coherence, directionality and brightness, laser speckles, applications of lasers in engineering. Fiber optics and Applications, Types of optical fibers.

UNIT -V THERMODYNAMICS 6

Zeroth law of thermodynamics, first law of thermodynamics, brief discussion on application of 1st law, second law of thermodynamics and concept of Engine, entropy, change in entropy in reversible and irreversible processes, third law of thermodynamics.

TOTAL: 30 PERIODS

LIST OF EXPERIEMENTS

1. Magnetic field along the axis of current carrying coil – Stewart and Gee
2. Determination of Hall coefficient of semi-conductor
3. Determination of Plank constant
4. Determination of wave length of light by Laser diffraction method
5. Determination of wave length of light by Newton's Ring method
6. Determination of laser and optical fiber parameters
7. Determination of Stefan's Constant.
8. Determination of thermal conductivity of a bad conductor – Lee‟s Disc method

TOTAL: 30 PERIODS

TEXT BOOKS

1. Ajoy Ghatak, Optics, 5th Ed., Tata McGraw Hill, 2012
2. Arthur Beiser, Shobhit Mahajan and S Rai Choudhury, Concepts of Modern Physics, 6th Edition, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2014
3. B. K. Pandey and S. Chaturvedi, Engineering Physics, 1st edition, Cengage Learning India Pvt Ltd., New Delhi, 2017
4. Halliday and Resnick, Fundamentals of Physics, 11 th edition, John Wiley and Sons, Inc, 2018
5. Basics of laser physics: for students of science and engineering http://www.springer.com/978-3- 319- 50650-0

COURSE OUTCOME

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

CO1 Explain the different types of harmonic oscillations and compare electrical oscillator with mechanical oscillator

CO2 Illustrate the interference, diffraction and polarization of light in Newton's rings, diffraction grating and double refraction respectively

CO3 Gain knowledge on the basics of electromagnetic waves and its properties.

CO4 Outline the different types of lasers and compare the different types of optical fibers based on mode and refractive index profile for data communication system

CO5 Acquire the fundamental knowledge of laws of thermodynamics.

CO-PO AND PSO MAPPING

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

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

23ES1105	PRINCIPLES OF ELECTRICAL ENGINEERING	L	T	P	C
		2	0	2	3

COURSE OBJECTIVE:

- To understand the basic concepts of electric circuits.
- To understand the basic concepts of magnetic circuits
- To identify the types of sensors and measure quantities in AC and DC systems

UNIT - I INTRODUCTION 6

Fundamental linear passive and active elements to their functional current-voltage relation, voltage source and current sources, ideal and practical sources, Kirchhoff-s laws and applications to network solutions using mesh and nodal analysis. Concept of work, power, energy and conversion of energy.

UNIT - II BASIC NETWORK 6

Current voltage relations of electric network by mathematical equations to analyse the network (Thevenins theorem, Nortons Theorem, Maximum Power Transfer theorem), Simplifications of networks using series- parallel, Star/Delta transformation. Superposition theorem.

UNIT - III CONCEPT OF AC 6

AC waveform definitions, form factor, peak factor, phasor representation in polar and rectangular form, concept of impedance, admittance, complex power, power factor, single phase and 3 phase concept.

UNIT -IV ELECTROSTATICS AND ELECTRO-MECHANICS 6

Electrostatic field, electric field strength, concept of permittivity in dielectrics, energy stored in capacitors, charging and discharging of capacitors, Electro Magnetism magnetic field and Faraday's law. Magnetic materials and B-H curve. self and mutual inductance, Ampere's law, Study of R-L, R-C, RLC series circuit, R-L-C parallel circuit, Electromechanical energy conversion.

UNIT -V MEASUREMENTS AND SENSORS 6

Measuring devices/sensors and transducers (Piezoelectric and thermo-couple) related to electrical signals, Elementary methods for the measurement of electrical quantities in DC and AC systems (Current & Single-phase power). Basic concept of indicating and integrating instruments

Practical considerations: Electrical Wiring types and accessories, Illumination system: Basic layout of the distribution system, Types of earthing, Safety devices & system. Battery principles and types.

TOTAL: 30 PERIODS

LIST OF EXPERIEMENTS

1. Familiarization of electrical circuits, sources, measuring devices and transducers.
2. Determination of resistance temperature coefficient
3. Verification of Network Theorem (Superposition, Thevenin, Norton, Maximum Power Transfer theorem)
4. Simulation of R-L-C series circuits for XL>XC , XL< XC

5. Simulation of Time response of RC circuit
6. Demonstration of measurement of electrical quantities in DC and AC systems.

TOTAL: 30 PERIODS

TEXT BOOKS

1. Electric Machinery, (Sixth Edition) A. E. Fitzgerald, Kingsely Jr Charles, D. Umans Stephen, Tata McGraw Hill, 2003
2. A Textbook of Electrical Technology, (vol. I), B. L. Theraja, Chand and Company Ltd., New Delhi 2014.
3. Basic Electrical Engineering, V. K. Mehta, S. Chand and Company Ltd., New Delhi.
4. Theory and problems of Basic Electrical Engineering, (Second Edition), J. Nagrath and Kothari, Prentice Hall of India Pvt. Ltd 2016.

REFERENCE BOOKS

1. T. K. Nagsarkar and M. S. Sukhija, Basic of Electrical Engineering, Oxford University Press, 2011.
2. Introduction to Electrodynamics, D. J. Griffiths, (Fourth Edition), Cambridge University Press 2012.
3. Engineering Circuit Analysis, William H. Hayt & Jack E. Kemmerly, McGraw-Hill Book Company Inc Eight Edition 2020.
4. Fundamentals of Electrical and Electronics Engineering, Smarjith Ghosh, Prentice Hall (India) Pvt. Ltd, Second Edition, 2007.

COURSE OUTCOME

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

CO1 Understand the basic concepts and terminology of electrical quantities

CO2 Analyze the DC circuit using various network theorems

CO3 Analyze the electrical parameters of AC circuits with R-L-C elements

CO4 Analyze the Static and dynamic characteristics of Electro-static and Electromagnetic fields

CO5 Apply the concept of sensors in measurement of various electrical quantities

CO-PO AND PSO MAPPING

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

<table>
<tr><td colspan="2">Assessment
(40% weightage)
(Theory Component)</td><td colspan="2">Assessment
(60% weightage)
(Laboratory Component)</td><td>End Semester Examination</td></tr>
<tr><td>Individual Assignment / Case Study / Seminar / Mini Project</td><td>Written Test</td><td>Evaluation of Laboratory Observation, Record</td><td>Test</td><td>Written Examination</td></tr>
<tr><td>40</td><td>60</td><td>75</td><td>25</td><td rowspan="2">100</td></tr>
<tr><td colspan="4">100</td></tr>
<tr><td colspan="4">50 %</td><td>50 %</td></tr>
</table>

23MA1102	DISCRETE MATHEMATICS FOR COMPUTER SCIENCE	L	T	P	C
		3	0	2	4

COURSE OBJECTIVE:

- Understand the basic concepts of propositions by various discrete structure techniques
- Analyze the combinatorics techniques in solving the system by various methodology
- Apply the concepts of graph theory and logic in solving the real time engineering problem

UNIT I BOOLEAN ALGEBRA 9

Introduction of Boolean algebra, truth table, basic logic gate, basic postulates of Boolean algebra, principle of duality, canonical form, Karnaugh map.

UNIT II ABSTRACT ALGEBRA 9

Set, relation, group, ring, field.

UNIT III COMBINATORICS 9

Basic counting, balls and bins problems, generating functions, recurrence relations. Proof techniques, principle of mathematical induction, pigeonhole principle.

UNIT IV GRAPH THEORY 9

Graphs and digraphs, complement, isomorphism, connectedness and reachability, adjacency matrix, Eulerian paths and circuits in graphs and digraphs, Hamiltonian paths and circuits in graphs and tournaments, trees; Planar graphs, Euler‟s formula, dual of a planer graph, independence number and clique number, chromatic number, statement of Four-color theorem.

UNIT V LOGIC 9

Propositional calculus - propositions and connectives, syntax; Semantics - truth assignments and truth tables, validity and satisfiability, tautology; Adequate set of connectives; Equivalence and normal forms; Compactness and resolution; Formal reducibility - natural deduction system and axiom system; Soundness and completeness.

TOTAL:45 PERIODS

LIST OF EXPERIEMENTS

1. Write a program in C to Display the Boolean Truth Table for AND, OR , NOT
2. Write a C Program to find Cartesian Product of two sets
3. Practice of various set operations
4. Recursion and Induction
5. Implementation of a recursive counting technique
6. Write a program in C for minimum cost spanning tree.
7. Write a program in C for finding shortest path in a GraphNote.

TOTAL: 30 PERIODS

TEXT BOOKS

1. Topics in Algebra, I. N. Herstein, John Wiley and Sons second edition, 1975.
2. Digital Logic & Computer Design, M. Morris Mano, Pearson 2016.
3. Elements of Discrete Mathematics, (Second Edition) C. L. LiuMcGraw Hill, New Delhi, 2012.
4. Graph Theory with Applications, J. A. Bondy and U. S. R. Murty, Macmillan Press, London 1976.
5. Mathematical Logic for Computer Science, L. Zhongwan, World Scientific, Singapore, 1989.

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. Koshy, T. “Discrete Mathematics with Applications”, Elsevier Publications, 2006.

COURSE OUTCOME

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

CO1 Understand the concepts and significance of lattices and boolean algebra.
CO2 Familiarize the applications of algebraic structures
CO3 Interpret the concepts of Permutations, Combinations and Mathematical induction
CO4 Understand the basic concepts of combinatorics and graph theory
CO5 Acquire the knowledge in check the validity of the argument and Normal forms

CO-PO AND PSO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
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		

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

23ES1112	FUNDAMENTALS OF COMPUTER SCIENCE LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVE:

- To develop programs in C using basic constructs.
- To develop applications in C using arrays
- To develop applications in C using strings, pointers
- To develop applications in C using functions, structures
- To develop applications in C using file processing
- To build solutions for real world problems

LIST OF EXPERIMENTS

1. Algorithm and flowcharts of small problems like GCD
2. Structured code writing with:
   a) Small but tricky codes
   b) Proper parameter passing
   c) Command line Arguments
   d) Variable parameter
   e) Pointer to functions
   f) User defined header
   g) Make file utility
   h) Multi file program and user defined libraries
   i) Interesting substring matching / searching programs
   j) Parsing related assignments
3. Mini Project

TOTAL PERIODS: 60

COURSE OUTCOME

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

CO1 Develop the use of the C programming language to implement various algorithms.
CO2 Acquire decision making and looping concepts in C.
CO3 Develop C programs using Array and Pointers.
CO4 Ability to define structures, functions in solving real world problem
CO5 Design applications using sequential and random access file processing
CO6 Able to interpret real world problems into software solutions in C.

WEB REFERENCES

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

4. https://www.javatpoint.com/C-programs
5. https://www.w3schools.com/C/C-examples.asp
6. https://www.includehelp.com/c-programs/c-programs-pointers-solvedexamples.asp

CO-PO AND PSO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	2	1						2	3	3	
CO2	3	2	2	1	1						2	2	2	
CO3	1	1	2	2	2						1	2	2	
CO4	1	1	2	2	2						1	2	2	
CO5	2	2	3	2	1						2	2	3	
CO6	1	1	2	1	1						1	2	2	

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

23TA1101	HERITAGE OF TAMILS	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 - ClassicalLiterature in Tamil — Secular Nature of Sangam Literature — Distributive Justice inSangam 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 Modernliterature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

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

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

UNIT–III FOLK AND MARTIAL ARTS 3

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

UNIT–IV THINAI CONCEPT OF TAMILS 3

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

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

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

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 ஓவியங்கள் வரை - சிற்பக் கலை** **3**

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 விளையாட்டுகள்** **3**

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

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

தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்காப்பியம் 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 பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு** **3**

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

TOTAL : 15 PERIODS

TEXT-CUM REFERENCE BOOKS:

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

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

		L	T	P	C
23HS1104	**INTERPERSONAL COMMUNICATION SKILLS I**	**0**	**0**	**2**	**0**

COURSE OBJECTIVE

- To understand and control emotions, promoting personal growth, self-confidence, and a positive mind-set.
- To strengthen skills in navigating relationships, staying motivated, adapting to new situations, and communicating effectively.
- To teach methods for organizing tasks, meeting deadlines, and resolving disputes to improve productivity and relationships.
- To develop abilities in creative problem-solving and thoughtful decision-making using structured techniques for innovative solutions.
- To collaborate effectively, lead with confidence, and inspire others in group and professional settings.

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Unit I

Self-Analysis - Growth Mind-set- Empathy for Self

Unit II

Attitude Reengineering- Motivation- Interpersonal Skills

Unit III

Time Management (Deadlines management, Prioritisation)- Conflict Resolution - Change Management

Unit IV

Decision Making - Creative Thinking Skills - Six Thinking Hats technique

Unit V

Leadership- Collaborative Skills- Teamwork- Presentation Skills

COURSE OUTCOME:

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

CO1 Manage emotions effectively, embrace a growth-oriented mind-set, and build stronger self- confidence.

CO2 Demonstrate strong interpersonal skills, motivation, and adaptability, fostering effective communication across diverse settings.

CO3 Prioritize tasks and handle conflicts constructively, enhancing their productivity and interpersonal interactions.

CO4 Make informed decisions and address challenges creatively using structured problem-solving approaches.

CO5 Excel in teamwork, exhibit leadership, and positively influence others in group and community initiatives.

TOTAL : 30 PERIODS

TEXT BOOKS

1. Covey, Stephen R. The 7 Habits of Highly Effective People: 30th Anniversary Edition. Simon &Schuster, 2020.
2. Goleman, Daniel. Emotional Intelligence: Why It Can Matter More Than IQ. 10th anniversary ed., Bantam Books, 2005.

REFERENCE BOOKS

1. Dweck, C. S. (2006). Mindset: The New Psychology of Success. Random House.
2. De Bono, E. (2017).Six Thinking Hats (Revised Edition). Penguin Books.

WEB REFERENCES

1. https://casel.org/what-is-the-casel-framework/
2. https://ggie.berkeley.edu/sel-for-students-self-awareness-and-self-management/

ONLINE COURSES/RESOURCES

1. https://www.coursera.org/learn/emotional-intelligence-leadership
2. https://www.coursera.org/learn/critical-thinking-skills

CO-PO AND PSO MAPPING

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

23HS1105	QUANTITATIVE APTITUDE PRACTICE I	L	T	P	C
		0	0	1	0

COURSE OBJECTIVE:

- To strengthen students understanding of number systems, algebra and assist them in developing their problem-solving skills.
- To get the abilities needed to address challenges with quantitative aptitude.

Module 1 NUMBER SYSTEM **3**

Numbers - HCF and LCM- simplification - square root - cube root.

Module 2 ALGEBRA **3**

Algebra - decimal fraction - arithmetic progression - geometric progression.

Module 3 BLOOD RELATIONS **3**

Blood relations - pattern sequence - alphabet test question – clocks-calenders.

Module 4 DATA INTERPRETATION **3**

Table chart- pie chart - bar chart - line charts

TOTAL PERIODS: 12

COURSE OUTCOME

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

CO1 Demonstrate solid understanding to address number system and algebraic problems

CO2 Handle problems with the blood relations and data interpretation.

TEXT BOOKS

1. AggarwalR.S.(2017). Quantitative Aptitude for Competitive Examinations 3rd edition New Delhi: S. Chand Publishing.
2. Abhijit guha(2016). Quantitative Aptitude for All Competitive Examinations, 6th edition. Noida: McGraw Hill Education Pvt.Ltd.
3. FACE.(2016).Aptipedia Aptitude Encyclopedia1(Ed.).New Delhi: Wiley Publications.

REFERENCE BOOK

1. Sharma arun.(2016).Quantitative aptitude,7th(Ed.).Noida : McGraw Hill Education Pvt. Ltd.
2. Praveen. R.V 3rd edition, Quantitative aptitude and reasoning, PHI learning publication.

WEB REFERENCES:

1. https://www.indiabix.com/

Mode of Evaluation: Online Test

SEMESTER - II

23CB1201	DATA STRUCTURES AND ALGORITHMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- Understand the basics of abstract data types
- Impart knowledge about the principles of linear and nonlinear data structures
- Build an application using sorting and searching

UNIT - I BASIC TERMINOLOGIES AND INTRODUCTION TO ALGORITHM & DATA ORGANISATION 9

Algorithm specification, Recursion, Performance analysis, Asymptotic Notation - The Big-O, Omega and Theta notation, Programming Style, Refinement of Coding - Time-Space Trade Off, Testing, Data Abstraction.

UNIT - II LINEAR DATA STRUCTURE 9

Array, Stack, Queue, Linked-list and its types, Various Representations, Operations & Applications of Linear Data Structures.

UNIT - III NON-LINEAR DATA STRUCTURE 9

Trees (Binary Tree, Threaded Binary Tree, Binary Search Tree, B & B+ Tree, AVL Tree, Splay Tree) and Graphs (Directed, Undirected), Various Representations, Operations & Applications of Non-Linear Data Structures.

UNIT -IV SEARCHING AND SORTING ON VARIOUS DATA STRUCTURES 9

Sequential Search, Binary Search, Comparison Trees, Breadth First Search, Depth First Search Insertion Sort, Selection Sort, Shell Sort, Divide and Conquer Sort, Merge Sort, Quick Sort, Heap sort, Introduction to Hashing

UNIT -V FILE AND GRAPH 9

Organization (Sequential, Direct, Indexed Sequential, Hashed) and various types of accessing schemes. Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.

TOTAL: 45 PERIODS

COURSE OUTCOME

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

CO1 Explore the basics of data structures and algorithm analysis.

CO2 Demonstrate the concept of linear data structures

CO3 Demonstrate the concept of non- linear data structures.

CO4 Design algorithms for various searching and sorting techniques.

CO5 Exemplify the concept of files and its operations

CO6 Explain the concept of graph and its operations

TEXT BOOKS

1. Fundamentals of Data Structures in C, E. Horowitz, S. Sahni,S. A-Freed, Universities Press, 2012.

2. Data Structures and Algorithms, A. V.Aho, J. E.Hopperoft, J. D.UIlman, Pearson, 1985
3. Data Structure and Algorithm through C, Brijesh Bakariya, BPB Publication, 2018

REFERENCE BOOKS

1. The Art of Computer Programming: Volume 1: Fundamental Algorithms, Donald E. Knuth, 1997.
2. Introduction to Algorithms, Thomas, H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, The MIT Press, Fourth Edition 2022..
3. Open Data Structures: An Introduction (Open Paths to Enriched Learning), (Thirty First Edition), Pat Morin, UBC Press, 2013.

CO-PO AND PSO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	2	3	2						2			
CO2	2	3	1	2	2						1	1	1	
CO3	1	2	1	2	2						1	2	2	
CO4	1	3	1	2	2						1	2	2	
CO5	3	1		3	2						1	3	2	
CO6	2	2	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	100
40%				**60 %**

23CB1202	FUNDAMENTALS OF ECONOMICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To explain the fundamental principles of micro economics relevant to managing an organization.
- To understand the efficiency and equity implications of market interference, including government policy.
- To describe the fundamental principles of macroeconomics to have the understanding of economic environment of business.
- To understand the various aspects of India‟s economy

UNIT I INTRODUCTION 9

Principles of Demand and Supply- Supply Curves of Firms - Elasticity of Supply; Demand Curves of Households Elasticity of Demand; Equilibrium and Comparative Statics (Shift of a Curve and Movement along the Curve)

UNIT II CONSUMER ANALYSIS 9

Welfare Analysis- Consumers‟ and Producers‟ Surplus - Price Ceilings and Price Floors; Consumer Behavior - Axioms of Choice - Budget Constraints and Indifference Curves; Consumer's Equilibrium- Effects of a Price Change, Income and Substitution Effects - Derivation of a Demand Curve

UNIT III PRODUCTION AND COSTING 9

Applications- Tax and Subsidies - Intertemporal Consumption - Suppliers‟ Income Effect; Theory of Production - Production Function and Iso-quants - Cost Minimization; Cost Curves- Total, Average and Marginal Costs - Long Run and Short Run Costs; Equilibrium of a Firm Under Perfect Competition; Monopoly and Monopolistic Competition

UNIT IV MACROECONOMIC REFORMS 9

National Income and its Components- GNP, NNP, GDP, NDP; Consumption Function; Investment; Simple Keynesian Model of Income Determination and the Keynesian Multiplier; Government Sector- Taxes and Subsidies; External Sector- Exports and Imports; Money- Definitions; Demand for Money-Transactionary and Speculative Demand; Supply of Money- Bank‟s Credit Creation Multiplier; Integrating Money and Commodity Markets- IS, LM Model

UNIT V POLICY GOVERNANCE 9

Business Cycles and Stabilization- Monetary and Fiscal Policy - Central Bank and the Government; The Classical Paradigm- Price and Wage Rigidities - Voluntary and Involuntary Unemployment.

TOTAL: 45 PERIODS

COURSE OUTCOME

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

CO1 Understand the links between household behavior and the economic models of demand.

CO2 Understand government policies and programs.

CO3 Understand about approaches to consumer behaviour and relation between production and cost function

CO4 Describe and discuss on interaction of product and factor market

CO5 Get awareness about importance and development of Indian economy and economic reforms

CO6 Have thorough knowledge in the areas of inflation, unemployment, monetary policy, fiscal policy and international trade

TEXT BOOKS

1. Pindyck, Robert S., and Daniel L. Rubinfeld, "Microeconomics", 7th edition Pearson 2009
2. Dornbusch, Fischer and Startz," Macroeconomics", 12th edition McGraw Hill,2018
3. Paul Anthony Samuelson, William D. Nordhaus, "Economics",19th edition, McGraw Hill,2009

REFERENCE BOOKS

1. Hal R, Varian, "Intermediate Microeconomics: A Modern Approach", 8th edition,2009
2. N. Gregory Mankiw, "Principles of Macroeconomics", 6th edition, Cengage India, 2008

CO-PO AND PSO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	1			2		3	3	3	1			
CO2	2	2	1			1		3						
CO3	2	2	1			1		2	3			1	1	
CO4	2	2	2			1		2	2			2	2	
CO5	2	3	1			2						3	1	
CO6	2	3	1					2	3		1	3	1	

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

23HS1202	BUSINESS COMMUNICATION AND VALUE SCIENCE II	L	T	P	C
		2	0	2	3

COURSE OBJECTIVE:

- Develop effective writing, reading, presentation and group discussion skills.
- Help students identify personality traits and evolve as a better team player.
- Introduce them to key concepts of a) Morality b) Behavior and beliefs c) Diversity & Inclusion
- Facilitate students to broaden the writing skills in business communication
- Impart essentials life skills for professional and personal development

UNIT - I MECHANICS OF WRITING 6+6

Listening: social issues, causes and findings
Speaking: Icebreaker - Participating in „Join Hands Movement‟ - Individual identification of social issues – addressing social issues.
Reading: Research Reports based on social issues
Writing: Good and bad writing - Common errors, punctuation rules, use of words - writing techniques of Catherine Morris and Joanie McMahon‟s .
Group Activity: contribute articles to the magazine – Quiz Time

UNIT - II LAUNCHING E MAGAZINE 6+6

Listening: Listen to interactive e-magazines and presentations
Speaking: Introduction to basic presentation skills & ORAI app - Groups to present their ideas about e-magazine and share their findings
Reading: Introduction to skimming and scanning, speed reading techniques.
Writing: create vision, mission, value statement, and tagline and design a logo- individual write up for E- magazine and evaluation - preparation and publication of E-Magazine.
Group Activity: Plan & Design an e- magazine as a group - SATORI– Join the dots - Quiz Time

UNIT - III TEAM PLAY 6+6

Listening: Ad campaign - Brain storming session
Speaking: discussing and exploring the means of articulating and amplifying social issues
Reading: Articles on Team Building – secrets of team work
Writing: Berbin‟s 8 Team roles and Lindgren‟s big 5 personality traits
Group Activity: Designing skits: write the script - Promote the play through social media and gather audience - Enact the play- SATORI joining dots - Quiz Time

UNIT -IV DIVERSITY AND INCLUSION 6+6

Listening: Video recorded interviews of people from diverse groups -Touch the target, film: “The Fish and I‟ by Babak Habibifar - Learn from movies - film on diversity — discussion on key take away of the film - Theory to connect and concept of empathy.
Speaking: narration of story in first person - Feedbacks by other groups- Debate on diversity with an angle of ethics, morality and respect for individual. Prepared speech **Reading**: Comprehension passages on diversity and human values
Writing: Write a review in a blog about their research on a book, incident or film - Diversity & Inclusion - Different forms of Diversity in our society.
Group Activity: Create story – a person's life affected by the social issue –Discussion on TCS values, Respect for Individual and Integrity. SATORI and Quiz Time.

UNIT -V ORGANIZING AWARENESS CAMPAIGN 6+6

Listening: Listening to various activities by NGOs
Speaking: Creating awareness on social welfare programs
Reading: Articles and reports about activities of different NGOs
Writing: Draft your resume - Include your recent achievements in your resume.
Group Activity:
Project-

a) Each team to look for an NGO/ social group in the city, which is working on the issue their college group, is supporting.
b) Spend a day with the NGO/ social group to understand exactly how they work and the challenges they face.
c) Render voluntary service to the group for one day
d) Invite the NGO/ social group to address their university students for couple of hours. Plan the entire event, decide a suitable venue in the university, gather audience, invite faculty members etc. (they need to get their plan ratified their professor). COURSE OUTCOME-- Host an interactive session with the NGO spokesperson
e) The groups to present their experience of a day with the NGO and inspire students to work for the cause.

TOTAL: 60 PERIODS

COURSE OUTCOME

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

CO1 Understand and use tools of structured written communication
CO2 Develop materials to create an identity for an organization dedicated to a social cause
CO3 Identify individual personality types and role in a team.
CO4 Understand the basic concepts of Morality and Diversity
CO5 Gain confidence to communicate effectively in various situations to acquire employability skills.
CO6 Organize an event to generate awareness and get support for a cause

TEXT BOOKS

1. Dr. A.P.J Abdul Kalam, ArunTiwari, ”Guiding Souls : Dialogues on the purpose of life”,2005.
2. Dr. A.P.J Abdul Kalam, AcharyaMahapragya , ”The Family and the Nation”, 2015.
3. Dr. A.P.J Abdul Kalam, Y.S.Rajan, ” The Scientific India: A twenty First Century Guide to the World around Us”,2011.

REFERENCE BOOKS

1. Dr. A.P.J Abdul Kalam , ”Forge Your Future: Candid, Forthright, Inspiring” ,2014
2. Peter H. Diamandis and Steven Kotler, ”Abundance: The Future is Better Than You Think”, 2012.
3. Simon Sinek , ”Start With Why: How Great Leaders Inspire Everyone to Take Action”, Penguin,2011.
4. Sandra Moriarty, Nancy D. Mitchell, William D. Wells,” Advertising & IMC: Principles and Practice”, Pearson Education India,2016.

WEB REFERENCES

1. Ethics Fundamentals and approaches to ethics, https://www.eolss.net/Sample- Cchapters/C14/E1- 37-01-00.pdf
2. A Framework for Making Ethical decisions https://www.brown.edu/academics/science- and- technologystudies/framework-makingethical-decisions.
3. Five Basic Approaches to Ethical Decision http://faculty.winthrop.edu/meelerd/docs/rolos/5_Ethical_Approaches.pdf

ONLINE RESOURCES

1. https://youtu.be/CsaTslhSDI
2. https://m.youtube.com/watch?feature=youtu.be&v=IIKvV8_T95M
3. https://m.youtube.com/watch?feature=youtu.be&v=e80BbX05D7Y
4. https://m.youtube.com/watch?v=7sLLEdBgYYY&feature=youtu.be

CO-PO AND PSO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1									3	3				
CO2								2	2	2				
CO3									3	3				
CO4								2	2	2				
CO5									3	3				
CO6								2	2	3				

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

23EE1204	PRINCIPLES OF ELECTRONICS ENGINEERING	L	T	P	C
		2	0	2	3

OURSE OBJECTIVE:

- Understand about current, voltage and power, basic laws in circuits.
- Understand about semiconductor materials and its application
- Understand working principal of BJT and FET
- Understand about Integrated circuit and its application
- Understand about the fundamentals of Electronics and its applications.
-

UNIT - I INTRODUCTORY IDEA OF SEMICONDUCTORS 6

Formation of P-N junction, energy band diagram, built-in-potential, forward and reverse biased P-N junction, formation of depletion zone. Formation of PNP / NPN junctions, energy band diagram. Crystalline material: Mechanical properties, Energy band theory, Fermi levels; Conductors, Semiconductors & Insulators: electrical properties, band diagrams. Semiconductors: intrinsic & extrinsic, energy band diagram, P&N-type semiconductors, drift & diffusion carriers.

UNIT - II DIODES AND DIODE CIRCUITS 6

V-I characteristics, Zener breakdown, Avalanche breakdown and its reverse characteristics; Junction capacitance and Varactor diode. Simple diode circuits, load line, linear piecewise model; Rectifier circuits: half wave, full wave, PIV, DC voltage and current, ripple factor, efficiency, idea of regulation.

UNIT - III TRANSISTORS AND TRANSISTOR CIRCUITS 6

Transistor mechanism and principle of transistors, CE, CB, CC configuration, transistor characteristics: cut-off active and saturation mode. Concept of Field Effect Transistors (channel width modulation), Gate isolation types, JFET Structure and characteristics, MOSFET Structure and characteristics, depletion and enhancement type; CS, CG, CD configurations; CMOS: Basic Principles
transistor action, injection efficiency, base transport factor and current amplification factors for CB and CE modes. Biasing and Bias stability: calculation of stability factor.

UNIT -IV OPERATIONAL AMPLIFIER BASICS 6

Introduction to integrated circuits, operational amplified and its terminal properties; Application of operational amplifier; inverting and non-inverting mode of operation, Proportional, Integral, Derivative circuits.

UNIT -V BASIC IDEAS OF DIGITAL ELECTRONICS 6

Basic idea of switching circuit, Realization of Logic gates, multiplexers and demultiplexers, Flip flop, Registers and Counters.

TOTAL: 30 PERIODS

LIST OF EXPERIMENTS

1. To plot V-I characteristics of PN junction diode.
2. To plot regulation characteristics of half wave rectifier
3. To plot regulation characteristics of Full wave rectifier
4. To plot input-output characteristics of CE configuration of BJT.

5. To study Biasing techniques of BJT- to find stability factor of self-bias, collector to base bias, fixed bias circuits.
6. To plot frequency response of single stage FET amplifier (CS/CD configuration) and find its bandwidth.
7. To study Colpitts Oscillator.
8. Study of OP-AMP circuits: Inverting and Non-inverting Amplifier
9. Study of basic logic gates and De-Morgan's Theorem
10. Study of half adder and full adder.

TOTAL: 30 PERIODS

TEXT BOOKS

1. William Hayt,JVJack,EKemmerly and Steven M Durbin, Engineering Circuits Analysis, Tata
2. Graw-Hill, 2013
3. L Robert Boylestead, Louis Nashelsky, "Electronic Devices and Circuit Theory" pearson Education,2012.
4. J Millman, C. Halkias&SatyabrataJIT "Electronic Devices and Circuits", Tata McGraw-Hill,2010
5. Microelectronics Circuits, Adel S. Sedra and Kenneth Carless Smith, Oxford University Press, 2019.

REFERENCE BOOKS

1. Ramakant A. Gayakwad, OP-AMP and Linear IC"s , Prentice Hall of India, 2002.
2. Thomas L. Floyd, Digital Fundamentals, Prentice Hall, 11th Edition, 2015.
3. Millman"s Integrated Electronics, Jacob Millman, Christos Halkias, Chetan Parikh, McGraw Hill Education, 2001.
4. Digital Logic & Computer Design, M. Morris Mano, Pearson, second edition, 2012.

COURSE OUTCOME

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

CO1 Apply Voltage-Current laws and transformation techniques to solve linear electric circuits.

CO2 Apply the diodes in rectifier and regulator applications and also analyze its characteristics.

CO3 Explain the working of Bipolar Junction and Field Effect Transistors with different configurations and also analyze their characteristics.

CO4 Illustrate the working of analog IC with different configurations and its applications

CO5 Simplification of Boolean expressions using K-map and implementation of combinational &sequential circuits

CO-PO AND PSO MAPPING

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

.

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

23MA1204	LINEAR ALGEBRA	L	T	P	C
		3	0	2	4

COURSE OBJECTIVE:

- To gain knowledge in using matrix algebra techniques to solve system of linear equations.
- To understand the concept of vector spaces to use in the principal component analysis

UNIT I MATRICES AND DETERMINANTS 9

Introduction to Matrices and Determinants; Solution of Linear Equations; Cramer's rule; Inverse of a Matrix.

UNIT II APPLICATION OF MATRICES 9

Vectors and linear combinations; Rank of a matrix; Gaussian elimination; LU Decomposition; Solving Systems of Linear Equations using the tools of Matrices**.**

UNIT III VECTOR SPACE 9

Dimension; Basis; Orthogonality; Projections; Gram-Schmidt orthogonalization and QR decomposition.

UNIT IV EIGEN VALUES AND EIGEN VECTORS 9

Positive definite matrices; Linear transformations; Hermitian and Unitary matrices.

UNIT V PRINCIPAL COMPONENT ANALYSIS 9

Singular value decomposition and Principal component analysis (Non-credit and optional); Introduction to their applications in Image Processing and Machine Learning (one or two classes).

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

1. Write a program which demonstrate the following
   i. Addition of two complex numbers.
   ii. Displaying the conjugate of a complex number.
   iii. Plotting a set of complex numbers.
   iv. Creating a new plot by rotating the given number by a degree 90, 180, 270 degrees and also by scaling b a number a=1/2, a=1/3, a=2 etc.
2. Write a program to do the following
   i. Enter a vector u as a n-list.
   ii. Enter another vector v as a n-list.
   iii. Find the vector au +bv for different values of a and b.
   iv. Find the dot product of u and v
3. Write a program to do the following
   i. Enter an r by c matrix M(r and c being positive integers).
   ii. Display M in matrix format.
   iii. Display the row and columns of the matrix M.
   iv. Find the scalar multiplication of M for a given scalar.
   v. Find the transpose of the matrix M

4. Write a program to do the following
   i. Find the vector-matrix multiplication of a r by c matrix M with an c- vector u.
   ii. Find the matrix- matrix product of M with a c by p matrix N.
5. Write a program to do the following
   i. Enter a vector b and find the projection of b orthogonal to a given vector u.
   ii. Find the projection of b orthogonal to a set of given vectors.

TOTAL: 30 PERIODS

TEXT BOOKS

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers.

2. Introduction to linear algebra, (Fifth Edition), Gilbert Strang, Wellesley- Cambridge Press, 6th edition 2023.

REFERENCE BOOKS

1. Advanced Engineering Mathematics, (Seventh Edition), Peter V. O'Neil, Cengage Learning, 7th edition, 2012
2. Advanced Engineering mathematics, (Second Edition), Michael. D. Greenberg, Pearson, 2nd edition, 1998.
3. Applied Mathematics (Vol. I & II), P. N. Wartikar& J. N. Wartikar, PuneVidyarthi Griha Prakashan, 2014.
4. Digital Image Processing, R C Gonzalez and R E Woods, Pearson, 2010.

ONLINE COUSES / RESOURCES:

1. https://machinelearningmastery.com/introduction-matrices-machine-learning/

COURSE OUTCOME

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

CO1 Use matrix algebra techniques to solve system of linear equations.
CO2 Solve system of equations using the concept of matrix decomposition.
CO3 Use the concept of vector spaces in generating ortho-normal bases.
CO4 Solve problems of linear transformation using eigen values and eigen vectors.
CO5 Use principal component analysis for applications in image processing and machine learning.

CO-PO AND PSO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
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		

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

23MA1205	STATISTICAL METHODS AND MODELLING	L	T	P	C
		3	0	2	4

COURSE OBJECTIVE:

- To gain knowledge of sampling techniques and use testing of hypothesis for parameter estimation.
- To understand the use of statistical models for forecasting
- To gain the knowledge of using R programming in simulation and modelling

UNIT - I SAMPLING AND ESTIMATION THEORY 9

Random sampling. Sampling from finite and infinite populations. Estimates and standard error (sampling with replacement and sampling without replacement), Sampling distribution of sample mean, stratified random sampling - Point estimation, criteria for good estimates (un-biasedness, consistency), Methods of estimation including maximum likelihood estimation. Concept & examples, complete sufficiency, their application in estimation

UNIT - II LINEAR STATISTICAL MODELS 9

Scatter diagram. Linear regression and correlation. Least squares method. Rank correlation. Multiple regression& multiple correlation, Analysis of variance (one way, two way with as well as without interaction).

UNIT - III TEST OF HYPOTHESIS 9

Concept & formulation, Type I and Type II errors, Neyman Pearson lemma, Procedures of testing .Non-parametric Inference: Comparison with parametric inference, Use of order statistics

UNIT - IV NON-PARAMETRIC INFERENCE 9

Sign test, Wilcoxon signed rank test, Mann-Whitney test, Run test, Kolmogorov-Smirnov test. Spearman‟s and Kendall‟s test. Tolerance region.

UNIT - V BASICS OF TIME SERIES ANALYSIS & FORECASTING 9

Stationary, ARIMA Models: Identification, Estimation and Forecasting

TOTAL : 45 PERIODS

LIST OF EXPERIMENTS

1. Introduction to R, Functions, Control flow and Loops
2. Working with Vectors and Matrices
3. Reading in and Writing Data
4. Working with Data
5. Manipulating Data
6. Simulation
7. Linear model
8. Data Frame
9. Graphics in R

TOTAL : 30 PERIODS

TEXT BOOKS

Probability and Statistics for Engineers (9th Edition), I.R. Miller, J.E. Freund and R. Johnson, 202
Fundamentals of Statistics (Vol. I & Vol. II), A. Goon, M. Gupta and B.Dasgupta,
8th edition 2002
The Analysis of Time Series: An Introduction, Chris Chatfield, 7th edition 2019.

REFERENCE BOOKS

1. Introduction to Linear Regression Analysis, D.C. Montgomery &E.Peck, 2006
2. Introduction to the Theory of Statistics, A.M. Mood, F.A. Graybill & D.C. Boes,2017
3. Applied Regression Analysis, N. Draper & H. Smith, Third edition,1998.
4. Hands-on Programming with R,- Garrett Grolemund, 2014.
5. R for Everyone: Advanced Analytics and Graphics, Jared P. Lander, 2013.

COURSE OUTCOME(S):

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

CO1 Apply the concept of sampling distribution and estimation theory in forecasting.

CO2 Apply the concept of correlation, regression using R programming and design experiments

CO3 Use the concepts of Testing of Hypothesis for industrial problems

CO4 Use the concepts of Non Parametric Testing for Non-Normal Populations

CO5 Apply the concept of time series analysis in real life situation

CO-PO AND PSO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
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		

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

23CB1211	DATA STRUCTURES AND ALGORITHMS LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVE:

- To provide the knowledge of basic data structures and their implementations.
- To understand the Linear data structures
- To be aware of the Non Linear data structures
- To solve problems using data structures binary search trees, and graphs and writing programs for these solutions.
- To efficiently implement the different data structures and solutions for specific problems.

LIST OF EXPERIMENTS

1. Stack using array
2. Queue using array
3. Towers of Hanoi using user defined stacks.
4. Singly Linked List
5. Stack using Linked List
6. Queue using Linked List
7. Reading, writing, and addition of polynomials.
8. Line editors with line count, word count showing on the screen.
9. Trees with all operations.
10. Binary Search Tree
11. Breadth First Search
12. Depth First Search
13. Reading the data from file using file operation
14. Writing the data into file using file operation
15. Mini Project

TOTAL: 60 PERIODS

COURSE OUTCOME

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

CO1 Implement linear data structure such as stacks, queues and linked lists

CO2 Apply linear data structure applications.

CO3 Execute Non-linear data structure applications.

CO4 Realize basic operations on binary trees

CO5 Demonstrate the representation and traversal techniques of graphs and their applications

CO6 Demonstrate the file concepts using file operations

WEB REFERENCES:

1. https://www.geeksforgeeks.org/data-structures/
2. https://www.javatpoint.com/data-structure-tutorial
3. https://www.programiz.com/dsa/data-structure-types

CO-PO AND PSO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	2	3	2						2			
CO2	2	3	1	2	2						1	1	1	
CO3	1	2	1	2	2						1	2	2	
CO4	1	3	1	2	2						1	2	2	
CO5	3	1		3	2						1	3	2	
CO6	2	2	1	1	1						1			

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

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

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

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

CO1 Propose solutions for a given problem.

CO2 Infer the fundamental programming elements in C language and learn to apply basic control structures in C.

CO3 Demonstrate the applications of structures and unions.

CO4 Visualize the capabilities of modular programming approach in C.

CO5 Understand the basic principles of pointers and their association during implementations.

CO6 Apply various input, output and error handling functions in C.

TEXT BOOKS

1. Reema Thareja, ``Programming in C"", 2nd edition, OXFORD University Press, New Delhi, 2019.
2. Paul Deitel and Harvey Deitel, “C How to Program”, Seventh edition, Pearson Publication,2016.

REFERENCE BOOKS

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

ONLINE COURSES / RESOURCES:

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

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 Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries —— Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.

UNIT –V SCIENTIFIC TAMIL & TAMIL COMPUTING 3

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

Total : 15 PERIODS

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. பொருநை - ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை)
5. Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: InternationalInstitute of Tamil Studies
7. Historical by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation,Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Publishedby: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book

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

		L	T	P	C
23HS1204	**INTERPERSONAL COMMUNICATION SKILLS II**	0	0	2	0

COURSE OBJECTIVE:

- To enhance their vocabulary through understanding synonyms, antonyms, and word formation techniques.
- To identify and correct grammatical errors and use precise word choices in sentences.
- To apply grammar rules, including subject-verb agreement, pronouns, tenses, and sentence structure.
- To effectively rearrange sentences and solve para jumbles to improve coherence and logical flow in writing.
- To foster reading comprehension and creative storytelling abilities through structured activities and practice.

Unit I

Introduction to Verbal - Word Building - Synonyms & Antonyms

Unit II

Common Confusables- One word Substitution- Sentence Completion

Unit III

Error Spotting- Sentence Correction

Unit IV

Sentence Rearrangement- Para jumbles

Unit V

Reading Comprehension- Story Building Activity

TOTAL: 30 HOURS

COURSE OUTCOME:

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

CO1 Demonstrate an expanded vocabulary and accurately use synonyms, antonyms, and word- building techniques in communication.

CO2 Identify and correct common grammatical errors and apply one-word substitutions and sentence completion strategies effectively.

CO3 Construct grammatically correct sentences, ensuring proper use of subject-verb agreement, pronouns, tenses, and modifiers.

CO4 Rearrange sentences and para jumbles to create coherent and logically structured texts.

CO5 Excel in reading comprehension and create engaging stories, showcasing improved analytical and creative writing skills.

TEXT BOOKS

1. Murphy, Raymond. English Grammar in Use: A Self-Study Reference and Practice Book for Intermediate Learners of English. 5th ed., Cambridge University Press, 2019.
2. Wren, P. C., and H. Martin. High School English Grammar and Composition.Revised ed., S. Chand Publishing, 2017.

REFERENCE BOOKS

1. Leech, G., &Svartvik, J. (2013). A Communicative Grammar of English (3r ed.).Routledge.

2. Azar, B. S., & Hagen, S. A. (2016). Understanding and Using English Grammar (5th ed.). Pearson Education.

WEB REFERENCES

1. https://learnenglish.britishcouncil.org/grammar
2. https://owl.purdue.edu/owl/general_writing/grammar/index.html

ONLINE COURSES/RESOURCES

1. https://www.edx.org/course/english-grammar-and-style
2. https://www.coursera.org/learn/careerdevelopment

23HS1102	QUANTITATIVE APTITUDE PRACTICE I	L	T	P	C
		0	0	1	0

COURSE OBJECTIVE:

- To improve students comprehension of geometry and mensuration, average as well as help them hone their problem-solving abilities
- To develop students ability to use the techniques for resolving riddles, streams, boats, and coding problems.

Module 1 GEOMETRY AND MENSURATION **3**

Lines and angles – circles – triangles – quadrilaterals – polygons - coordinate geometry area &volume of 2D and 3D figures.

Module 2 AVERAGE, TIME, WORK **3**

Logarithm - Average - time and work - time and distance.

Module 3 BOATS AND STREAMS **3**

Relative speed – problems on trains – boats and streams – races and gam

Module 4 LOGICAL REASONING - I **3**

Odd man out and series – Venn diagram - seating arrangement – decision making

TOTAL : 12 PERIODS

COURSE OUTCOME

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

CO1 Acquire knowledge of solving geometry and mensuration, average, percentage, time and work questions effortlessly

CO2 Understand and exhibit sound knowledge to the boats and streams, venn diagram and decision making.

TEXT BOOKS

1. AggarwalR.S.(2017). Quantitative Aptitude for Competitive Examinations 3rd edition New Delhi: S. Chand Publishing.
2. Abhijit guha(2016). Quantitative Aptitude for All Competitive Examinations, 6th edition. Noida: McGraw Hill Education Pvt.Ltd.
3. FACE.(2016).Aptipedia Aptitude Encyclopedia1(Ed.).New Delhi: Wiley Publications.

REFERENCE BOOK

1. Sharma arun.(2016).Quantitative aptitude,7th(Ed.).Noida : McGraw Hill Education Pvt. Ltd.
2. Praveen. R.V 3rd edition, Quantitative aptitude and reasoning, PHI learning publication.
3. https://www.indiabix.com/

Mode of Evaluation: Online Test

SEMESTER III

23CB1301	OBJECT ORIENTED PROGRAMMING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To understand Object Oriented Programming concepts and basic characteristics of C and C++.
- To build C++ classes using appropriate encapsulation and design principles
- To introduce advanced C++ features such as composition of objects, operator overloads, dynamic memory allocation, inheritance and polymorphism, file I/O, exception handling etc
- To apply object oriented concepts to solve bigger computing problems.

UNIT I INTRODUCTION TO C 8

Introduction to C, Data Types, Operators and Expressions, Scope and Lifetime of variables, Constants, Pointers, Arrays, and Strings, Control Flow, Functions and Program Structure, Namespaces, error handling, Input and Output (*C*-way), Library Functions (*string*, *math*, *stdlib*), Command line arguments, Pre-processor directive.

UNIT II FUNCTIONS IN C PROGRAMMING 9

Single line comments, Local variable declaration within function scope, function declaration, function overloading, stronger type checking, Reference variable, parameter passing —value vs reference, passing pointer by value or reference, Operator new and delete, the typecasting operator, Inline Functions in contrast to macro, default arguments.

UNIT III OBJECT ORIENTED PROGRAMMING CONCEPTS 10

Necessity for OOP, OOP in C++, Data Hiding, Data Abstraction, Encapsulation, Procedural Abstraction, Class and Object. Extensions to C in C++ - Scope of Class and Scope Resolution Operator, Member Function of a Class, Access Specifier, this Keyword, Constructors and Destructors, friend class, error handling (exception).

UNIT IV INHERITANCE AND POLYMORPHISM 9

Operator overloading, Inheritance — Single and Multiple, Class Hierarchy, Pointers to Objects, Assignment of an Object to another Object, Polymorphism through dynamic binding, Virtual Functions, Overloading, overriding and hiding, Error Handling

UNIT V GENERIC PROGRAMMING AND I/O STREAMS 9

Generic Programming - Template concept, class template, function template, template specialization. Input and Output -Streams, Files, Library functions, formatted output.

TOTAL: 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Understand the concepts of C and relative merits of C++.

CO2 Gain the basic knowledge on Object Oriented concepts.

CO3 Able to reuse the code with extensible Class types, User-defined operators andfunction Overloading.

CO4 Able to use proper class protection mechanism to provide security.

CO5 Achieve code reusability and extensibility by means of inheritance and how C++ supports Object Oriented principles such as abstraction, polymorphism.

CO6 Understand and implement the features of templates, exceptions and filehandling for providing programmed solutions to complex problems.

TEXT BOOKS:

1. Bjarne Stroustrup, “The C++ Programming Language”, Pearson Education, 3rdEdition, 2009.
2. Debasish Jana, “C++ and Object-Oriented Programming Paradigm”, PHI Learning,2nd Edition, 2005.
3. Paul Deitel and Harvey Deitel, “C How to Program with an Introduction to C++”,Eighth edition, Pearson Education, 2018.

REFERENCE BOOKS

1. Bjarne Stroustrup, “Programming: Principles and Practice Using C++”, AddisonWesley, 2009
2. Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020

CO-PO AND PSO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	1	-	1	-	1		-	-	-			
CO2	3	2	2	-		1	1	2	-	-	-	1	1	
CO3		2	3	1	1	2	2	2	-	-	-	1	2	
CO4	1	1	3	1		2	2	2	-	-	-			
CO5	1	1	3	1		1	2	2	-	-	-	2	2	
CO6	3	2	2	-			2		-	-	-			

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

23CB1302	FORMAL LANGUAGE AND AUTOMATA THEORY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To understand foundations of computation including automata theory
- To construct models of regular expressions and languages
- To design context free grammar and push down automata
- To understand Turing machines and their capability
- To understand Undecidability and NP class problems

UNIT - I INTRODUCTION AND FINITE AUTOMATA 9

Introduction : Alphabet- languages and grammars- productions and derivation - Chomsky hierarchy of languages.

Finite automata: Regular expressions - Deterministic Finite Automata (DFA) and equivalence with regular expressions - Nondeterministic Finite Automata (NFA) and equivalence with DFA, Myhill-Nerode theorem and its uses - Minimization of finite automata.

UNIT - II REGULAR LANGUAGES AND CONTEXT-FREE LANGUAGES 9

Regular Languages : Introduction - Regular grammars and equivalence with finite automata - properties of regular languages- Kleene"s theorem - pumping lemma for regular languages. CONTEXT-FREE LANGUAGES : Context-free grammars (CFG) and languages (CFL) - Chomsky and Greibach normal forms.

UNIT - III PUSHDOWN AUTOMATA 9

Pushdown Automata: Nondeterministic pushdown automata (PDA) and equivalence with CFG - parse trees- ambiguity in CFG - pumping lemma for context-free languages - deterministic pushdown automata, closure properties of CFLs .

Context-sensitive grammars (CSG) and languages- linear bounded automata and equivalence with CSG.

UNIT - IV TURING MACHINES 9

The basic model for Turing machines (TM) - Turing recognizable(recursively enumerable) and Turing - decidable (recursive) languages and their closure properties - variants of Turing machines - nondeterministic TMs and equivalence with deterministic TMs - unrestricted grammars and equivalence with Turing machines **—** TMs as enumerators.

UNIT - V UNDECIDABILITY AND COMPLEXITY 9

Undecidability :Church-Turing thesis - universal Turing machine - the universal and diagonalization languages - reduction between languages and Rice's theorem - undecidable problems about languages

Basic Introduction to Complexity : Introductory ideas on Time complexity of deterministic and nondeterministic Turing machines - P and NP, NP – completeness - Cook's Theory -other NP - Complete problems.

TOTAL : 45 PERIODS

COURSE OUTCOME(S):

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

- **CO1** Apply the computational models to solve problems in diverse areas such aspattern matching and language design
- **CO2** Identify deterministic and non-deterministic machines
- **CO3** Analyze machines by their power to recognize languages
- **CO4** Apply pumping lemma to Regular Languages and Context Free Languages
- **CO5** Construct a Turing Machine for a recursive language
- **CO6** Understand the differences between decidability and undecidability

TEXT BOOKS:

1. Introduction to Automata Theory, Languages, and Computation John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman. 3rd Edition, Pearson Education, 2014.
2. John C Martin , "Introduction to Languages and the Theory of Computation".3rd Edition, Tata McGraw Hill, 2007.

REFERENCE BOOKS:

1. Kamala Krithivasan and Rama. R, “Introduction to Formal Languages, Automata Theory and Computation”, Pearson Education, 2009.
2. Lewis, H. and Papadimitriou, C.H “Elements of the Theory of Computation”, 2nd Edition, Pearson. Education/PHI, 2003.
3. Michael Sipser, “Introduction to the Theory of Computation”, 3rd Edition, Cengage Learning, 2013.
4. Peter Linz, “An Introduction to Formal Language and Automata”, Narosa Publishers, New Delhi,2011
5. M. R. Garey and D. S. Johnson, “Computers and Intractability: A Guide to the Theory of NP Completeness”, 1979.

CO-PO AND PSO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	2	-	-	-	-	-	2	2			
CO2	2	2	2	2	1	-	-	-	-	2	2	2	1	
CO3	1	2	2	3	1	-	-	-	-	2	2	2	2	
CO4	1	1	1	1	-	-	-	-	-	1	2	1	1	
CO5	2	2	1	2	1	-	-	-	-	1	1	1	2	
CO6	2	1	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	100
40%				**60 %**

23MA1305	COMPUTATIONAL STATISTICS	L	T	P	C
		3	0	2	4

COURSE OBJECTIVE:

- To study the concepts of linear regression models.
- To develop a sound understanding of current, modern computational statistical approaches and their application to a variety of datasets.
- To apply principles of data science to analyse the business problems.
- To effectively visualize the data.
- To analyse data using various statistical tools like clustering and correlation.

UNIT I MULTIVARIATE NORMAL DISTRIBUTION 9

Multivariate Normal Distribution Functions, Conditional Distribution and its relation to regression model, Estimation of parameters.

UNIT II DISCRIMINANT ANALYSIS 9

Statistical background, linear discriminant function analysis, Estimating linear discriminant functions and their properties.

UNIT III PRINCIPAL COMPONENT ANALYSIS 9

Principal components, Algorithm for conducting principal component analysis, deciding on how many principal components to retain, H-plot.

UNIT IV FACTOR ANALYSIS 9

Factor analysis model, Extracting common factors, determining number of factors, Transformation of factor analysis solutions, Factor scores.

UNIT V . CLUSTERING 9

Introduction, Types of clustering, Correlations and distances, clustering by partitioning methods, hierarchical clustering, K-Means Clustering-Profiling and Interpreting Clusters.

TOTAL :45 PERIODS

COURSE OUTCOME

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

CO1 Interpret the usage of multivariate normal distribution and multivariate regression
CO2 To find discriminants, rules to optimally assign new objects to the labelled classes.
CO3 Apply the principal component techniques to reduce data and to interpret.
CO4 To reduce the number of variables in regression models using Factor analysis.
CO5 Apply the techniques of clustering methods for massive amounts of data.

TEXT BOOKS:

1. Probability and Statistics for Engineers (9th Edition), I.R. Miller, J.E. Freund and R. Johnson, 2023.
2. Fundamentals of Statistics (Vol. I & Vol. II), A. Goon, M. Gupta and B.Dasgupta, 8th edition 2002.
3. The Analysis of Time Series: An Introduction, Chris Chatfield, 7th edition 2019.

REFERENCE BOOKS:

1. Introduction to Linear Regression Analysis, D.C. Montgomery &E.Peck, 2006.
2. Introduction to the Theory of Statistics, A.M. Mood, F.A. Graybill& D.C. Boes, 2017.
3. Applied Regression Analysis, N. Draper & H. Smith, Third edition,1998.
4. Hands-on Programming with R,- Garrett Grolemund, 2014.
5. R for Everyone: Advanced Analytics and Graphics, Jared P. Lander, 2013.

LIST OF EXPERIMENTS **30 PERIODS**

1. Basic Python Programs.
2. Program using String Operations.
3. Program on python Data structures.
4. Working with data in python using pandas.
5. Perform various numpy operations and special functions.
6. Draw statistical graphics using seaborn.
7. Implement k-means, logistic and time series algorithm using Scikit-learn.
8. Visualization in python using matplotlib.

SOFTWARE REQUIRED: PYTHON

CO-PO AND PSO MAPPING

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

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

23CB1303	SOFTWARE ENGINEERING	L	T	P	C
		2	0	2	3

COURSE OBJECTIVE:

- To gain knowledge of basic Software Engineering methods and practices, and theirappropriate application.
- To describe software engineering layered technology and Process frame work
- To identify software measurement and software risks.
- To describe the approaches to verification and validation using static and dynamictesting.
- To examine the good qualities of a software.
- To gain knowledge of basic Software Engineering methods and practices, and theirappropriate application.

UNIT-I INTRODUCTION 6

Introduction: Programming in the small vs. programming in the large; software project failures and importance of software quality and timely availability; of software engineering towards successful execution of large software projects; emergence of software engineering as a discipline, Software Engineering Historical Development from Jackson Structured Programming to Agile Development. **Agile Software Engineering:** Concepts of Agile Methods, Extreme Programming; Agile Process Model - Scrum, Feature; Scenarios and Stories.

UNIT-II SOFTWARE PROJECT MANAGEMENT 6

Basic concepts of life cycle models — different models and milestones; software project planning –identification of activities and resources; concepts of feasibility study; techniques for estimation of schedule and effort; software cost estimation models and concepts of software engineering economics; techniques of software project control and reporting; introduction to measurement of software size; introduction to the concepts of risk and its mitigation; configuration management.

UNIT-III SOFTWARE QUALITY MANAGEMENT AND RELIABILITY 6

Software Quality and Reliability: Internal and external qualities; process and product quality; principles to achieve software quality; introduction to different software quality models like McCall, Boehm, FURPS / FURPS+, Dromey, ISO — 9126; introduction to Capability Maturity Models (CMM and CMMI); introduction to software reliability, reliability models and estimation**.**
Software Requirements Analysis, Design and Construction: Introduction to Software Requirements Specifications (SRS) and requirement elicitation techniques; techniques for requirement modelling — Decision tables, Event tables, State transition tables, Petri nets; requirements documentation through use cases; Introduction to UML, Introduction to software metrics and metrics-based control methods; Measures of code and design quality.

UNIT-IV OBJECT ORIENTED ANALYSIS, DESIGN AND CONSTRUCTION 6

Concepts -- the principles of abstraction, modularity, specification, encapsulation and information hiding; concepts of abstract data type; Class Responsibility Collaborator (CRC) model; Quality of design; Design measurements; concepts of design patterns; Refactoring; object-oriented construction principles; object oriented metrics.

UNIT-V SOFTWARE TESTING 6

Introduction to faults and failures; basic testing concepts; concepts of verification and validation; black box and white box tests; white box test coverage — code coverage, condition coverage, branch coverage; basic concepts of black-box tests — equivalence classes, boundary value tests, usage of state tables; testing use cases; transaction based testing; testing for non-functional requirements — volume, performance and efficiency; concepts of inspection; Unit Testing, Integration Testing, System Testing and Acceptance Testing.

TOTAL: 30 PERIODS

LIST OF EXPERIMENTS

1. Development of requirements specification
2. Function-oriented design using Structured Analysis(SA) / Structured Design (SD)
3. Object-Oriented design using UML
4. Test case design
5. Implementation using C++ and testing
6. Use of appropriate CASE tools and other tools such as configuration managementtools
7. Program analysis tools in the software life cycle.

Prepare the following documents for any one of the above experiments and developthe software using software engineering methodology.

- Course Registration System
- Quiz System
- Online ticket reservation system
- Remote computer monitoring
- Student marks analysing system
- Expert system to prescribe the medicines for the given symptoms
- ATM system
- Platform assignment system for the trains in a railway station
- Stock maintenance.

TOTAL: 30 PERIODS

TEXT BOOKS

1. Software Engineering, Ian Somerville, Addison-Wesley, 8th Edition, 2021.
2. Software Engineering A Practitioner’s Approach, Roggers S. Pressman and Bruce R.Maxim. 8th edition,2024

3. Roger S. Pressman, Bruce R.Maxim—Software Engineering —A Practitioner's Approach, Seventh Edition, McGraw-Hill International Edition, 2024.

REFERENCE BOOKS

1. Carlo Ghezzi, Jazayeri Mehdi, Mandrioli Dino, "Fundamentals of Software Engineering", 2nd Edition, Pearson,2002.
2. Ivar Jacobson, Grady Booch, James Rum Baugh, "The Unified Development Process", Addison Wesley, 2004.
3. A Lexicon of Practice, Principles and Prejudices, Michael Jackson, "Software Requirements and Specification", 1 Edition, 1995.
4. Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, "Design Patterns: Elements of Object-Oriented Reusable Software", 1st Edition, Addison Wesley, 1994.
5. Norman E. Fenton, Shari Lawrence Pledger, "Software Metrics: A Rigorous and Practical Approach", 2nd Edition, International Thomson Computer Press, 1997.

COURSE OUTCOME(S):

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

CO1 Apply the system development life cycle for any Business system.
CO2 Establish software project management activities such as planning, scheduling and Estimation for the business system.
CO3 Specify the business requirements through appropriate system analysis and design.
CO4 Adapt good programming and documentation standards
CO5 Implement and demonstrate any business system software from specification to validation and verification.
CO6 Analyze the Software Requirements Specifications and modelling

CO-PO AND PSO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	3	3	2	2	3	3	3	3	3	3		3	
CO2	2	2	3	2	1	2	2	3	3	3	2		2	
CO3	3	3	3	2	1	2	3	3	2	3	3		3	
CO4	1	2	2	1	2	1	2	2	2	3	3		1	
CO5	2	3	3	1	1	2	1	1	3	3	3		1	
CO6	3	3	3	2	1	2	3	3	2	3	3			

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

23CB1304	COMPUTER ORGANIZATION AND ARCHITECHTURE	L	T	P	C
		3	0	2	4

COURSE OBJECTIVE:

- Discuss the functionalities of various blocks of a digital computer and express thedata representation.
- llustrate the logic design of Arithmetic and control Unit.
- Infer the concepts of memory system, concurrence access in parallel processorsand classify the approaches for I/O communication.
- Distinguish hazards in pipelining and outline its impact in the performance of theprocessors

UNIT I COMPUTER ORGANISATION AND INSTRUCTIONS 9

Basics in Boolean logic and Combinational/Sequential Circuits.
Functional blocks of a computer: CPU, memory, input-output subsystems, control unit; **Instruction set architecture of a CPU**: Registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set; Outlining instruction sets of some common CPUs. **Data representation**: Signed number representation, fixed andfloating point representations, character representation

UNIT II COMPUTER ARITHMETIC 9

Computer arithmetic: Integer addition and subtraction- ripple carry adder- carry look- ahead adder, etc.; multiplication – shift-and-add, Booth multiplier, carry save multiplier, etc.- Division restoring and non-restoring techniques, floating point arithmetic, IEEE 754 format.

UNIT III X86 ARCHITECTURE 9

x86 architecture: Introduction.
CPU control unit design: Hardwired and micro-programmed design approaches, design ofa simple hypothetical CPU.
Memory system design: Semiconductor memory technologies, memory organization.

UNIT IV PERIPHERAL DEVICE 9

Peripheral devices and their characteristics: Input-output subsystems, I/O device interface, I/O transfers – program controlled, interrupt driven and DMA, privileged and non- privileged instructions, software interrupts and exceptions; Programs and processes – role of interrupts in process state transitions, I/O device interfaces — Small Computer System Interface (SCSI), Universal Serial Bus (USB).

UNIT V PIPELINING AND MEMORY ORGANIZATION 9

Pipelining: Basic concepts of pipelining, throughput and speedup, pipeline hazards. **Parallel Processors**: Introduction to parallel processors, Concurrent access to memoryand cache coherency.
Memory organization: Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, replacement algorithms, write policies.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

1. Circuits on breadboard or simulators

   a) Implementation of Combinational Digital/Boolean Circuits: Adder, Subtractor, Multiplication Module, Division Module, Multiplexer, Demultiplexer, Encoder, Decoder

   b) Implementation of Sequential Circuits: Counters, Linear Feedback Shift Registers(LFSR)

2. C/C++ programming to understand the formats of char, int, float, double, long etc.

3. Machine language programming on x86 or higher version kits or simulators:

   a) Add/subtract/multiplication/division/GCD/LCM

   b) Accessing some specific memory locations/ports

   c) Counting odd and even integers from a series of memory locations

   d) Printing values of selected registers

   e) Handing interrupts

TOTAL: 30 PERIODS

COURSE OUTCOME(S):
On successful completion of the course student will be able to:

CO1 Understand the basic structure of computers, operations and instructions.

CO2 Discuss the functionalities of various blocks of a digital computer and expressthe data representation.
CO3 Illustrate the logic design of Arithmetic and control Unit.
CO4 Understand parallel processing architectures.
CO5 Infer the concepts of memory system, concurrence access in parallel processorsand classify the approaches for I/O communication.
CO6 Distinguish hazards in pipelining and outline its impact in the performance of the processors.

TEXT BOOKS
1. Morris Mano, “Computer System Architecture” 3rdEdition, Prentice Hall of

India, NewDelhi, 2014.
2. David A. Patterson and John L. Hennessy, “Computer Organization and Design: TheHardware/Software Interface”, Elsevier, 5th Edition 2013.
3. Carl Hamacher, ZvonkoVranesic, SafwatZaky, NaraigManjikian, “ComputerOrganization and Embedded Systems” McGraw-Hill, 6th Edition 2014.

REFERENCE BOOKS

1. John P. Hayes, Computer Architecture and Organization, McGraw-Hill ,3rd Edition,2013.
2. William Stallings, “Computer Organization and Architecture — Designing forPerformance”, 10thEdition, Pearson Education, 2015.
3. Vincent P. Heuring and Harry F. Jordan,”Computer System Design and Architecture”,Prentice Hall, 2ndEdition, 2004

CO-PO AND PSO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	1											
CO2	2	2	2	1				1		1				
CO3	2	2	2	2	1	1	1	1					1	
CO4	1	1	1	1	1	1	1						1	
CO5	2	1	2					2			1			
CO6	1	1	1	1			1	1			1			

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

23CB1311	OBJECT ORIENTED PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVE:

- Understand the basics of C and C++.
- To develop applications using files in C++
- Apply object oriented programming concepts to solve real time problems
- To familiarize with constructors, inheritance, polymorphism, templates and exceptionhandling

LIST OF EXPERIMENTS

1. Write a Program to pass parameter by value vs by reference, passing array asconstant pointer.

2. Write a program for function overloading in String ,operations like strcat and strncat,strcpy and strncpy as overloaded functions.

3. Dynamically allocating space for a pointer depending on input and doing this repeatedly, depending on different inputs and finally de-allocating the pointer.

4. Write a class complex with all possible operations: constructor, destructor, copyconstructor, assignment operator with the data members stored as pointer to integers.

5. Write a class vector of integers with all possible operations like constructor, destructor,copy constructor and assignment operators.

6. Write a class matrix of integers with all possible operations like constructor, destructor,copy constructor and assignment operators.

7. Write a class matrix of integers using vector, with all possible operations like constructor, destructor, copy constructor and assignment operators.

8. Develop class stack, queue, linked-list, array, set using some data-type (int) with data members kept as private and functions kept in both protected and public sections.

9. Write a class complex with all possible operators: constructor, destructor, copyconstructor, assignment operator and operators >, <, >=, <=, ==, ++ (pre and post), +,
   +=, ( ), with the data members stored as pointer to integers.

10. Write a class matrix of integers with all possible operations like constructor, destructor,copy constructor and assignment operators>, <, >=, <=, ==, ++ (pre and post), +, +=, (
).

11. Write a program to create class matrix of integers using vector, with all possible operations like constructor, destructor, copy constructor and assignment operators>,
    <, >=, <=, ==, ++ (pre and post), +, +=, ( ).

12. Write a program to perform stack and queue inherited from array class, with standardfunctions and operators.

13. Design a class called ‘array’ with data type passed as template type with constructor, destructor, copy constructor and assignment operators and index operator.

14. Write a template functions to compare and use it in the algorithms like bubble sort,insertion sort, merge sort
15. Write a program for Formatted input-output examples.

16. Write a program to implement Input manipulators.

17. Write a Program to Override the operators <<, >>.

18. Design a class model for complex number, student class, book class and show itusing UML diagram as well as concrete class.

19. Implement behavioural modelling through sequence diagram and activity diagram forworkflow in a typical log-in, log-out situation.

TOTAL: 60 PERIODS

COURSE OUTCOME(S):

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

CO1 To develop the skills in programming using C++.

CO2 Apply object oriented programming concepts to solve real time problems.

CO3 Employ the concepts of constructors, inheritance and polymorphism.

CO4 Implement function and operator overloading using C++.

CO5 Develop software applications using templates, exception handling and files in C++.

CO6 Implement the concepts of data structures and UML diagrams.

WEB REFERENCES:

1. https://www.studytonight.com/cpp/cpp-and-oops-concepts.php

2. https://www.tutorialspoint.com/What-are-basic-Object-oriented-programming-concepts

3. https://www.geeksforgeeks.org/basic-concepts-of-object-oriented-programming-using- c/

4. http://www.iitk.ac.in/esc101/05Aug/tutorial/java/concepts/index.html

CO-PO AND PSO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	3	-	2	2	-	-	-	-	-	2	1	1	
CO2	2	3	-	2	1	-	-	-	-	-	2	1	2	
CO3	2	2	-	1	1	-	-	-	-	-	1			
CO4	1	3	2	2	2	-	-	-	-	-	2	2	2	
CO5	1	2	2	2	2	-	-	-	-	-	1			
CO6	1	3	2	3	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	0

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. Binary Tree Traversal
7. Binary Search Tree
8. B-Tree
9. Binary Heaps
10. Linear search algorithm & Binary search algorithm
11. Sorting algorithms
    i. Bubble Sort
    ii. Selection Sort
    iii. Insertion Sort
    iv. Merge Sort
    v. Quick sort
    vi. Radix Sort
    vii. Bucket Sort
    viii. Heap Sort
    ix. Shell Sort
12. Graph Traversal algorithms
    i. BFS
    ii. DFS
    iii. Topological Sorting
13. Shortest Path algorithm
    I. Dijkstra Algorithm
    II. Bellman-Ford Algorithm
14. Minimum Spanning tree
    i. Kruskal Algorithm
    ii. Prim’s Algorithm

15. All pairs shortest paths using Floyd's Algorithm
16. Hashing using open addressing technique

TOTAL: 30 PERIODS

COURSE OUTCOME(S):

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

CO1 Implement arrays and abstract data types for list.
CO2 Solve real world problems using appropriate linear data structures.
CO3 Apply appropriate tree data structures in problem solving.
CO4 Implement various searching and sorting algorithms.
CO5 Implement appropriate Graph representations and solve real-world applications.
CO6 Apply various hashing operations.

SOFTWARE REQUIREMENTS

Anaconda Python Distribution/ TURBO C.

TEXT BOOKS:

1. G. A. Vijayalakshmi Pai," A Textbook of Data Structures and Algorithms, Volume 1",Wiley-ISTE,January 2023.
2. G. A. Vijayalakshmi Pai,"A Textbook of Data Structures and Algorithms, Volume 2:Mastering Nonlinear Data Structures", Wiley-ISTE,February2023.
3. Dr.Harsh Bhasin,"Data Structures with Python", BPB Publications,Delhi,March2023.
4. John Canning ,Alan Broder,Robert Lafore,``Data Structures & Algorithms in Python",Addison-Wesley Professional, October 2022.
5. Y Daniel Liang, "Introduction To Python Programming And Data Structures", GlobalEdition 3rd Edition ,Pearson Publications ,November 2022.

REFERENCE BOOKS:

1. Dr.Basant Agarwal,"Hands-On Data Structures and Algorithms with Python",3rd Edition, Packt Publishing, July 2022.
2. Narasimha Karumanchi, "Data Structures and Algorithms Made Easy", Career MonkPublications, August 2016.
3. MichaelH.Gold wasser, Michae lT.Good rich, and Roberto Tamassia,"
4. DataStructures and Algorithms in Python", Wiley Publications 2013.

ONLINE COURSES/RESOURCES:

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

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23HS1301	SKILLS FOR CAREER BUILDING AND DEVELOPMENT I	L	T	P	C
		0	0	2	0

COURSE OBJECTIVE:

- To improve language accuracy through error spotting, sentence correction, and text completion.
- To build critical thinking by analysing arguments and organizing ideas.
- To create a strong personal brand and effective self-introduction using social media.
- To develop persuasion, negotiation, and business planning skills.
- To enhance teamwork, empathy, and feedback skills for better interpersonal relations.

Unit I

Error Spotting- Sentence Correction- Subject Verb Agreement- Pronouns- Tense- Comparisons – Modifiers- Parallelism

Unit II

Sentence Equivalence and Text completion: Grammar- Single, Double and Triple blanks

Unit III

Para jumble – Para Completion

Unit IV

Critical Reasoning – Facts – Inference – Judgement – Strengthening and Weakening an Argument

Unit V

Reading Comprehension

COURSE OUTCOME:

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

CO1 Proficiently spot and correct advanced errors, complete texts, and achieve sentence equivalence with accuracy

CO2 Demonstrate strong critical reasoning by analysing arguments, making judgments, and Organizing coherent paragraphs.

CO3 Create impactful self-introductions and personal brands, leveraging social media for effective profiling.

CO4 Apply persuasion and negotiation skills to develop and market business plans successfully convince others and create solid business plans.

CO5 Exhibit strong interpersonal skills, empathy, and synergy, delivering constructive feedback to enhance team dynamics

TOTAL : 30 PERIODS

TEXT BOOKS

1. Powers, L., and T. Knapp. The Official Guide to the GRE General Test. 3rd ed., McGraw-Hill Education, 2019.
2. Gallo, Carmine. Talk Like TED: The 9 Public-Speaking Secrets of the World's Top Minds. St. Martin’s Press, 2016.

REFERENCE BOOKS

1. Manhattan Prep. (2021). GRE Reading Comprehension & Essays (7th ed). Manhattan Prep Publishing.
2. Cialdini, R. B. (2021). Influence, New and Expanded: The Psychology of Persuasion. Harper Business.

WEB REFERENCES

1. https://www.ets.org/gre/test-takers/general-test/prepare/practice-questions/verbal-reasoning.html
2. https://www.linkedin.com/learning/building-your-personal-brand

ONLINE COURSES/RESOURCES

1. https://www.coursera.org/learn/critical-thinking-skills
2. https://www.coursera.org/learn/negotiation

23HS1302	QUANTITATIVE APTITUDE PRACTICE III	L	T	P	C
		0	0	1	0

COURSE OBJECTIVE:

- Students can refine their problem solving skills by using ratio and proportion, simple and compound interest.
- To improve students ability to use strategies for addressing logical reasoning, surds and indices problems.

Module 1 Simple and Compound interest **3**

Simple interest - compound interest - problems on ages - simplification and approximation.

Module 2 Ratio and Proportion **3**

Chain rule – percentage - ratio and proportion - profit and loss

Module 3 Surds and Indices **3**

surds and indices – clock – cubes – dices – direction - sense.

Module 4 Logical Reasoning II **3**

Puzzles – series – coding - decoding – classifications.

TOTAL : 12 PERIODS

COURSE OUTCOME

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

CO1 Solve problems using ratio and proportion, simple and compound interest, and ease.

CO2 Comprehend and demonstrate solid knowledge for the surds and indices, as well as logical reasoning exercises.

TEXT BOOKS

1. AggarwalR.S.(2017). Quantitative Aptitude for Competitive Examinations 3rd edition New Delhi: S. Chand Publishing.
2. Abhijit guha(2016). Quantitative Aptitude for All Competitive Examinations, 6th edition. Noida: McGraw Hill Education Pvt.Ltd.
3. FACE(2016).AptipediaAptitude Encyclopedia1(Ed.).New Delhi: WileyPublications.

REFERENCE BOOK

1. Sharma arun.(2016).Quantitative aptitude,7th(Ed.).Noida : McGraw Hill Education Pvt. Ltd.
2. Praveen. R.V 3rd edition, Quantitative aptitude and reasoning, PHI learning publication.

WEB REFERENCES:

1. https://www.indiabix.com/

Mode of Evaluation: Online Test

SEMESTER IV

23CB1401	DATABASE MANAGEMENT SYSTEMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To understand the basic concepts and the applications of database systems.
- To know the basics of SQL and construct queries using SQL.
- To learn the relational database design principles.
- To learn about the normalization concepts and storage strategies.
- To understand the basic issues of transaction processing and concurrency control.
- To familiar with advances in data security

UNIT I DATABASE FUNDAMENTALS 9

Introduction to Database - Hierarchical, Network and Relational Models, Database system architecture - Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML), Data models - Entity-relationship model, network model, relational and object oriented data models, integrity constraints, data manipulation operations.

UNIT II RELATIONAL DATABASE 9

Relational query languages - Relational algebra, Tuple and domain relational calculus,SQL3, DDL and DML constructs, Open source and Commercial DBMS - MYSQL,ORACLE, DB2, SQL server.

NIT III RELATIONAL DATABASE DESIGN, QUERY PROCESSING AND 9 STORAGE

Domain and data dependency, Armstrong's axioms, Functional Dependencies, Normal forms, Dependency preservation, Lossless design, Storage strategies - Indices, B-trees, Hashing, Query processing and optimization - Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms.

UNIT IV TRANSACTION PROCESSING 9

Transaction processing-Concurrency control, ACID property (Atomicity, Consistency, Isolation, Durability), Serializability of scheduling, Locking and timestamp based schedulers, Multi-version and optimistic Concurrency Control schemes, Database recovery.

UNIT V DATABASE SECURITY AND ADVANCED DATABASE 9

Authentication, Authorization and access control, DAC (Discretionary Access Control), MAC(Mandatory Access Control) and RBAC(Role-based access control) models, Intrusion detection, SQL injection, Advanced topics - Object oriented and object relational databases, Logical databases, Web databases, Distributed databases, Data warehousing and data mining.

TOTAL: 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Understand the basic concepts of database systems.

CO2 Apply SQL and MySQL Queries using open source and commercial database andrelational database design

CO3 Apply the query processing techniques for the optimization.

CO4 Utilize various indexing and hashing techniques of database and securitymechanisms for authentication and recovery.

CO5 Understand the basic issues of transaction processing and concurrency control.

CO6 Interpret various advanced database to compare with traditional databases.

TEXTBOOKS

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, “Database System Concepts”,7th Edition, Tata McGraw Hill, March 2019.
2. Gupta G K, “Database Management Systems”, Tata McGraw Hill Education PrivateLimited, New Delhi, 2011.
3. Peter rob, Carlos Coronel, “Database Systems — Design, Implementation andManagement”, 9 th Edition, Thomson Learning, 2009.

REFERENCE BOOKS

1. J. D. Ullman, “Principles of Database and Knowledge — Base Systems”, Vol 1,Computer Science Press, Inc. New York, 1998.
2. R. Elmasri and S. Navathe, “Fundamentals of Database Systems”, 7th Edition, Pearson,2016.
3. Serge Abiteboul, Richard Hull, Victor Vianu, “Foundations of Databases”, Addison-Wesley Publishing Company, 1995.

CO-PO AND PSO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	1	-	-	3	-	-	-	-	-	-	1	-	
CO2	3	2	1	1	3	-	-	-	-	-	-	2	1	
CO3	3	1	1	1	3	-	-	-	-	-	-	1	1	
CO4	3	2		2	-	-	-	-	-	-	-	1		
CO5	3	3		2	-	-	-	-	-	-	-	1		
CO6	1	2		2	-	-	-	-	-	-	-	2		

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

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 start-up.
- 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 ofIPR: 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- Usein 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(S):

On successful completion of the course student 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 assetsfrom 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, 7th 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:
5. Entrepreneurship Development”, Institute of India, Ahmadabad, 1986.
6. Hisrich R D, Peters M P, “Entrepreneurship” 8th Edition, Tata McGraw-Hill, 2013.
7. Mathew J Manimala, “Enterprenuership theory at cross roads: paradigms and praxis”2nd Edition Dream tech, 2005.

CO-PO AND PSO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	1	-	1	1	-	1	2	1	1	2	1	1	
CO2	1	3	2	1	1	1	2	1	1	2	2		2	
CO3	-	-	-	1	1	1	-	2	1	1	1	1		
CO4	1	-	-	-	-	-	2	2	1	1	2	1	1	
CO5	2	2	-	-	-	-	2	1	1	1	1		1	
CO6	2	2	-	-	-	-	2	1	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	100
40%				**60 %**

23MA1407	OPERATIONS RESEARCH	L	T	P	C
		3	0	2	4

COURSE OBJECTIVE:

- To formulate linear programming problem and solve using graphical, simplex method.
- To solve linear programming problem using dual simplex method.
- To solve transportation and assignment problem.
- To solve project management problems.
- To optimize inventory levels considering costs, demand, and lead time.

UNIT I LINEAR PROGRAMMING 9

Linear programming – Examples from industrial cases, formulation & definitions, Basic feasible solutions – Graphical method: Special cases – infeasibility, unboundedness, Simplex Algorithm – slack, surplus & artificial variables, Big-M method, Two phase method.

UNIT II DUALITY IN LINEAR PROGRAMMING 9

Duality – formulation, results and primal-dual algorithms, dual – simplex method. Sensitivity analysis – change in cost, change in the requirement of vector b, change in the elements a_{ij} of co-efficient matrix.

UNIT III TRANSPORTATION AND ASSIGNMENT MODELS 9

Transportation Problem – Balanced & unbalanced situations, Solution methods – NWCR, minimum cost and VAM, test for optimality(MODI method), degeneracy and its resolution.

Assignment Problem – Balanced & unbalanced situations, Solution method – Hungarian, test for optimality (MODI method), degeneracy & its resolution.

UNIT IV NETWORK MODELS 9

PERT – CPM - Project definition, Project scheduling techniques – Gantt chart, PERT & CPM, Determination of critical paths, Estimation of Project time and its variance in PERT using statistical principles, Concept of project crashing.

UNIT V INVENTORY MODELS 9

Inventory Control – Functions of inventory and its disadvantages, ABC analysis, Concept of inventory costs, Basics of inventory policy (order, lead time, types), Fixed order-quantity models – EOQ, POQ & Quantity discount models- EOQ models for discrete units.

TOTAL : 45 PERIODS

COURSE OUTCOME

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

CO1 Formulate and find optimal solution in the real life optimizing.
CO2 Apply dual simplex method to solve linear programming problem.
CO3 Apply transportation and assignment models optimization techniques to solve problems.
CO4 Apply operations research techniques and algorithms to solve Network problems.
CO5 Recognize and solve inventory problems.

TEXT BOOKS:

1. Taha H.A, “Operation Research”, 10th Edition, Pearson Education, 2017.
2. F.S. Hiller and G.J. Lieberman, “Introduction to Operations Research”, McGraw Hill, 11th Edition, 2020.
3. A. Ravi Ravindran, “Operations Research and Management Science, Hand Book”, CRC Press, 2nd Edition, 2016.

REFERENCE BOOKS:

1. K.G. Murthy, Linear Programming, Wiley, New York, 1983.
2. H.M. Wagner, “Principles of OR with Application to Managerial Decisions”, Prentice Hall,1975.
3. Thomas L. Saaty, “Elements of Queuing Theory”, McGraw Hill, 1961.
4. Jerome D. Wiest, Ferdin, and K. Levy Management Guide to PERT/CPM, Englewood Cliffs, N.J. : Prentice-Hall, 1969.
5. J.W. Prichard and R.H. Eagle, “Modern Inventory Management”, Wiley, 1965.

LIST OF EXPERIMENTS **TOTAL :30 PERIODS**

1. Formulation of linear programming problems.
2. Solution of linear programming problem using graphical method with:
   i. Unbounded solution
   ii. Infeasible solution
   iii. Alternative or multiple solutions.
3. Solution of linear programming problem with simplex method.
4. Problem solving using Big M method.
5. Problem solving using a two-phase method.
6. Solution on primal problem as well as dual problem.
7. Solution of transportation problem.
8. Solution of assignment problem.
9. ABC analysis.
10. Inventory model.

SOFTWARE REQUIRED: R-PROGRAMMING/PYTHON

CO-PO AND PSO MAPPING

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

<table>
<tr><th colspan="2">Assessment
(40% weightage)
(Theory Component)</th><th colspan="2">Assessment
(60% weightage)
(Laboratory
Component)</th><th>End Semester
Examination</th></tr>
<tr><th>Individual
Assignment
/
Case Study
/
Seminar /
Mini Project</th><th>Written
Test</th><th>Evaluation
of
Laboratory
Observation,
Record</th><th>Test</th><th>Written
Examination</th></tr>
<tr><td>40</td><td>60</td><td>75</td><td>25</td><td rowspan="2">100</td></tr>
<tr><td colspan="4">100</td></tr>
<tr><td colspan="4">50 %</td><td>50 %</td></tr>
</table>

23CB1403	OPERATING SYSTEMS	L	T	P	C
		3	0	2	4

COURSE OBJECTIVE:

- To understand the basic concepts and functions of operating systems.
- To understand concepts of Processes and analyse Scheduling algorithms.
- To analyse various memory management schemes.
- To understand I/O management and File systems.
- To be familiar with the basics of Unix system.

UNIT I INTRODUCTION 8

Introduction: Concept of Operating Systems (OS), Generations of OS, Types of OS, OS Services, Interrupt handling and System Calls, Basic architectural concepts of an OS, Concept of Virtual Machine, Resource Manager view, process view and hierarchical view ofan OS.
Processes: Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching.
Thread: Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads.

UNIT II PROCESS MANAGEMENT 11

Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time.
Scheduling algorithms: Pre-emptive and non-pre-emptive, FCFS, SJF, RR; Multiprocessor scheduling: Real Time scheduling: RM and EDF.
Inter-process Communication: Concurrent processes, precedence graphs, Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Semaphores, Strict Alternation, Peterson's Solution, The Producer / Consumer Problem, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem, Barber's shop problem.
Deadlocks: Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.
Concurrent Programming: Critical region, conditional critical region, monitors, concurrent languages, communicating sequential process (CSP); Deadlocks - prevention, avoidance, detection and recovery.

UNIT III STORAGE MANAGEMENT 9

Memory Management: Basic concept, Logical and Physical address maps, Memory allocation: Contiguous Memory allocation — Fixed and variable partition–Internal and External fragmentation and Compaction.

Virtual Memory: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page allocation, Partitioning, Paging, Page fault, Working Set, Segmentation, Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU).
I/O Hardware: I/O devices, Device controllers, Direct Memory Access, Principles of I/O.

UNIT IV FILE SYSTEMS 9

File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed),Free- space management (bit vector, linked list, grouping), directory implementation(linear list, hash table), efficiency and performance.
Disk Management: Disk structure, Disk scheduling — First come-First Serve (FCFS), Shortest Seek Time First (SSTF), SCAN, Circular-Scan (C-SCAN), Disk reliability, Disk formatting, Boot-block, Bad blocks.

UNIT V CASE STUDY 8

Case study: UNIX OS file system, shell, filters, shell programming, programming with the standard I/O, UNIX system calls.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

1. Unix commands (files directory, data manipulation, network communication etc),shell programming and vi editor
2. C program implementation of the following:
    a) Scheduling Algorithms
    b) Shared memory
    c) Thread and Multi Thread
    d) Inter Process Communication
    e) Deadlock Avoidance and Deadlock Detection
    f) Semaphore
    g) Memory Management
    h) Indexing and Hashing

TOTAL: 30 PERIODS

COURSE OUTCOME(S):

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

CO1 Study and Understand the basics of Operating System.

CO2 Analyse and design the applications of Process, Process scheduling, Process Synchronization, Deadlock.

CO3 Analyse the various memory management schemes.

CO4 Learn the various concepts of File systems.

CO5 Understand various concepts of Disk management techniques.

CO6 Understand the functionality of UNIX Operating System.

TEXT BOOKS

1. Abraham Silberschatz, Peter B. Galvin, Greg Gagne, “Operating System Concepts”,10th Edition, John Wiley, 2018.

2. William Stallings, “Operating Systems –Internals and Design Principles”, 8thEdition,Pearson Publications, 2014.

REFERENCE BOOKS

1. N. Gregory Mankiw, “Principles of Macroeconomics”, 6th edition, Cengage India, 2008
2. Charles Patrick Crowley, “Operating System: A Design-oriented Approach”,2001.
3. Gary Nutt, —Operating Systems, Third Edition, Pearson Education, 2004.
4. Maurice J. Bach, “Design of the Unix Operating Systems”, Prentice/Hall International.,Inc,2016.
5. Daniel Pierre Bovet, Marco Cesati, “Understanding the Linux Kernel”,2000.

CO-PO AND PSO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	-	-	-	-	-	-	1		
CO2	1	1	-	-	-	-	-	-	-	-	-	1		
CO3	1	1	-	-	-	-	-	-	-	-	-	1		
CO4	1	1	-	-	-	-	-	-	-	-	-	1		
CO5	1	1	-	-	-	-	-	-	-	-	-	1		
CO6	1	1	-	-	-	-	-	-	-	-	-	1		

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

23CB1404	SOFTWARE DESIGN WITH UML	L	T	P	C
		3	0	2	4

COURSE OBJECTIVE:

- Obtain knowledge of software engineering discipline
- Learn various modelling techniques for different perspectives of object oriented software design(UML)
- Apply business modeling and modeling languages to design software
- Develop correct and robust software deployment models

UNIT-I INTRODUCTION TO ON OBJECT ORIENTED TECHNOLOGIES AND THE UML METHOD 9

Software development process: The Waterfall Model vs. The Spiral Model. -The Software Crisis, description of the real world using the Objects Model. -Classes, inheritance and multiple configurations-Quality software characteristics. -Description of the Object-Oriented Analysis process vs. the Structure Analysis Model.

Introduction to the UML Language: Standards, Elements of the language. General description of various models, The process of Object Oriented software development, Description of Design Patterns, Technological Description of Distributed Systems.

UNIT-II REQUIREMENTS ANALYSIS USING CASE MODELING AND INTERACTION DIAGRAMS 9

Using Case Modeling : Analysis of system requirements -Actor Definitions-Writing a case goal. -Use Case Diagram -Use Case Relationships-Requirements Analysis Using Case Modeling

Interaction Diagrams : Description of goal-Defining UML Method, Operation, Object Interface, Class-Sequence Diagram -Finding objects from Flow of Events-Describing the process of finding objects using a Sequence Diagram-Describing the process of finding objects using a Collaboration Diagram.

UNIT-III THE LOGICAL VIEW DESIGN STAGE 9

The Static Structure Diagrams: The Class Diagram Model-Attributes descriptions-Operations descriptions- Connections descriptions in the Static Model -Association, Generalization, Aggregation, Dependency, Interfacing, Multiplicity.

UNIT-IV PACKAGE DIAGRAM MODEL AND DYNAMIC MODEL 9

Package Diagram Model : Description of the model-White box, black box-Connections between packagers -Interfaces -Create Package Diagram -Drill Down.

Dynamic Model: State Diagram / Activity Diagram-Description of the State Diagram -Events Handling -Description of the Activity Diagram - Exercise in State Machines.

UNIT-V COMPONENT DIAGRAM AND DEPLOYMENT DIAGRAM MODEL 9

Component Diagram Model- Physical Aspect. -Logical Aspect. -Connections and Dependencies. -User face. -Initial DB design in a UML environment. Deployment Model- Processors -Connections -Components-Tasks-Threads -Signals and Events.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

Draw the UML diagrams for the suggested Mini Projects:

1. Class Diagram
2. Object Diagram
3. Use Case Diagram
4. Sequence Diagram
5. Collaboration Diagram
6. State Chart Diagram
7. Activity Diagram
8. Component Diagram
9. Deployment Diagram

Suggested Mini Projects Domain For the following Applications: (Not limited to)

a) Passport automation Systems
b) Stock Maintenance System
c) Online Reservation Systems
d) Student Information Systems
e) Software Personnel Management Systems
f) Credit Card Management Systems
g) Recruitment Systems
h) Library Management Systems

TOTAL: 30 PERIODS

TEXT BOOKS:

1. The Unified Modelling Language User Guide. Grady Booch, James Rumbaugh, Ivar Jacobson, Pearson Education, Publisher: Addison Wesley, First Edition, 1998.
2. Object-Oriented Software Engineering: using UML, Patterns, and Java. Bernd Bruegge and Allen H. Dutoit. Third Edition, 2000 Pearson Education, Inc., publishing as Prentice Hall.

REFERENCE BOOKS:

1. Design Patterns: Elements of Reusable Object-Oriented Software. Erich Gamma, Richard Helm, Ralph Johnson, and John M. Vlissides.

COURSE OUTCOME(S):

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

CO1 Understand the software development process models

CO2 Interpret the contemporary issues and discuss about analysis and coding standards

CO3 Analyze the design methods and modelling

CO4 Provide a clear view of the hierarchical structure of the various UML elements withina given system.

CO5 Show which software elements are deployed by which hardware elements.

CO6 Employ UML diagrams for real time problems

CO-PO AND PSO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	-	1	-	-	-	2	2	-		1	
CO2	3	2	2	-	2	-	-	-	1	1	-		2	
CO3	3	3	3	-	2	-	-	-	1	1	-		1	
CO4	3	3	3	-	1	-	-	-	3	3	-		1	
CO5	3	2	2	-	1	-	-	-	3	3	-		1	
CO6	2	2	2	-	2	1	-	1	1	2	2		1	

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

23CB1405	DESIGN THINKING	L	T	P	C
		2	0	2	3

COURSE OBJECTIVE:

- Recognize the importance of Design Thinking.
- Explain the phases in the Design Thinking process.
- List the steps and apply the steps required to complete each phase in Design Thinkingprocess.
- Use doodling and storytelling in presenting ideas and prototypes.
- Create value proposition statements as part of their presentations.
- Recognize how Design Thinking can help in functional work.and how Agile and DesignThinking

UNIT I **INTRODUCTION** **6**

Why is Design Thinking important for business? - Linking Design Thinking Solution to Business Challenges. Why is Design Thinking important for you? – Recognize the importance of Design Thinking - What is Design Thinking? — Empathy- Recognize the steps in the empathize phase of Design Thinking - How to empathize? - Introduction to Immersion Activity
- Immersion activity through flowcharts and handouts.

UNIT II **UNDERSTAND, OBSERVE AND DEFINE THE PROBLEM** **6**

Creating personas - Recognize the steps to create personas in the define phase of Design Thinking- Create personas in the define phase of Design thinking- Problem statements- Recognize the steps to create problem statements in the define phase of Design Thinking - Defining problem statements - Define the problem statements in the define phase of Design Thinking.

UNIT III **IDEATION** **6**

How to Ideate? - Recognize the steps in the ideate phase of Design Thinking - Ideation games - Apply the steps in the ideate phase of Design Thinking - Six Thinking Hats - Million- dollar idea- Ideate to find solutions - Ideate solutions for the problem statements identified (as continuation of immersion activity) - Apply ideation methods- Let's doodle! - Presenting ideas during ideate and prototype phases - Storytelling in Design Thinking - Present their findings in forms of stories.

UNIT IV **PROTOTYPING** **6**

Why is a Prototype important in Design Thinking? - Recognize the importance of the prototype phase in Design Thinking - Prototype your idea - Create a prototype - Value Proposition Statement — how to create a value proposition statement.

UNIT V **TESTING** **6**

Testing in Design Thinking — The importance of Testing the prototype through stories — Test the Prototype - Conducts a group/open house discussion on : "How Design Thinking can help me to become a better coder. TOTAL: 30 PERIODS

LIST OF EXPERIMENTS

1. 2030 Schools Challenge: Concept: Design thinking is often presented without teaching content. This is very different. Learners get 30 minutes to choose a UN 2030 Goal (there are 17) that is relevant and meaningful to them, then they get into small groups. The group researches the goal quickly, by answering the questions: What does the world need to know about this goal and what can we do about it? The group then creates a short PSA (Public Service Announcement) and shares it widely with an authentic audience. It is fun, fast, and shows the power of design sprints to teach content and skills.

2. THE GIFT-GIVING PROJECT VIA STANFORD D-SCHOOL Concept: The Gift-Giving Project is 90-minute (plus debrief) fast-paced project through a full design cycle. Students pair up to interview each other, come to a point-of-view of how they might design for their partner, ideate, and prototype a new solution to "redesign the giftgiving experience" fortheir partner.

3. THE WALLET PROJECT VIA STANFORD D-SCHOOL Concept: Very similar to the GiftGiving Project, the Wallet Project is 90-minute (plus Tentative 48 debrief) fast-paced project through a full design cycle. Students pair up, show and tell each other about their wallets, ideate, and make a new solution that is "useful and meaningful" to their partner.

4. INVENT A SPORT (WITH JUST THESE ITEMS) Concept: We've all played sports at some point in our life. Who came up with the rules? Who created the game? Who made the constraints? And who decided the objects to play with? Now, with limited time and resources, your group will create and invent a new sport, and a set of directions for people to actually play the game.

5. "BOOK IN AN HOUR" ACTIVITY (VIA ALL WHO WONDER) Concept: Give a group a book (fiction or non-fiction). Then you break them up into smaller groups (or individuals) to read different parts of the book. Each group (or person) has to read and then create an overview/trailer of their part of the book to share chronologically with the rest of the class. Here the design really starts with the creative process driving how you share the information, plot, characters etc. Perfect use for professional development when you want to introduce a topic in a fun, engaging way.

6. CHILDREN'S STORY DESIGN ACTIVITIES Concept: The University of Arkansas created aseries of STEM Challenges that work as great design activities with groups old and young! For example after reading "The Three Billy Goat's Gruff" they set up a challenge like this: You decide to help the billy goats reach the opposite side of the creek so they can eat. You must create a model structure to help the billy goats get from one side to the other while using the design loop and only the materials provided. Your teacher will also provide you with model billy goats, with specific weights, that your bridge must be able to withstand.

TOTAL: 30 PERIODS

TEXT BOOKS

1. Müller-Roterberg, Christian, “Handbook of Design Thinking”, Amazon Digital Services LLC -KDP Print US, 2018.
2. Tim Brown, “Change by Design: How Design Thinking Transforms Organizations andInspires Innovation”, Harper Collins Publisher, 2009.
3. Eli Woolery, Design Thinking Handbook, Invision, 2019.

REFERENCE BOOKS

1. Johnny Schneider, “Understanding Design Thinking, Lean and Agile”, O'Reilly Media, 2017.
2. Nir Eyal , Hooked: How to build habit-forming, 2014.
3. Roger Martin, "The Design of Business: Why Design Thinking is the Next Competitive Advantage", Harvard Business Press , 2009.
4. Hasso Plattner, Christoph Meinel and Larry Leifer (eds), "Design Thinking: Understand – Improve – Apply", Springer, 2011.

COURSE OUTCOME(S):

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

CO1 Understand the importance of design thinking and its different phases.

CO2 Empathize with user situations and be able to define clear problem statements.

CO3 Use the different ideation methods and come with different feasible and viable ideasfor solving the problem statements.

CO4 Create prototypes for clear understanding of the problem statement.

CO5 Test the created prototypes and be able to iterate if the design does not meet thecustomer requirement.

CO6 Identify the phases of Design thinking to solve problem related to real world.

CO-PO AND PSO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	3	2	3	3	2	3	2	1	
CO2	2	2	3	2	1	2	2	3	3	3	2	1	2	
CO3	2	3	2	2	1	2	3	3	2	3	3	1	2	
CO4	1	2	2	2	2	1	2	2	2	3	3	1	1	
CO5	2	3	2	1	1	2	1	1	3	3	3	1	2	
CO6	3	2	3	2	1	1	3	3	2	3	3	1	1	

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

23CB1411	DATABASE MANAGEMENT SYSTEMS LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVE:

- Learn to create and use a database.
- Be familiarized with a query language.
- Have hands on experience on DDL Commands.
- Have a good understanding of DML Commands and DCL Commands.
- Familiarize advanced SQL queries
- Be exposed to different applications

LIST OF EXPERIMENTS

1. C implementation of a Database Editor
2. Creation of tables for Salesman and Customer Relation
3. Creating relationship between the databases and retrieve records using joins
4. Set various constraints like Not Null, Primary Key, Foreign Key and Check constraints.
5. Creation of Views, Synonyms, Sequence, Indexes, Save point
6. Implementation of SQL commands DDL, DML, DCL and TCL
7. Write a PL/SQL block to satisfy some conditions by accepting input from the user.
8. Write a PL/SQL block that handles all types of exceptions.
9. Creation of Procedures.
10. Creation of database triggers and functions
11. Database Connectivity with Front End Tools (Java/Python).
12. Study of Cloud Storage

    i)IT Training Group Database

    ii) Blood Donation System

    iii)Salary Management System

    iv)Traffic Light Information System
13. Mini Project (Application Development using DB)

TOTAL: 60 PERIODS

COURSE OUTCOME(S):

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

CO1 Understand the Syntax of SQL commands.

CO2 Remember queries to retrieve records.

CO3 Apply referential integrity constraints.

CO4 Analyze the database design using constraints.

CO5 Evaluate PL/SQL programs to implement triggers, functions, procedures andexceptions

CO6 Create front end tools to manipulate information from backend.

WEB REFERENCES:

1. http://nptel.ac.in/video.php?subjectId=106106093

CO-PO AND PSO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	2	1	-	-	-	-	-	-			
CO2	3	2	3	2	3	-	-	-	-	-	-			
CO3	3	3	3	1	3	-	-	-	-	-	-	3	3	
CO4	3	3	3	1	3	-	-	-	-	-	-	1	1	
CO5	3	3	3	1	3	-	-	-	-	-	-	3	2	
CO6	3	3	3	1	3	-	-	-	-	-	-			

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	0

COURSE OBJECTIVE:

- To understanding Java Fundamentals..
- To develop proficiency in flow control statements and Understand the usageof 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. Checked and Unchecked Exceptions - User defined Exceptions
17. Java Thread Model

TOTAL: 30 PERIODS

COURSE OUTCOME(S):

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

CO1 Understanding the fundamental programming elements of Java and learn to applybasic control structures in Java.

CO2 Apply scoping rules and demonstrate an understanding of parameter passing inJava

CO3 Analyze and create effective flow control statements in Java

CO4 Evaluate the usage of arrays, var-args, and enums in Java, based on programrequirements 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-definedexceptions.

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”, UpdatedEdition, Pearson Education, 2000.

WEB REFERENCES

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

CO4 Evaluate the usage of arrays, var-args, and enums in Java, based on programrequirements 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-definedexceptions.

TEXT BOOKS:

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

REFERENCE BOOKS:

3. Paul Deitel, Harvey Deitel, “Java SE 8 for programmers”, 3rd Edition, Pearson, 2015.
4. Timothy Budd, “Understanding Object-oriented programming with Java”, UpdatedEdition, Pearson Education, 2000.

WEB REFERENCES

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

23HS1401	SKILLS FOR CAREER BUILDING AND DEVELOPMENT II	L	T	P	C
		0	0	2	0

COURSE OBJECTIVE

- To equip students to develop profiles and understand the nuances of resume creation.
- To employ group discussion activities to exhibit expertise and abilities.
- To Gain insight into effective interview techniques and acquire hands-on experience through mock interviews.
- To improve presentation skills while exploring potential career opportunities.
- To foster networking skills and build professional connections to enhance career prospects and industry engagement.

Unit I

Professional Ethics- Etiquette- E-Mail Writing

Unit II

Personal Branding- Resume Building and Cover Letter - SOP

Unit III

Purpose and Role of GD in recruitment- GD preparation - Types of GD topics- Mock GDs

Unit IV

Introduction to personal interview- Types of Interviews- PI preparation- Mock Interviews

Unit V

Crafting STAR (Situation, Task, Action, Result) responses- Video Profile

TOTAL : 30 PERIODS

COURSE OUTCOME:

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

CO1 Develop a distinctive personal brand and craft a compelling, impactful resume.

CO2 Engage actively in group discussions to maximize their value and outcomes.

CO3 Tackle personal and technical interviews with confidence and clear preparation.

CO4 Articulate ideas and perspectives in a structured, coherent manner.

CO5 Gain insight into industry expectations and explore potential career pathways.

TEXT BOOKS

1. Carnegie, Dale. How to Win Friends and Influence People.Revised ed., Simon & Schuster, 2010. 2. Bolles, Richard N. What Color Is Your Parachute? 2021: A Practical Manual for Job-Hunters and Career-Changers. Ten Speed Press, 2021.

REFERENCE BOOKS

1. Adler, L. (2013). The Essential Guide for Hiring & Getting Hired.Workbench Media.
2. Yate, M. (2020). Knock 'em Dead Job Interview: How to Turn Job Interviews into Job Offers (10th ed.). Adams Media.

WEBREFERENCES

1. https://www.mindtools.com/pages/article/professionalism.html
2. https://www.themuse.com/advice/interviewing

ONLINE COURSES/RESOURCES

1. https://www.linkedin.com/learning/developing-your-professional-presence-and-influence
2. https://www.coursera.org/learn/career-networking-interviewing

23HS1402	QUANTITATIVE APTITUDE PRACTICE IV	L	T	P	C
		0	0	1	0

COURSE OBJECTIVE:

- Students can improve their problem-solving abilities by applying permutation and combination, probability, alligation, and mixture.
- To improve students ability to use strategies for addressing day sequence and data sufficiency problems.

Module 1 Permutation and Combination, Probability **3**

Permutation – combination – probability – Partnership.

Module 2 Alligation, Mixture and Analogy 3

Alligation and mixture – stocks and shares – analogy – symbols and notations.

Module 3 Time and work (advanced) **3**

Relative speed - work equivalence - division of wages – multiple pipe problems.

Module 4 Day sequence and Data sufficiency **3**

Day sequence - decision making - statement and assumptions - data sufficiency.

COURSE OUTCOME

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

CO1 Understand the basic concepts of permutation and combination, probability, alligation and mixture.

CO2 Assist in understanding and exhibiting strong understanding for the advanced problems in relative speed and data sufficiency tasks.

TEXT BOOKS

1. Aggarwal R.S.(2017). Quantitative Aptitude for Competitive Examinations 3rd edition New Delhi: S. Chand Publishing.
2. Abhijit guha(2016). Quantitative Aptitude for All Competitive Examinations, 6th edition. Noida: McGraw Hill Education Pvt.Ltd.
3. FACE.(2016).Aptipedia Aptitude Encyclopedia1(Ed.).New Delhi: Wiley Publications.

REFERENCE BOOK

1. Sharma arun.(2016).Quantitative aptitude,7th(Ed.).Noida : McGraw Hill Education Pvt. Ltd.
2. Praveen. R.V 3rd edition, Quantitative aptitude and reasoning, PHI learning publication.

WEB REFERENCES:

1. https:// www.indiabix.com

Mode of Evaluation: Online Test

SEMESTER V

23CB1501	DESIGN AND ANALYSIS OF COMPUTER ALGORITHMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE

- Acquire knowledge and comprehension of algorithm analysis techniques and complexity notations.
- Become familiar with the different algorithm design techniques for effective problem solving in computing.
- Study the application of design techniques to solve a wide range of problems efficiently. Understand the limitation of algorithm power
- Address diverse problems through various design methods.

UNIT I ANALYSIS OF ALGORITHMS 9

Introduction: Characteristics of Algorithm. Analysis of Algorithm: Performance Measurements of Algorithm, Time and Space Trade-Offs, Asymptotic analysis of Complexity Bounds – Best, Average and Worst-Case behaviour; Analysis of Recursive Algorithms through Recurrence Relations: Substitution Method, Recursion Tree Method and Masters' Theorem.

UNIT II BRUTE FORCE AND DIVIDE-AND-CONQUER 9

Brute Force - String Matching-KMP algorithm - Closest-Pair and Convex-Hull Problems - Exhaustive Search - Travelling Salesman Problem - Knapsack Problem – Assignment problem. Divide and Conquer Methodology - Binary Search - Merge sort - Quick sort – Randomized Quick Sort - Multiplication of Large Integers, Strassen's Matrix Multiplication.

UNIT III DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE 9

Dynamic programming - Principle of optimality - Computing a Binomial Coefficient – Floyd's algorithm - Multi stage graph - Optimal Binary Search Trees - Knapsack Problem. Greedy Technique - Container loading problem - Prim's algorithm and Kruskal's Algorithm - 0/1Knapsack problem - Huffman Trees.

UNIT IV GRAPH AND TREE ALGORITHMS 9

Branch and Bound and Backtracking methodologies; Illustrations of these techniques for Problem-Solving , n-Queens Problem , Graph Coloring , Knapsack, Travelling Salesman Problem.

UNIT V TRACTABLE, INTRACTABLE PROBLEMS AND ADVANCED TOPICS 9

Tractable and Intractable Problems: Computability of Algorithms, Computability classes – P, NP, NP-complete and NPhard. Cook's theorem, Standard NP-complete problems and Reduction techniques. Advanced Topics: Approximation algorithms, Randomized algorithms, Class of problems beyond NP – P SPACE, Introduction to Quantum Algorithms.

TOTAL:45 PERIODS

TEXT BOOKS

1. AnanyLevitin, —Introduction to the Design and Analysis of Algorithms‖, Third Edition,Pearson Education, 2012.
2. S.Sridhar, Design And Analysis Of Algorithms, First Edition, Oxford Edition, 2014.
3. E. Horowitz and S. Sahni., “Fundamental of Computer Algorithms”, Second Edition, Computer Science Press, 2008.

REFERENCE BOOKS

1. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein,—Introduction to Algorithms, Third Edition, PHI Learning Private Limited, 2012
2. S. Baase, “Computer Algorithms: Introduction to Design and Analysis”, Third Edition, Pearson, 2000.
3. Quantum Computation and Quantum Information, Michael A. Nielsen and Isaac L. Chuang, Cambridge University press, 2000.

COURSE OUTCOME(S):

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

CO1 Analyse the time and space complexity of various algorithms and compare algorithms with respect to complexities.

CO2 Ability to decide and Apply Brute Force and Divide and Conquer design strategies to Synthesize algorithms for appropriate computing problems.

CO3 Apply Greedy and Dynamic Programming techniques to Synthesize algorithms for appropriate computing problems.

CO4 Ability to decide and Apply Backtracking and Branch and Bound techniques to Synthesize algorithms for appropriate computing problems

CO5 Ability to identify an algorithm is tractable or intractable problem.

CO6 Evaluate their theoretical knowledge in practice.

CO- PO, PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3											3	2	2
CO2	2	3	3	2								3	3	1
CO3	2	3	3	2								3	3	1
CO4	2	3	3	2								3	3	1
CO5	1	2	2	1								3	3	1
CO6	2	3	3	3	2							3	3	1

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

23CB1502	COMPUTER NETWORKS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To provide a comprehensive understanding of computer networks, distributed systems, and the classification of computer networks.
- To understand flow control and error control protocols such as Stop-and-Wait, Go-Back-N ARQ, and Selective Repeat ARQ.
- To comprehend process-to-process communication through UDP, TCP, and SCTP.
- To explore the use of firewalls, electronic mail security, directory services, and network management practices.

UNIT I INTRODUCTION 9

Introduction: Computer networks and distributed systems - Classifications of computer networks - Preliminaries of layered network structures.

Data communication Components: Representation of data and its flow - Various Connection Topology - Protocols and Standards - OSI model - Transmission Media.

LAN: Wired LAN - Wireless LAN - Virtual LAN.

Techniques for Bandwidth utilization: Multiplexing - Frequency division - Time division and Wave division – Concepts on spread spectrum.

UNIT II DATA LINK LAYER AND NETWORK LAYER 9

Data Link Layer and Medium Access Sub Layer: Fundamentals of Error Detection and Error Correction - Block coding, Hamming Distance - CRC; Flow Control and Error control protocols - Stop and Wait - Go-back–N ARQ- Selective Repeat ARQ - Sliding Window - Piggybacking - Random Access - Multiple access protocols - Pure ALOHA - Slotted ALOHA - CSMA/CD - CDMA/CA

Network Layer: Switching - Logical addressing – IPV4 - IPV6; Address mapping – ARP – RARP - BOOTP and DHCP– Delivery - Forwarding and Unicast Routing protocols.

UNIT III TRANSPORT LAYER 9

Transport Layer: Process to Process Communication - User Datagram Protocol (UDP) - Transmission Control Protocol (TCP) - SCTP Congestion Control - Quality of Service (QoS) - QoS improving techniques - Leaky Bucket and Token Bucket algorithms.

UNIT IV APPLICATION LAYER 9

Application Layer: DNS – DDNS - TELNET – EMAIL – FTP – WWW – HTTP – SNMP – Bluetooth – Firewalls.

UNIT V NETWORK SECURITY 9

Network Security: Electronic mail - directory services and network management -Basic concepts of Cryptography.

TOTAL: 45 PERIODS

COURSE OUTCOME(S):

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

- Demonstrate a clear understanding of the fundamental concepts of computer networks and distributed systems.
- Analyze medium access control protocols and demonstrate knowledge of random access and multiple access protocols.
- Understand network layer concepts, including logical addressing, address mapping, and routing protocols.
- Demonstrate an understanding of transport layer protocols such as UDP, TCP, and SCTP, along with congestion control mechanisms.
- Apply knowledge of application layer protocols to solve real-world networking problems, including DNS, FTP, HTTP, and firewalls.
- Demonstrate an understanding of network security principles, including cryptography, firewalls, and secure communication protocols.

TEXT BOOKS

1. Andrew S. Tanenbaum, Computer Networks, Fifth Edition, Pearson Education, 2011
2. William Stallings, Data and Computer Communications, Tenth Edition, Pearson Education, 2013

REFERENCE BOOKS

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

CO- PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	1	2	-	2	1	2	-	1	3	2	3	3	3
CO2	2	2	2	3	2	1	1	1	-	2	1	3	2	2
CO3	2	1	2	2	2	1	2	1	-	1	1	3	2	2
CO4	3	1	2	3	3	1	1	-	1	1	2	3	3	3
CO5	2	2	2	3	3	2	2	-	1	2	1	3	3	3
CO6	2	2	2	2	2	3	1	-	1	1	2	3	2	2

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

23CB1503	FUNDAMENTALS OF MANAGEMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- The course will cover the management theories, evolution of management over the years and few basic concepts without going into the details.
- To expose the students to know the functions of management, the organizational design, leadership and ethics in management.

UNIT I MANAGEMENT THEORIES 9

Concept and Foundations of Management, Evolution of Management Thoughts [Pre-Scientific Management Era (before 1880), Classical management Era (1880- 1930), Neo-classical Management Era (1930-1950), Modern Management era (1950-onward). Contribution of Management Thinkers: Taylor, Fayol, Elton Mayo etc.

UNIT II FUNCTIONS OF MANAGEMENT & LEADERSHIP 9

Planning, Organizing, Staffing, Directing, Controlling, Leadership - Concept, Nature, Importance, Attributes of a leader, developing leaders across the organization, Leadership Grid.

UNIT III ORGANIZATION BEHAVIOR 9

Introduction, Personality, Perception, Learning and Reinforcement, Motivation, Group Dynamics, Power & Influence, Work Stress and Stress Management, Decision Making, Problems in Decision Making, Decision Making, Organizational Culture, Managing Cultural Diversity.

UNIT IV ORGANIZATIONAL DESIGN 9

Classical, Neoclassical and Contingency approaches to organizational design; Organizational theory and design, Organizational structure (Simple Structure, Functional Structure, Divisional Structure, Matrix Structure).

UNIT V MANAGERIAL ETHICS 9

Ethics and Business, Ethics of Marketing & advertising, Ethics of Finance & Accounting, Decision – making frameworks, Business and Social Responsibility, International Standards, Corporate Governance, Corporate Citizenship, Corporate Social Responsibility

TOTAL: 45 PERIODS

COURSE OUTCOME(S):

Upon successful completion of the course, the students will be able to:
CO1: Understand the theories, concept, and evolution of management.
CO2: Demonstrate the ability to employ ‘the management way of thinking’.
CO3: Understand how organizations work and find it easier to grasp the intricacies of other management areas such as finance, marketing, strategy etc.
CO4: Understand the qualities of a leader in the managerial aspect in future terms.
CO5: Understand the managerial ethics and CSR and its importance.

TEXT BOOKS

1. Richard L. Daft, Understanding the Theory and Design of Organization, Cengage Learning India Private Limited, Eleventh Edition, 2020.

REFERENCE BOOKS

1. Stephen P. Robbins, Timothy A. Judge, Neharika Vohra, Organizational Behaviour, Eighteenth Edition, Pearson India, 2019.

CO- PO AND PSO MAPPING

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

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

23CB1504	JAVA PROGRAMMING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To introduce the fundamental concepts of Java programming, including syntax, data types, control structures, and object-oriented programming principles.
- To enable students to design and implement object-oriented programs using Java features like classes, objects, inheritance, polymorphism, and abstraction.
- To familiarize students with exception handling techniques and multithreading for efficient program execution and concurrency.
- To provide knowledge of advanced Java concepts, including file handling, Java I/O streams, collections framework, and database connectivity using JDBC.
- To develop skills in creating GUI-based applications using Java Swing, AWT, and networking concepts like sockets and HTTP communication.
- To explore advanced Java features such as lambda expressions, the Streams API, and introduce frameworks like Spring, Hibernate, and JavaFX for modern application development.

UNIT I INTRODUCTION TO JAVA PROGRAMMING **9**

Basics of Java-Features of Java-JDK, JRE, and JVM-Structure of a Java program-Data Types, Variables, and Constants-Operators and Expressions-Control Statements (if, switch, loops),Introduction to Classes and Objects-Class Declaration and Object Instantiation-Methods and Method Overloading-Constructors and Constructor Overloading.

UNIT II OBJECT-ORIENTED PROGRAMMING IN JAVA **9**

Core OOP Principles-Encapsulation, Inheritance, Polymorphism, and Abstraction-Inheritance and Its Types-Single, Multilevel, Hierarchical, and Hybrid-Method Overriding-Use of super and final keywords,Polymorphism-Compile-time and Runtime Polymorphism-Abstract Classes and Interfaces-Abstract Methods and Classes-Interface Implementation and Multiple Inheritance.

UNIT III EXCEPTION HANDLING AND MULTITHREADING **9**

Exception Handling-Types of Exceptions-Try, Catch, Finally, Throw, Throws-Custom Exceptions-Multi-threading-Thread Life Cycle-Creating Threads (Extending Thread and Implementing Runnable)-Synchronization and Inter-thread Communication-Thread Priority.

UNIT IV ADVANCED JAVA CONCEPTS **9**

Java I/O Streams-Byte and Character Streams-File Handling-Serialization and Deserialization-Collections Framework-List, Set, Map, Queue, and Their Implementations-Iterators and Generics-Java Database Connectivity (JDBC)-Connecting to Databases-Executing SQL Queries-Prepared Statements and Result Sets.

UNIT V JAVA ADVANCED FEATURES **9**

Java Swing and AWT-GUI Basics, Event Handling, Layout Managers-Creating Simple Applications-Java Networking-Basics of Networking in Java-Sockets and Server-Socket Programming-URL and HTTP Communication-Java 8+ Features-Lambda Expressions and Functional Interfaces-Streams API-Default and Static Methods in Interfaces,Introduction to Frameworks (Optional)-Overview of Spring, Hibernate, and JavaFX.

TOTAL:45 PERIODS

COURSE OUTCOME(S):

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

CO1: Demonstrate an understanding of Java programming basics, including its features, syntax, and structure, and implement programs using control structures and operators.

CO2 : Object-oriented programming concepts like encapsulation, inheritance, polymorphism, and abstraction to solve real-world problems in Java.

CO3 : Handle runtime errors effectively using exception handling mechanisms and develop concurrent applications using multithreading concepts.

CO4: Implement advanced Java features such as file handling, serialization, deserialization, and collections to manage and process data efficiently.

CO5: Create interactive GUI-based applications and implement networking solutions using Java Swing, AWT, sockets, and HTTP communication.

CO6: Utilize Java 8+ features like lambda expressions, the Streams API, and explore the basics of modern frameworks to develop scalable and robust applications

TEXT BOOKS

1. Herbert Schildt**-**Java: The Complete Reference (11th Edition) McGraw-Hill Education. ISBN-10. 1260440230 · ISBN-13. 978-1260440232 · Edition. 11th · Publisher. McGraw-Hill Education · Publication date. 19 March 2019
2. E. Balagurusamy**-**Programming with Java: A Primer (6th Edition) McGraw-Hill Education. Publisher, McGraw Hill Education, 2019 ; ISBN, 9353162335, 9789353162337 ; Length, 600 pages
3. Kathy Sierra & Bert Bates**-**Head First Java (2nd Edition) O'Reilly Media. 2nd Edition. Head First Java, 2nd Edition, ISBN: 0596009208

REFERENCE BOOKS

1.Joshua Bloch**-***Effective Java* (3rd Edition) Addison-Wesley, ISBN-13. 978-0134685991 ; Edition. 3rd ; Publisher. Addison-Wesley Professional ; Publication date. 18 December 2017.

2. Paul Deitel and Harvey Deitel. Java: How to Program Early Objects 10th Edition. Pearson, 2014, ISBN-0133807800 ISBN-13: 9780133807806

CO- PO AND PSO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	2	2	1	-	-	2	2	-	-	-	2	1	1	1
CO2	2	2	2	-	-	2	2	-	-	-	2	1	1	1
CO3	2	3	1	-	-	1	2	-	-	-	2	-	-	-
CO4	3	2	-	-	-	2	2	-	-	-	1	-	-	-
CO5	2	1	-	-	-	2	2	-	-	-	2	1	1	1
CO6	2	1	2	-	-	2	2	-	-	-	2	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	100
40%				60 %

23CB1511	JAVA PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVE:

- To learn about OOPS concepts
- To study about basic concepts in Java
- Have hands on experience on Exception and multithreading concepts
- Have a good understanding of database concepts.
- Familiarize advanced Java Concepts

LIST OF EXPERIMENTS

1. Fibonacci series using recursive and non recursive functions
2. Abstract class and methods.
3. Interface and Exception handling
4. Program using Multithreaded Concepts
5. Database connectivity using ODBC and JDBC.
6. Javalist Interface
7. Queue using linked list
8. Develop a Java application to generate Electricity bill. Create a class with the following members: Consumer no., consumer name, previous month reading, current month reading, type of EB connection (i.e domestic or commercial).Database Connectivity with Front End Tools (Java/Python).
9. 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.
10. Mini Project (Application Development using DB)

TOTAL: 60 PERIODS

COURSE OUTCOME(S):

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

CO1 Understand the Syntax of SQL commands.
CO2 Remember queries to retrieve records.
CO3 Apply referential integrity constraints.
CO4 Analyze the database design using constraints.
CO5 Evaluate PL/SQL programs to implement triggers, functions, procedures and exceptions
CO6 Create front end tools to manipulate information from backend.

WEB REFERENCES:

1. http://nptel.ac.in/video.php?subjectId=106106093

CO- PO AND PSO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	2	1	-	-	-	-	-	-	-	-	-
CO2	3	2	3	2	3	-	-	-	-	-	-	-	-	-
CO3	3	3	3	1	3	-	-	-	-	-	-	-	-	-
CO4	3	3	3	1	3	-	-	-	-	-	-	-	-	-
CO5	3	3	3	1	3	-	-	-	-	-	-	-	-	-
CO6	3	3	3	1	3	-	-	-	-	-	-	-	-	-

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

23ES1511	TECHNICAL SKILL PRACTICES IV	L	T	P	C
		0	0	2	0

COURSE OBJECTIVE:

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

LIST OF TOPICS

1. Data Types, Variables, Operators
2. Create, Append, and Remove list
3. Conditional Statements, Switch Statements
4. Working with dictionaries
5. Arrays indexing such as slicing, integer array indexing
6. Demonstrate various ways of accessing the string.
7. Lambda functions in Python
8. Print date, time using date and time functions
9. Searching and Sorting techniques
10. File Handling & Exception Handling
11. Find word and lines in command line argument
12. Compute summary statistics such as mean, median, mode, standard deviation and variance
13. To create a package (Engg), subpackage(years),modules (sem) and create staff and student function.
14. Sort list of elements using bubble sort
15. Sort list of elements using insertion sort
16. Program using Class and Object
17. Regression analysis with pie, bar and line chart
18. Naïve Bayesian classifier
19. K-Means clustering algorithm
20. Decision tree-based ID3 algorithm

TOTAL: 30 PERIODS

COURSE OUTCOME(S):

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

CO1 Propose solutions for a given problem.

CO2 Infer the fundamental programming elements in Python language and learn to apply basic control structures in Python

CO3 Demonstrate the applications of tuple, array and dictionaries

CO4 Visualize the various dataset in python.

CO5 Understand the basic principles of clustering and Naïve Bayesian classifier

CO6 Apply various input, output and error handling functions in python.

TEXT BOOKS:

1. Reema Thareja, ``Problem Solving and Programming with Python'', 2nd edition, OXFORD University Press, New Delhi, 2019

2. Bill Lubanovic, —Introducing Python-Modern Computing in Simple Packagell, 2 nd edition, O'REILLY, 2019

REFERENCE BOOKS:

1. Steven F. Lott, —Modern Python Cookbook'', 2nd Edition, O'REILLY, 2020.
2. Ryan Marvin, Mark Ng'ang'a, Amos Omondi, —Python Fundamentals, Packt Publishing., 2018.

SEMESTER VI

23CB1601	CLOUD COMPUTING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To impart knowledge on the equip students with the knowledge of cloud technologies, architectures, and service models.
- Students will learn to deploy, manage, and optimize cloud-based solutions while understanding key concepts like security, cost management, and scalability.

UNIT I INTRODUCTION TO CLOUD COMPUTING 9

Evolution and History of Cloud Computing, Introduction to Cloud Computing, Why Cloud Computing is Becoming Highly Important, Features of Cloud Computing, Cloud Computing for various users, Advantages of Cloud Computing, Limitations of Cloud Computing.

UNIT II CLOUD MODELS AND TYPES 9

The NIST Model, Cloud Cube Model, Deployment Models, Service Models. Layers and Types of Cloud, Components of Cloud Computing, Cloud Computing Service Providers.

Software as a Service (SaaS): Software as a Service , Evolution of SaaS ,Brief Introductory part of Software as a Service , SaaS Unification Technologies , SaaS Integration Products and Technologies, SaaS Product Selection Criteria, SaaS Integration Services, Advantages of SaaS

UNIT III PLATFORM AS A SERVICE (PAAS) 9

Introduction to PaaS, Evolution of PaaS, PaaS Service Providers- Acquia Cloud, Amazon AWS, Amazon Elastic Beanstalk, Google App Engine, Force.com, PaaS Application Framework, PaaS Operator Verbs, PaaS Developer Verbs, Advantages and Challenges of PaaS.

UNIT IV INFRASTRUCTURE AS A SERVICE (IAAS) 9

Evolution, IaaS Architecture- Advantages and Disadvantages of Infrastructure as a Service, SAN model, IaaS Providers, IaaS Architecture, Advantages and Disadvantages of Infrastructure as a Service

Data in Cloud : Evolution of Network Storage in Cloud, Data as a Service, Database as a Service, Cloud Based Data Storage, Advantages and Limitations of Cloud Based Storage Solution, Cloud Based Data Storage Service Providers

UNIT V VIRTUALIZATION 9

Introduction to Virtualization and its Technical Evolution, History of Virtualization, Types of Virtual Machines, Advantages of Virtualization, Components of Virtualization, Types of Virtualization

TOTAL : 45 PERIODS

COURSE OUTCOME(S):

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

CO1: Ability to identify core concepts of the cloud computing paradigm

CO2 : Students identify the architecture and infrastructure of cloud computing.

CO3 : Students Identify resource management fundamentals.

CO4: Students Analyze various cloud programming models and apply them to solve problems

on the cloud.

CO5: Students will integrate the core issues of cloud computing such as security, privacy, and interoperability

TEXT BOOKS

1. Handbook of Cloud Computing by Dr.Anand Nayyar (Editor), First Edition 2019, BPB Publication, India.
2. Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill , New Delhi – 2010.
3. Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate online - Michael Miller - Que 2008.

REFERENCE BOOKS

1. Cloud Computing, Theory and Practice, Dan C Marinescu, MK Elsevier.
2. Cloud Computing, A Hands on approach, ArshadeepBahga, Vijay Madisetti, University Press
3. Mastering Cloud Computing, Foundations and Application Programming, Raj Kumar Buyya, Christenvecctiola, S Tammaraiselvi, TMH.
4. Cloud Computing: Concepts, Technology & Architecture, Thomas Erl, Zaigham Mahmood, and Ricardo Puttini, Pearson.
5. Cloud Native Infrastructure: Patterns for Scalable Infrastructure and Applications in a Dynamic Environment, Justin Garrison and Kris Nova, O'Reilly Media.

CO- PO AND PSO MAPPING

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

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

23CB1602	HUMAN RESOURCE MANAGEMENT	L	T	P	C
		2	0	0	2

COURSE OBJECTIVE:

- To provide a comprehensive understanding of the evolution, concepts, challenges, and emerging trends in Human Resource Management (HRM).
- To explore the design and structure of HR systems, including HR professions, departments, and responsibilities in HRM.
- To examine key functional areas of HRM, such as recruitment, compensation, employee relations, training, and payroll management.
- To understand the processes of human resource planning, including forecasting, retention strategies, training, and career management.
- To analyze strategic management of human resources and its role in achieving competitive advantage, particularly in the service sector.

UNIT I INTRODUCTION TO HUMAN RESOURCE MANAGEMENT 6

Evolution of human resource management, HRM Concept and Challenges, HR Philosophy, Policies, Procedures and Practices,, Emerging trends in Human resource Management, Human resources accounting and audit.

UNIT II HUMAN RESOURCE SYSTEM DESIGN 6

HR Profession, and HR Department,Line Management Responsibility in HRM, Measuring HR**,** Human Resource Planning, Internal and External Sources for Recruitment, Human Resource Information Systems (HRIS

UNIT III FUNCTIONAL AREAS OF HRM 6

Recruitment and staffing, benefits, Compensation, employee relations, HR compliance, organizational design, training and development, human resource information systems (H.R.I.S.) and payroll.

UNIT IV HUMAN RESOURCE PLANNING 6

Demand Forecasting, Action Plans– Retention, Training and its types, Redeployment & Staffing, Succession Planning, Motivation Theories,Performance Evaluation and Feedback, Career Management and Mentoring

UNIT V STRATEGIC MANAGEMENT OF HUMAN RESOURCE 6

Strategic Human Resource Management (SHRM), relationship between HR strategy and overall corporate strategy, HR as a Factor of Competitive Advantage, Managing Diversity in the Workplace**.**

Case study

Human Resource Management in Service Sector- Special considerations for Service Sector including

- Managing the Customer – Employee Interaction
- Employee Empowerment and Customer Satisfaction
- Service Failure and Customer Recovery – the Role of Communication and Training
- Similarities and Differences in Nature of Work for the Frontline Workers and the Backend
- Support Services - Impact on HR Practices Stressing Mainly on Performance
- Flexible Working Practices – Implications for HR

TOTAL:30 PERIODS

TEXT BOOKS

1. Human Resource Management, 8th Edition, K. Aswathappa, Tata McGraw Hill, 2017.
2. Dessler Human Resource Management, Pearson Education Limited, 15th Edition, 2020.
3. Human Resource Management: A Contemporary Approach" by Ian Beardwell, Len Holden, and Tim Claydon
4. Fundamentals of Human Resource Management" by Robert L. Mathis and John H. Jackson, Cengage Learning, 15th Edition (2019)

REFERENCE BOOKS

1. Decenzo and Robbins, Fundamentals of Human Resource Management, Wiley, 11th Edition, 2013
2. Luis R.Gomez-Mejia, David B.Balkin, Robert L Cardy. Managing Human Resource. PHI Learning. 2012
3. Bernadin , Human Resource Management ,Tata Mcgraw Hill ,8th edition 2012.

COURSE OUTCOME

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

CO1 Understand the evolution and core concepts of Human Resource Management (HRM), along with its emerging trends and challenges.

CO2 Develop skills to design and implement HR systems, including planning, recruitment, and Human Resource Information Systems (HRIS).

CO3 Gain knowledge of functional HR areas such as staffing, compensation, training, and employee relations.

CO4 Learn techniques for effective HR planning, performance evaluation, succession planning, and career management.

CO5 Evaluate strategic HR management's impact on organizational performance and competitive advantage

CO6 Analyze HR practices in the service sector, focusing on employee empowerment and flexible working

CO-PO AND PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	1	0	0	0	0	0	0	0	0	0	2	1	0
CO2	2	2	1	0	2	0	0	0	1	0	0	2	1	0
CO3	0	2	2	0	1	0	0	0	2	1	0	2	2	0
CO4	2	0	1	2	0	0	0	0	2	1	1	0	2	0
CO5	0	0	2	0	1	2	2	0	0	2	0	2	1	0
CO6	0	0	1	0	2	1	0	0	2	2	1	1	2	0

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

23CS1501	FULL STACK DEVELOPMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE :

- To understand the basics of JavaScript and importance of MERN stack.
- To understand the role of React in designing front-end components.
- To understand the design issues in the development of backend components using Node.js and Express.
- To understand the advanced features of full stack development.
- To understand the significance of using Mongo DB as a database system.

UNIT- I OPEN SOURCE JAVASCRIPT AND BASICS OF MERN STACK 9

JavaScript Fundamentals - Objects - Generators, advanced iteration - Modules DOM tree - Node properties - browser events - Event delegation - UI Events -Forms, controls - Document and resource loading - Mutation observer - Event loop: micro tasks and macro tasks - MERN Components - React - Node.js - Express - MongoDB - Need for MERN - Server-Less Hello World - Server Setup - nvm - Node.js – npm.

UNIT- II REACT 9

React Introduction - React ES6 - React Render HTML - React JSX - Components -React Classes - Composing Components - Passing Data - Dynamic Composition - React state - setting State - Async State Initialization - Event Handling Communicating from Child to Parent - Stateless Components - Designing components- React Forms - React CSS - React SaaS.

UNIT- III NODE.JS AND EXPRESS 9

Node.js basics - Local and Export Modules - Node Package Manager - Node.js web server - Node.js File system - Node Inspector - Node.js Event Emitter - Frameworks for Node.js - Express.js Web App - Serving Static Resource - Node.js Data Access - Express REST APIs - REST - Resource Based - HTTP Methods as Actions - JSON- Express - Routing - Handler Function - Middleware - The List API - Automatic Server Restart - Testing - The Create API - Using the List API - Using the Create API- Error Handling - Template Engine.

UNIT- IV ADVANCED FEATURES AND MONGO DB 9

Modularization and Web pack - Routing with React Router - Forms - More Filters in the List API - UI Components - Update API - Delete API - React-Bootstrap - Bootstrap Installation - Navigation - Table and Panel - Forms - Alerts - Modals -Server Rendering - Basic Server Rendering - Handling State – Mongo DB Aggregate - Replication - Sharding - Creating backup – Deployment - Pagination - Higher Order Components - Search Bar - Google Sign In - Session Handling.

UNIT- V CASE STUDY

9

Developing a Blogging Platform - Building a Social Media Platform Using React, Real- Time Chat Application, Real-Time Collaborative Document Editing Application.

TOTAL : 45 PERIODS

COURSE OUTCOME(S):

CO1 Outline the Web Applications using Java stack technologies Software Development.

CO2 Understand Enterprise Applications using Java stack technologies.

CO3 Present Front end development using React.

CO4 Illustrate the Back end development Node.js and Express

CO5 Experiment fully working applications that can be used on cross- platforms.

CO6 Create a flexible, scalable, and high-performance database solutions using Mongo DB.

TEXT BOOKS :

1. Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node, Vasan Subramanian, A Press Publisher, 2019.

REFERENCE BOOKS :

1. Full Stack React Native: Create beautiful mobile apps with JavaScript and React Native, Anthony Accomazzo, Houssein Djirdeh, Sophia Shoemaker, Devin Abbott, FullStack publishing.
2. Mastering Full Stack React Web Development Paperback – April 28, 2017 by TomaszDyl, Kamil Przeorski , Maciej Czarnecki.

WEB REFERENCES :

1. https://www.geeksforgeeks.org/courses/full-stack-node.
2. https://www.simplilearn.com/full-stack-developer-course-mern-certification-training.
3. https://www.scaler.com/courses/full-stack-developer/.

ONLINE COURSES/RESOURCES :

1. https://www.udemy.com/course/ultimate-web/.
2. https://www.coursera.org/professional-certificates/ibm-full-stack-cloud-developer.

CO- PO AND PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	1					2	2	3	
CO2	3	3	3	3	3	1					2	2	3	
CO3	3	3	3	3	3	1					3	2	3	
CO4	3	3	3	3	3	1					2	2	3	
CO5	3	3	3	3	3	1	1				2	2	3	
CO6	3	3	3	3	3	1	1	3	2	3	2	2	3	

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

23CS1602	COMPILER DESIGN	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE :

- To learn the various phases of compiler.
- To learn the various parsing techniques.
- To understand intermediate code generation and run-time environment.
- To learn to implement front-end of the compiler.
- To learn to implement code generator.

UNIT- I INTRODUCTION TO COMPILERS & LEXICAL ANALYSIS 8

Introduction- Translators- Compilation and Interpretation- Language processors -The Phases of Compiler – Lexical Analysis – Role of Lexical Analyzer – Specification of Tokens – Recognition of Tokens – Finite Automata – Regular Expressions to Automata– Minimizing DFA - Language for Specifying Lexical Analyzers – Lex tool

UNIT- II SYNTAX ANALYSIS 11

Role of Parser – Grammars – Context-free grammars – Writing a grammar Top Down Parsing - General Strategies - Recursive Descent Parser Predictive Parser-LL(1) - Parser-Shift Reduce Parser-LR Parser- LR (0)Item Construction of SLR Parsing Table - Introduction to LALR Parser - Error Handling and Recovery in Syntax Analyzer-YACC tool - Design of a syntax Analyzer for a Sample Language.

UNIT- III SYNTAX DIRECTED TRANSLATION & INTERMEDIATE CODE GENERATION 9

Syntax directed Definitions-Construction of Syntax Tree-Bottom-up Evaluation of S-Attribute Definitions- Design of predictive translator - Type Systems-Specification of a simple type Checker-Equivalence of Type Expressions-Type Conversions. Intermediate Languages: Syntax Tree, Three Address Code, Types and Declarations, Translation of Expressions, Type Checking, Back patching.

UNIT- IV RUN-TIME ENVIRONMENT AND CODE GENERATION 9

Runtime Environments – Source language issues – Storage organization – Storage Allocation Strategies: Static, Stack and Heap allocation - Parameter Passing-Symbol Tables -Dynamic Storage Allocation - Issues in the Design of a code generator – Basic Blocks and Flow graphs - Design of a simple Code Generator - Optimal Code Generation for Expressions.

UNIT- V CODE OPTIMIZATION 8

Principal Sources of Optimization – Peep-hole optimization - DAG- Optimization of Basic Blocks - Global Data Flow Analysis - Efficient Data Flow Algorithm . Recent trends in Compiler Design

TOTAL : 45 PERIODS

COURSE OUTCOME(S):

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

CO1	Understand the techniques in different phases of a compiler.
CO2	Design a lexical analyser for a sample language and learn to use the LEX tool.
CO3	Apply different parsing algorithms to develop a parser and learn to use YACC tool.

CO4	Understand semantics rules (SDT), intermediate code generation and run-time environment.
CO5	Implement code generation.
CO6	Apply the various optimization techniques.

TEXT BOOKS :

1. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, “Compilers: Principles, Techniques and Tools”, Second Edition, Pearson Education Limited, 2014.

REFERENCE BOOKS :

1. Des Watson,”A Practical Approach to Compiler Construction”- 2017.
2. Allen I. Holub, “Compiler Design in C”, Prentice-Hall Software Series, 2014.
3. Randy Allen, Ken Kennedy, and Optimizing Compilers for Modern Architectures: A Dependence based Approach, Morgan Kaufmann Publishers, 2002.
4. Steven S. Muchnick, Advanced Compiler Design and Implementation, Morgan Kaufmann Publishers - Elsevier Science, India, Indian Reprint 2003.
5. Keith D Cooper and Linda Torczon, Engineering a Compiler, Morgan Kaufmann, Publishers Elsevier Science, 2004.
6. V. Raghavan, Principles of Compiler Design, Tata McGraw Hill Education Publishers, 2010.

WEB REFERENCES :

1. https://www.geeksforgeeks.org/introduction-of-compiler-design/
2. https://www.javatpoint.com/compiler-tutorial
3. https://www.tutorialspoint.com/compiler_design/index.html

ONLINE COURSES / RESOURCES :

1. https://onlinecourses.nptel.ac.in/noc23_cs57/preview
2. https://www.udemy.com/topic/compiler-design/

CO- PO AND PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	3	3				3	3	1	3	3	1	3
CO2	3	3	3	3				2	2	3	3	2	2	3
CO3	3	2	2		3			3	1	1	2	3	1	3
CO4	2	3	2	3	3			2	3	3	1	2	1	2
CO5	3	2	3	2	1			2	1	2	1	2	2	3
CO6	2	3	3	3	1			2	1	1	3	2	1	2

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

23IT1703	SOFTWARE TESTING AND QUALITY ASSURANCE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- Describe the fundamental concepts and lifecycle of software testing and quality assurance
- Explain unit testing, black-box testing, and performance testing techniques with tools
- Apply testing frameworks such as JUnit, PyTest, Selenium, and JMeter in real scenarios
- Evaluate software quality using metrics, process models, and risk assessment strategies
- Explore automation, AI-based testing tools, and RPA for software quality improvement
- Integrate security, quality standards, and compliance requirements into testing workflows

UNIT - I FUNDAMENTALS OF TESTING AND QUALITY ASSURANCE 9

Software Testing and Quality Concepts – Testing vs Debugging – Software Development and Testing Life Cycles (SDLC, STLC) – QA vs QC – Test Planning and Documentation – IEEE and ISO Standards – Introduction to SQA Framework – SQA Activities – Cost of Quality – Quality Attributes – Software Quality Models (McCall, Boehm, ISO 9126).

UNIT - II UNIT AND STRUCTURAL TESTING TECHNIQUES 9

Types of Unit Testing – Unit Test Frameworks (JUnit, PyTest) – Mocking and Stubbing – Test-Driven Development (TDD) – Code Coverage – Static vs Dynamic Testing – Control Flow, Data Flow Testing – Integration Testing Strategies – Structural Coverage Criteria – Maintainability and Refactor-Friendly Testing Practices

UNIT - III FUNCTIONAL, PERFORMANCE AND SECURITY TESTING 9

Black Box Testing: Equivalence Partitioning, Boundary Value Analysis – Decision Table & State Transition Testing – Test Case Design – Performance Testing: Load, Stress, Spike, Scalability – Tools: JMeter, LoadRunner – Metrics and Bottlenecks – Security Testing: Penetration Testing, Vulnerability Scanning – OWASP Top 10 – Tools: Burp Suite, ZAP, Metasploit.

UNIT - IV AUTOMATED TESTING AND SQA METRICS 9

Automation Testing Concepts – Types: Regression, UI, Functional – Tools: Selenium, Appium – CI/CD Integration – AI-Based Testing Tools (FireFlink) – Software Quality Metrics: Defect Density, Test Effectiveness – Defect Tracking and Logging – Root Cause Analysis – Risk Management in QA – Test Reviews and Inspections – QA Process Audits

UNIT - V SOFTWARE PROCESS IMPROVEMENT AND STANDARDS 9

Software Process Models: Waterfall, Agile, V-Model – Process Improvement Models: CMMI, Six Sigma, TMMi – Quality Standards: ISO 9001, ISO 25010 – Compliance (GDPR, HIPAA) – Use Cases in QA – Best Practices in Quality Engineering – Test Governance.

TOTAL : 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Recall software testing and SQA fundamentals, standards, and models.
CO2 Describe unit testing, structural techniques, and test automation frameworks.
CO3 Apply black-box, performance, and security testing methods with tools.
CO4 Analyse and interpret QA metrics, defect reports, and risk assessments.

CO5 Evaluate software process quality through audits, metrics, and compliance.
CO6 Design automated testing and RPA-based solutions for quality improvement.

TEXT BOOKS:

1. Aditya P. Mathur, *Foundations of Software Testing: ISTQB Certification*, Pearson Education, 2020.
2. Gary Pollice, *Test-Driven Development: A Practical Guide*, Pragmatic Bookshelf, 2020.
3. Shahid Jameel, *Performance Testing with JMeter 3.0*, Packt Publishing, 2019.
4. Nina S. Godbole, *Software Quality Assurance: Principles and Practice*, Alpha Science, 2020.
5. Roger S. Pressman, *Software Engineering: A Practitioner's Approach*, McGraw-Hill, 2021.

REFERENCE BOOKS:

1. Raghavendra S., JUnit 5 in Action, Manning Publications, 2020.
2. Kaner, C., Bach, J., Lessons Learned in Software Testing, Wiley, 2019.
3. Raj Subrameyer, Mastering Performance Testing with JMeter, Wiley, 2021.
4. Jason Arbon, Appium Essentials, Packt Publishing, 2020.
5. Owasp Foundation, OWASP Testing Guide, Wiley, 2020.

CO-PO-PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	1	1	2	2	2	2	1	1	1	2	2	
CO2	3	1	2	2	1	2	2	1			2	2	2	
CO3	3	1	2	2	1	2	3	1			2	2	3	
CO4	3	2	1	2	1	2	2		1	1	1	2	2	
CO5	3	1	2	2	2	2	2	2	3	3	3	2	2	
CO6	3	3	2	2	2	3	1	2	2	2	3	3	1	

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

23CS1503	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING	L	T	P	C
		3	0	2	4

COURSE OBJECTIVE :

- To understand the various characteristics of intelligent agents.
- To learn the different search strategies in AI.
- To learn to represent knowledge in solving AI problems.
- To know about the various applications of AI.
- To understand the need for machine learning and various algorithms in machine learning.

UNIT- I INTRODUCTION 9

Introduction–Definition – Future of Artificial Intelligence – Characteristics of Intelligent Agents–Typical Intelligent Agents – Problem Solving Approach to Typical AI problems-Search Strategies- Uninformed – Informed-BFS-Greedy best first search-A* search .

UNIT- II PROBLEM SOLVING METHODS 9

Problem solving Methods – Heuristics - Iterative Deepening A*- RBFS – Memory Bounded A* – Local Search Algorithms and Optimization Problems – Searching with Partial Observations – Constraint Satisfaction Problems – Constraint Propagation – Backtracking Search – Game Playing –Min Max- Optimal Decisions in Games – Alpha Beta Pruning – Stochastic Games.

UNIT- III KNOWLEDGE REPRESENTATION AND AI APPLICATIONS 9

First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining-Backward Chaining – Resolution – Knowledge Representation – Ontological Engineering-AI applications – Language Models – Information Retrieval- Information Extraction – Natural Language Processing – Machine Translation – Speech Recognition-Robot.

UNIT- IV MACHINE LEARNING AND SUPERVISED LEARNING ALGORITHMS 9

Introduction to Machine Learning (ML) - Essential concepts of ML – Learning a Class from Examples- Linear, Non-Linear-Multi-class and Multi-label classification, Decision Trees-ID3- -Regression - Linear Regression- Multiple Linear Regression- Logistic Regression-Bayesian Classifier.

UNIT- V UNSUPERVISED LEARNING AND NEURAL NETWORKS 9

Introduction to clustering, clustering algorithms - Self-Organizing Map - Expectation Maximization - Gaussian Mixture Models – Principal Component Analysis (PCA) – Basic Neural Networks: Concept of Neurons – Perceptron Algorithm – Feed Forward and Back Propagation Networks.

TOTAL : 45 PERIODS

LIST OF EXERCISES **30 PERIODS**

ARTIFICIAL INTELLIGENCE

1. Write a program to implement simple Facts and Queries.
2. Write a program to solve Monkey Banana Problem.
3. Implementation of A* Algorithm
4. Implementation of hill climbing algorithm.
5. Write a program to DFS and BFS.

MACHINE LEARNING

Note:The programs can be implemented in either JAVA or Python
Data sets can be taken from standard repositories
(https://archive.ics.uci.edu/ml/datasets.html) or constructed by the students

1. Create a Linear Regression Model in Python using a randomly created data set.
2. 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.
3. 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.
4. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and Comment on the quality of clustering.
5. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set.
6. Write a program to implement Feed forward network Tensor flow/keras Environment.

TOTAL : 75 PERIODS

COURSE OUTCOME(S):

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

CO1	Define the concepts of Artificial Intelligence and different types of intelligent agents and their architecture
CO2	Explain state space search problem .
CO3	Apply informed and uninformed searching algorithms and different heuristics
CO4	Illustrate the concept of knowledge representation
CO5	Investigate supervised and unsupervised learning algorithms.
CO6	Formulate Machine learning algorithms for real world problems.

TEXTBOOKS :

1. S. Russell and P. Norvig, Artificial Intelligence: A Modern Approach, Prentice Hall,Fourth Edition, 2020
2. Tom M. Mitchell, Machine Learning, Indian Edition, McGraw-Hill, 2017.

REFERENCE BOOKS :

1. Munesh Chandra Trivedi, A Classical Approach to Artificial Intelligence, Khanna Book Publishing, 2019.
2. Vinod Chandra S.S, AnandHareendran S, Artificial Intelligence and MachineLearning, PHI Learning, 2014.
3. David L. Poole and Alan K. Mackworth, Artificial Intelligence: Foundations of Computational Agents, Cambridge University Press, 2010.
4. Charu C. Aggarwal, Data Classification Algorithms and Applications, CRC Press,2014.
5. Stephen Marsland, Machine Learning – An Algorithmic Perspective, 2nd Edition,CRC Press, 2015.

WEB REFERENCES :

1. https://www.geeksforgeeks.org/self-organising-maps-kohonen-maps/
2. https://www.geeksforgeeks.org/unsupervised-neural-network-models/

CO- PO and PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	1	1	2	2	2	2	1	1	1	2	2	
CO2	3	1	2	2	1	2	2	1			2	2	2	
CO3	3	1	2	2	1	2	3	1			2	2	3	
CO4	3	2	1	2	1	2	2		1	1	1	2	2	
CO5	3	1	2	2	2	2	2	2	3	3	3	2	2	
CO6	3	3	2	2	2	3	1	2	2	2	3	3	1	

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

23ES1611	TECHNICAL SKILL PRACTICES V	L	T	P	C
		0	0	2	1

COURSE OBJECTIVE:

1. Develop the logical design of the database using data modeling concepts such as Relational model.
2. Infer the data models and use of queries in retrieving the data.
3. Create a relational database using a relational database package.
4. Manipulate a database using SQL.
5. Render the concepts of database system structure.

LIST OF TOPICS

1. Introduction to DDL Commands of SQL
2. DML Commands of SQL
3. DCL Commands of SQL
4. TCL Commands of SQL
5. Constraints
6. SQL Aggregate Functions, Group by clause, Having clause
7. SQL Functions
8. Nested Queries
9. SQL Operators and Order by Clause
10. Introduction to Views, Destroying / Altering Tables and Views
11. Sub query
12. Joins, Set Operators
13. High Level Language Extensions - Procedures, Functions.
14. Cursors, Triggers and Active Databases
15. Normalization

TOTAL: 30 PERIODS

COURSE OUTCOME(S):

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

CO1 Construct the schema of the database and modify it

CO2 Compile a query to obtain the aggregated result from the database.

CO3 Speculate the concepts of various database objects.

CO4 Compare the use of procedure and function in database.

CO5 Use triggers and packages to create applications in the database

TEXT BOOKS:

1. A. Silberschatz, H. F. Korth & S. Sudarshan, Database System Concepts, McGraw Hill,7th Edition 2019.
2. R. Elmasri & S. B. Navathe, Fundamentals of Database Systems, Addison Wesley, 7thEdition, 2016

REFERENCE BOOKS:

1. Gerardus Blokdyk, NoSQL Databases A Complete Guide, 5STARCooks, 2021
2. Raghu Ramakrishnan, Database Management Systems, Mcgraw-Hill, 4th Edition, 2018.
3. C.J.Date, A.Kannan, S.Swamynathan," An Introduction to Database Systems", Pearson,Eighth Edition, 2006.
4. The Complete Reference,3rd edition by James R.Groff, Paul N.Weinberg, AndrewJ. Oppel
5. SQL & PL/SQL for Oracle10g, Black Book,Dr.P.S.Deshpande.

WEB REFERENCES:

1. https://leetcode.com/studyplan/top-sql-50/
2. https://www.guvi.in/blog/sql-queries-with-examples/
3. https://learnsql.com/blog/basic-sql-query-examples/
4. https://www.codechef.com/learn/course/sql

23CB1701	FINANCIAL MANAGEMENT	L	T	C	P
		3	0	0	3

COURSE OBJECTIVE:

- Understand the functional distinctions of a Finance Manager.
- Comprehend the technique of making decisions related to finance function.
- Understand the techniques involved in deciding upon purchase or sale of securities.
- An overview and generating investment project proposals.
- Motives for holding cash and receivables

UNIT I INTRODUCTION 9

Introduction to Financial Management - Goals of the firm - Financial Environments. Time Value of Money: Simple and Compound Interest Rates, Amortization, Computing more than once a year, Annuity Factor.

UNIT II VALUATION OF SECURITIES 9

Bond Valuation, Preferred Stock Valuation, Common Stock Valuation, Concept of Yield and YTM. Risk & Return: Defining Risk and Return, Using Probability Distributions to Measure Risk, Attitudes Toward Risk, Risk and Return in a Portfolio Context, Diversification, The Capital Asset Pricing Model (CAPM).

UNIT III CAPITAL BUDGETING 9

The Capital Budgeting Concept & Process - An Overview, Generating Investment Project Proposals, Estimating Project, After Tax Incremental Operating Cash Flows, Capital Budgeting Techniques, Project Evaluation and Selection - Alternative Methods.

UNIT IV COST OF CAPITAL, OPERATING & FINANCIAL LEVERAGE 9

Cost of Capital : Concept , Computation of Specific Cost of Capital for Equity - Preference – Debt, Weighted Average Cost of Capital – Factors affecting Cost of Capital 4L. Operating & Financial Leverage: Operating Leverage, Financial Leverage, Total Leverage and Indifference Analysis in leverage study.

UNIT V WORKING CAPITAL MANAGEMENT 9

Working Capital Management: Overview, Working Capital Issues, Financing Current Assets (Short Term and Long Term- Mix), Combining Liability Structures and Current Asset Decisions, Estimation of Working Capital. Accounts Receivable Management: Credit & Collection Policies, Analyzing the Credit Applicant, Credit References, Selecting optimum Credit period. 4L. Cash Management: Motives for Holding cash, Speeding Up Cash Receipts, Slowing Down Cash Payouts, Electronic Commerce, Outsourcing, Cash Balances to maintain, Factoring

TOTAL:45 PERIODS

TEXT BOOKS

1. Chandra Prasanna, “Financial Management - Theory & Practice”, Tata McGraw Hill, 10th Edition, 2019.
2. M.Y.Khanand and P.K.Jain, “Financial management, Text, Problems and Cases”, Tata Mc Graw Hill, 5^{TH} Edition, 2000.

3. I.M.Pandey, “Financial Management”, Vikas Publishing House Pvt.Ltd., 8th Edition, 2007.

4. Aswat Damodaran, “Corporate Finance Theory and Practice”, John Wiley & Sons, 2nd Edition, 2008.

5. James C.Vanhorne, “Fundamentals of Financial Management”, PHI Learning, 11th Edition, 2008.

REFERENCE BOOKS

1. Van Horne and Wachowicz, “Fundamentals of Financial Management”, Prentice Hall, 13th Edition, 2009.
2. Brigham and Ehrhardt, “Financial Management Theory and Practice”, 11th edition, Cengage Learning, 2011.

COURSE OUTCOME

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

CO1 Identify the basic concepts of financial management and time value of money.

CO2 Understand the various processes involved in securities market.

CO3 Evaluate and choose the best project from alternatives based on cost-benefit analysis.

CO4 Compute the fundamental concepts of financial management.

CO5 Influence the concept for deciding financial angle of IT projects.

CO6 Apply the financial techniques in valuating firms based on dividend decisions

CO- PO AND PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	1	2	-	2	-	-	-	1	3	1	2	1	1
CO2	2	1	2	3	2	1	1	-	-	2	1	2	1	2
CO3	2	1	2	2	2	2	-	-	-	1	1	2	1	1
CO4	2	1	2	3	2	1	-	-	1	1	2	2	1	1
CO5	2	1	2	3	2	1	-	-	1	2	1	2	1	1
CO6	2	1	2	2	2	3	-	-	1	1	1	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	100
40%				60 %

23IT1604 MODERN DEVOPS AND PRACTICES	L	T	P	C
	3	0	0	3

COURSE OBJECTIVE:

- Define the core concepts and tools involved in DevOps, including AWS, GCP, Azure, Git, and Jenkins.
- Explain the principles behind version control systems, continuous integration, and continuous delivery.
- Demonstrate the use of Maven, Gradle, and Ant for building and compiling projects.
- Assess the role of Jenkins and Ansible in automating workflows and configuration management.
- Critique the process of creating and managing DevOps pipelines using Azure DevOps.
- Develop end-to-end CI/CD pipelines using Jenkins, Ansible, and Azure DevOps.

UNIT - I INTRODUCTION TO DEVOPS 9

Devops Essentials - Introduction to AWS, GCP, Azure - Version control systems: Git and Github - Gerrit Code review.

UNIT - II COMPILE AND BUILD USING MAVEN , GRADLE & ANT 9

Introduction, Installation of Maven, POM files, Maven Build lifecycle, Build phases(compile build, test, package) Maven Profiles, Maven repositories(local, central, global),Maven plugins, Maven create and build Artificats, Dependency management, Installation of Gradle, Understand build using Gradle – Introduction to ANT- Installation of ANT – Understand and Build using ANT.

UNIT - III CONTINUOUS INTEGRATION USING JENKINS 9

Install & Configure Jenkins, Jenkins Architecture Overview, Creating a Jenkins Job, Configuring a Jenkins job, Introduction to Plugins, Adding Plugins to Jenkins, Commonly used plugins (Git Plugin, Parameter Plugin, HTML Publisher, Copy Artifact and Extended choice parameters). Configuring Jenkins to work with java, Git and Maven, Creating a Jenkins Build and Jenkins workspace.

UNIT - IV CONFIGURATION MANAGEMENT USING ANSIBLE 9

Ansible Introduction, Installation, Ansible master/slave configuration, YAML basics, Ansible modules, Ansible Inventory files, Ansible playbooks, Ansible Roles, adhoc commands in ansible

UNIT - V BUILDING DEVOPS PIPELINES USING AZURE 9

Create Github Account, Create Repository, Create Azure Organization, Create a new pipeline, Build a sample code, Modify azure-pipelines.yaml file - Testing and Monitoring - Selenium, Jira, ELK

TOTAL : 45 PERIODS

COURSE OUTCOME(S):

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

CO1 List and describe DevOps tools and platforms such as AWS, GCP, Azure, Jenkins, and Git.

CO2 Illustrate how continuous integration and build tools like Maven and Gradle work together in a DevOps environment.

CO3 Execute basic commands and configure Jenkins and Ansible for project

automation.

CO4 Differentiate between different DevOps tools and explain their impact on software development processes.

CO5 Assess the efficiency and scalability of CI/CD pipelines using Jenkins and Azure.

CO6 Design and implement automated DevOps pipelines for a sample project using appropriate tools and platforms.

TEXT BOOKS:

1. Gene Kim, Jez Humble, Patrick Debois, John Willis, The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations, IT Revolution Press, 2023.
2. Nicole Forsgren, Jez Humble, Gene Kim, Accelerate: The Science of Lean Software and DevOps: Building and Scaling High Performing Technology Organizations, IT Revolution Press, 2023.
3. Adora Nwodo, Beginning Azure DevOps: Planning, Building, Testing, and Releasing Software Applications on Azure, Wiley, 2023.
4. Luke Kysow, Consul: Up and Running: Service Mesh for Any Runtime or Cloud, O'Reilly Media, 2023.
5. Eric Chow, Mastering Python Networking: Utilize Python Packages and Frameworks for Network Automation, Monitoring, Cloud, and Management, Packt Publishing, 2023.

REFERENCE BOOKS:

1. Jez Humble, David Farley, Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation, Addison-Wesley Professional, 2023.
2. Gene Kim, The Phoenix Project: A Novel About IT, DevOps, and Helping Your Business Win, IT Revolution Press, 2023.
3. Patrick Debois, John Willis, The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations, IT Revolution Press, 2023.
4. Nicole Forsgren, Jez Humble, Gene Kim, Accelerate: The Science of Lean Software and DevOps: Building and Scaling High Performing Technology Organizations, IT Revolution Press, 2023.

CO-PO AND PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2			3							3	3	-
CO2	3	3	2		3						1	3	2	-
CO3	3	2	2		3			1			1	3	2	-
CO4	3	3	3	2	3	2		1	1		2	3	3	-
CO5	3	3	3	2	3	2		1	1	2	2	2	2	-
CO6	3	3	3	3	3	2	1	2	3	3	3	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	100
40%				60 %

23CB1712	IT WORKSHOP LABORATORY USING SCILAB	L	T	P	C
		0	0	4	2

COURSE OBJECTIVE:

- To introduce the students with the basic features of MATLAB for problem solving.
- To introduce the students about the Mathematical functions like matrix generation and Plotting with multiple data sets, line styles and colors.
- To introduce the students about the Array operations and solving Linear equations in MATLAB.
- To introduce the students about the control flow and operators using if-end structures and loops.

LIST OF EXPERIEMENTS

1. Programs using mathematical, relational expressions and the operators.
2. Vectors and Matrices: Programs using array operations and matrix operations (such as matrix multiplication).
3. Programs on input and output of values.
4. Selection Statements: Experiments on ifstatements, with else and elseif clauses and switch statements.
5. Loop Statements and Vectorizing Code: Programs based on the concepts of counted (for) and conditional (while) loops.
6. Programs based on scripts and user-defined functions.
7. Programs on Built-in text manipulation functions and conversion between string and number types.
8. Programs based on two main data structures: cell arrays and structures.
9. Programs based on Data Transfer.
10. Programs based on Advanced Functions.
11. Introduction to Object-Oriented Programming and Graphics.
12. Programs based on Advanced Plotting Techniques.
13. Programs based on sound files and image processing
14. Programs based on Advanced Mathematics.

TOTAL: 60 PERIODS

COURSE OUTCOME

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

CO1	Write fundamental programs in MATLAB, creating variables and mathematical functions.
CO2	Understand how to program matrix operations, array operations and how to solve the system of linear equations.
CO3	Program the fundamentals concepts of basic Plotting consisting of simple and multiple data sets in one plot.
CO4	Understand how to program M-file scripts, M- file functions, Input –output Arguments and program control flow operators, loops, flow structures
CO5	Use the debugging process and debugging M-files.

WEB REFERENCES

1	https://www.mathworks.com/content/dam/mathworks/mathworks-dot com/moler/exm/book.pdf
2	https://www.mathworks.com/help/releases/R2014b/pdf_doc/matlab/getstart.pdf

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	-	2	1	-	-	-	-	-	-	2	1	-
CO2	3	2	-	2	3	-	-	-	-	-	-	2	3	-
CO3	3	3	-	2	3	-	-	-	-	-	-	2	3	-
CO4	3	3	-	2	3	-	-	-	-	-	-	2	3	-
CO5	3	3	-	2	3	-	-	-	-	-	-	2	3	-
CO6	3	3	-	2	3	-	-	-	-	-	-	2	3	-

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

VERTICAL I - DATA SCIENCE

23AD1902	EXPLORATORY DATA ANALYSIS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To outline an overview of exploratory data analysis.
- To learn T-test.
- To perform univariate data exploration and analysis
- To apply bivariate data exploration and analysis.
- To use Data exploration and visualization techniques for multivariate and time series data
- To implement data visualization using advanced techniques

UNIT - I EXPLORATORY DATA ANALYSIS 9

EDA fundamentals – Understanding data science – Significance of EDA – Making sense of data – Comparing EDA with classical and Bayesian analysis – Software tools for EDA - Visual Aids for EDA- Data transformation techniques-merging database, reshaping and pivoting, Transformation techniques- Case study - attack for tampering with recommender systems.

UNIT - II T-TEST 9

t-test for one sample – sampling distribution of t – t-test procedure – degrees of freedom – estimating the standard error – case studies t-test for two independent samples – statistical hypotheses – sampling distribution – test procedure – p-value – statistical significance – estimating effect size – meta analysis t- test for two related samples.

UNIT - III UNIVARIATE ANALYSIS 9

Introduction to Single variable: Distribution Variables - Numerical Summaries of Level and Spread - Scaling and Standardizing – Inequality**-** Medical Statistics

UNIT - IV BIVARIATE ANALYSIS 9

Relationships between Two Variables - Percentage Tables - Analysing Contingency Tables - Handling Several Batches - Scatterplots and Resistant Lines**-** Regression Analysis.

UNIT - V MULTIVARIATE AND TIME SERIES ANALYSIS 9

Introducing a Third Variable - Causal Explanations - Three-Variable Contingency Tables and Beyond – Fundamentals of TSA – Characteristics of time series data – Data Cleaning – Timebased indexing – Visualizing – Grouping – Resampling- COVID 19**.**

TOTAL : 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Understand the fundamentals of exploratory data analysis
CO2 Use T-test in analysis Process.
CO3 Perform univariate data exploration and analysis.
CO4 Apply bivariate data exploration and analysis.
CO5 Evaluate Data exploration and visualization techniques for multivariate and time series data.
CO6 Build models for data visualization using advanced techniques.

TEXT BOOKS:

1. Suresh Kumar Mukhiya, Usman Ahmed, “Hands-On Exploratory Data Analysis with Python”, Packt Publishing, 2020.
2. Robert S. Witte and John S. Witte, “Statistics”, Eleventh Edition, Wiley Publications, 2017
3. Catherine Marsh, Jane Elliott, “Exploring Data: An Introduction to Data Analysis for Social Scientists”, Wiley Publications, 2nd Edition, 2008.

REFERENCE BOOKS:

1. Eric Pimpler, Data Visualization and Exploration with R, GeoSpatial Training service, 2017
2. Claus O. Wilke, “Fundamentals of Data Visualization”, O’reilly publications, 2019
3. Matthew O.Ward,GeorgesGrinstein,Daniel Keim, “Interactive Data Visualization: Foundations, Techniques, and Applications”, 2nd Edition, CRC press, 2015.

23AD1909	DATA VISUALIZATION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To understand the fundamental concepts related to visualization data
- To learn foundations for visualization
- To learn interaction concepts and techniques
- To use visualization techniques for research

UNIT - I INTRODUCTION AND DATA FOUNDATION 9

Basics - Relationship between Visualization and Other Fields -The Visualization Process - Pseudo code Conventions - The Scatter plot. Data Foundation - Types of Data - Structure within and between Records - Data Preprocessing - Data Sets

UNIT - II FOUNDATIONS FOR VISUALIZATION 9

Visualization stages - Semiology of Graphical Symbols - The Eight Visual Variables - Historical Perspective - Taxonomies - Experimental Semiotics based on Perception Gibson‘s Affordance theory – A Model of Perceptual Processing.

UNIT - III VISUALIZATION TECHNIQUES 9

Spatial Data: One-Dimensional Data - Two-Dimensional Data – Three Dimensional Data - Dynamic Data - Combining Techniques. Geospatial Data : Visualizing Spatial Data - Visualization of Point Data -Visualization of Line Data - Visualization of Area Data - Other Issues in Geospatial Data Visualization Multivariate Data : Point-Based Techniques - LineBased Techniques - Region-Based Techniques - Combinations of Techniques – Trees Displaying Hierarchical Structures – Graphics and NetworksDisplaying Arbitrary Graphs/Networks.

UNIT - IV INTERACTION CONCEPTS AND TECHNIQUES 9

Text and Document Visualization: Introduction - Levels of Text Representations - The Vector Space Model - Single Document Visualizations -Document Collection Visualizations - Extended Text Visualizations Interaction Concepts: Interaction Operators - Interaction Operands and Spaces - A Unified Framework. Interaction Techniques: Screen Space - Object-Space -Data Space -Attribute Space- Data Structure Space - Visualization Structure - Animating Transformations -Interaction Control.

UNIT - V RESEARCH DIRECTIONS IN VISUALIZATIONS 9

Steps in designing Visualizations – Problems in designing effective VisualizationsIssues of Data. Issues of Cognition, Perception, and Reasoning. Issues of System Design Evaluation,Hardware and Applications

TOTAL : 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Understand the fundamental concepts related to visualization data Learn the ethical considerations of AI with perspectives on ethical values.

CO2 Learn foundations for visualization and become familiar with visualization techniques.

CO3 Visualize the objects in different dimensions Analyse the evil genesis in the concept of AI.

CO4 Design and process the data for Visualization.

CO5 Evaluate Data exploration and visualization techniques for multivariate and time series data.

CO6 Build models for data visualization using advanced techniques.

TEXT BOOKS:

1. "Interactive Data Visualization: Foundations, Techniques, Applications" by Matthew Ward, Georges Grinstein, and Daniel Keim is the 2nd edition, 2015
2. "Information Visualization: Perception for Design" by Colin Ware is the 4th edition, published in 2020 ,Morgan Kaufmann Publishers.
3. "Information Visualization: Design for Interaction" by Robert Spence is the 3rd edition, published in 2014 by Pearson Education.

REFERENCE BOOKS:

1. Eric Pimpler, Data Visualization and Exploration with R, GeoSpatial Training service, 2017
2. Claus O. Wilke, "Fundamentals of Data Visualization", O'reilly publications, 2019
3. Matthew O. Ward, Georges Grinstein, Daniel Keim, "Interactive Data Visualization: Foundations, Techniques, and Applications", 2nd Edition, CRC press, 2015.

23AD1918	BUSINESS ANALYTICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To understand the Analytics Life Cycle.
- To comprehend the process of acquiring Business Intelligence
- To understand various types of analytics for Business Forecasting
- To model the supply chain management for Analytics.
- Apply analytics for different functions of a business

UNIT - I INTRODUCTION TO BUSINESS ANALYTICS 9

Analytics and Data Science – Analytics Life Cycle – Types of Analytics – Business Problem Definition – Data Collection – Data Preparation – Hypothesis Generation – Modeling – Validating and verifying analytical results, Communicating and presenting results to clients and driving organizational change and assessing impact– Interpretation – Deployment and Iteration- Optimizing Inventory Management.

UNIT - II BUSINESS INTELLIGENCE 9

Data Warehouses and Data Mart - Knowledge Management – Types of Decisions - Decision Making Process - Decision Support Systems – Business Intelligence – OLAP – Analytic functions - Enhancing Decision-Making with Business Intelligence.

UNIT - III BUSINESS FORECASTING 9

Introduction to Business Forecasting and Predictive analytics - Data Mining and Predictive Analysis Modeling -Linear Regression, Cluster, CART and Neural Network model– Data Visualization and Analytics- Charts(Bars-Pie-Line-Scatter-Map-Bubble-Box & Whisker-Tree map - Heat map-Circle and Area) -Worksheet, Dashboard and Story Board creation- Demand Forecasting for Retail Chain

UNIT - IV HR & SUPPLY CHAIN ANALYTICS 9

Decision Trees- Logistic Regression -Neural Network Model – K-Nearest Neighbours – Naive Bayes – Regression Models - Linear Regression - Other Regression Algorithms- Case study: predictive web Analytics.

UNIT - V MARKETING & SALES ANALYTICS 9

Marketing Strategy, Marketing Mix, Customer Behavior – selling Process – Sales Planning – Analytics applications in Marketing and Sales - Enhancing Marketing and Sales Effectiveness.

TOTAL : 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Define key concepts of Business Analytics and its life cycle.

CO2 Explain the role of Business Intelligence in decision-making.

CO3 **Apply predictive analytics for demand forecasting.**

CO4 **Analyze supply chain and HR analytics models.**

CO5 **Evaluate marketing and sales analytics strategies.**

CO6 **Develop a complete business analytics solution.**

TEXT BOOKS:

1. R. Evans James, Business Analytics, 2017.
2. R N Prasad , Seema Acharya , Fundamentals of Business Analytics.
3. Philip Kotler and Kevin Keller, Marketing Management, 15th edition, PHI, 2016.
4. Mahadevan B, “Operations Management -Theory and Practice”,3rd Edition, Pearson Education, 2018.

23AD1904	TEXT ANALYTICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To understand the methods for keyword extraction from documents
- To learn clustering methods for grouping of documents
- To explore the methods for classification of documents and E-mails
- To explore text visualization techniques and anomaly detection
- To learn about Events and trends in text streams
- To learn about advanced text visualization techniques

UNIT - I TEXT EXTRACTION 9

Introduction- Rapid automatic keyword extraction: candidate keywords, keyword scores, adjoining keywords, extracted keywords-Benchmark evaluation: precision and recall, efficiency, stoplist generation, Evaluation on new articles, Intelligent Text extraction.

UNIT - II DOCUMENT CLUSTERING 9

Multilingual document clustering: Multilingual LSA, Tucker1 method, PARAFAC2 method, LSA with term alignments, LMSA, LMSA with term alignments; Constrained clustering with k-means type algorithms, Document Clustering vs Topic Models : A case study.

UNIT - III CONTENT BASED CLASSIFICATION 9

Classification algorithms for Document Classification, Content-based spam email classification, Utilizing nonnegative matrix factorization for email classification problems, Development of content based SMS classification.

UNIT - IV ANOMALY AND TREND DETECTION 9

Text visualization techniques: Visualization in text analysis, Tag clouds, tag clouds, authorship and change tracking, Data Exploration and the search for noval patterns, sentiment tracking, visual analytics and FutureLens, scenario discovery. adaptive threshold setting for novelty mining: Introduction, adaptive threshold for anomaly detection, Experimental study.

UNIT - V TEXT STREAMS 9

Events and trends in text streams: Introduction, Text streams, Feature extraction and data reduction, Event detection, Trend detection, Event and trend descriptions. Embedding semantics in LDA topic models: Introduction, vector space modeling, latent semantic analysis, probabilistic latent semantic analysis, Latent Dirichlet allocation, embedding external semantics from Wikipedia, data-driven semantic embedding, Dynamic sampling of text streams and its application in text analysis**.**

TOTAL : 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Design text extraction techniques.
CO2 To apply clustering methods for grouping of documents.
CO3 Design classification techniques for text mining
CO4 Apply visualization techniques and perform anomaly & trend detection.
CO5 Perform Event operations in Text streams
CO6 Apply advanced text visualization techniques

TEXT BOOKS:

1. Michael W. Berry ,Jacob Kogan,"Text Mining Applications and Theory", Wiley publications, 2010
2. Aggarwal, Charu C., and Cheng Xiang Zhai, eds., "Mining text data", Springer Science & Business Media, 2012.

REFERENCE BOOKS:

1. Gary Miner, John Elder, Thomas Hill, Dursun Deller, Andrew Fast, Robert A. Nisbet, "Practical text mining and statistical analysis for non-structured text data applications", Academic Press, 2012.
2. Srivastava, Ashok N., and MehranSahami, "Text mining: Classification, clustering, and applications", Chapman and Hall/CRC, 2009.
3. Buitelaar, Paul, Philipp Cimiano, and Bernardo Magnini, eds., "Ontology learning from text: methods, evaluation and applications", Vol. 123. IOS press, 2005.

23AD1905	RECOMMENDER SYSTEMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To understand the foundations of the recommender system
- To learn the significance of machine learning and data mining algorithms for Recommender systems
- To learn about collaborative filtering
- To make students design and implement a recommender system
- To learn collaborative filtering.

UNIT - I INTRODUCTION 9

Introduction and basic taxonomy of recommender systems - Traditional and non-personalized Recommender Systems - Overview of data mining methods for recommender systems- similarity measures- Dimensionality reduction – Singular Value Decomposition (SVD)

UNIT - II CONTENT-BASED RECOMMENDATION SYSTEMS 9

High-level architecture of content-based systems - Item profiles, Representing item profiles, Methods for learning user profiles, Similarity-based retrieval, and Classification algorithms

UNIT - III COLLABORATIVE FILTERING 9

A systematic approach, Nearest-neighbor collaborative filtering (CF), user-based and item-based CF, components of neighborhood methods (rating normalization, similarity weight computation, and neighborhood selection

UNIT - IV ATTACK-RESISTANT RECOMMENDER SYSTEMS 9

Introduction – Types of Attacks – Detecting attacks on recommender systems – Individual attack – Group attack – Strategies for robust recommender design - Robust recommendation algorithms.

UNIT - V EVALUATING RECOMMENDER SYSTEMS 9

Evaluating Paradigms – User Studies – Online and Offline evaluation – Goals of evaluation design – Design Issues – Accuracy metrics – Limitations of Evaluation measures

TOTAL : 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Understand the basic concepts of recommender systems.
CO2 Implement machine-learning and data-mining algorithms in recommender systems data sets.
CO3 Implementation of Collaborative Filtering in carrying out performance evaluation of recommender systems based on various metrics.
CO4 Design and implement a simple recommender system.
CO5 Build a system to implement advanced topics of recommender systems

TEXT BOOKS:

1. Charu C. Aggarwal, Recommender Systems: The Textbook, Springer, 2016.
2. Dietmar Jannach, Markus Zanker, Alexander Felfernig and Gerhard Friedrich, Recommender Systems: An Introduction, Cambridge University Press,1st ed.,2011.
3. "Recommender Systems Handbook" by Francesco Ricci, Lior Rokach, and Bracha Shapira, published by Springer, 2nd edition, 2015
4. Jure Leskovec, Anand Rajaraman, Jeffrey David Ullman, Mining of massive datasets, 3rd edition, Cambridge University Press, 2020.

23AD1910	IMAGE AND VIDEO ANALYTICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To understand the basics of image processing techniques for computer vision
- To learn the techniques used for image pre-processing.
- To discuss the various object detection techniques
- To understand the various Object recognition mechanisms
- To elaborate on the video analytics techniques.
- To implement real time applications.

UNIT - I INTRODUCTION 9

Computer Vision – Image representation and image analysis tasks - Image representations – digitization– properties – color images – Data structures for Image Analysis - Levels of image data representation - Traditional and Hierarchical image data structures- T-pyramid of an image- the quad tree representation of an image using the homogeneity criterion of equal intensity

UNIT - II IMAGE PRE-PROCESSING 9

Local pre-processing - Image smoothing - Edge detectors - Zero-crossings of the second derivative - Scale in image processing - Canny edge detection - Parametric edge models - Edges in multi-speralct images - Local pre-processing in the frequency domain - Line detection by local pre-processing operators-Image restoration – Geometric transformations - Case study of MNIST.

UNIT - III OBJECT DETECTION USING MACHINE LEARNING 9

Object detection– Object detection methods – Deep Learning framework for Object detection– bounding box approach-Intersection over Union (IoU) –Deep Learning Architectures-R-CNN-Faster R-CNN-You Only Look Once(YOLO)-Salient features-Loss Functions-YOLO architectures - motion analysis using moving edges - Case study: Geospatial object detection.

UNIT - IV FACE RECOGNITION AND GESTURE RECOGNITION 9

Face Recognition-Introduction-Applications of Face Recognition-Process of Face Recognition- DeepFace solution by Facebook-FaceNet for Face Recognition- Implementation using FaceNet- Gesture Recognition – Implementation of Facial Detection and Recognition - static hand gesture.

UNIT - V VIDEO ANALYTICS 9

Video Processing – use cases of video analytics-Vanishing Gradient and exploding gradient problem- RestNet architecture-RestNet and skip connections-Inception Network-GoogleNet architecture- Improvement in Inception v2-Video analytics-RestNet and Inception v3. Case study: Airport Projects - event detection in video surveillance system

TOTAL : 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Understand the basics of image processing techniques for computer vision and video analysis.
CO2 Explain the techniques used for image pre-processing.
CO3 Develop various object detection techniques
CO4 Understand the various face recognition mechanisms
CO5 Elaborate on deep learning-based video analytics.
CO6 Implement in real time applications.

TEXT BOOKS:

1. Milan Sonka, Vaclav Hlavac, Roger Boyle, “Image Processing, Analysis, and Machine Vision”, 4nd edition, Thomson Learning, 2013
2. Vaibhav Verdhan,(2021, Computer Vision Using Deep Learning Neural Network Architectures with Python and Keras, Apress 2021(UNIT-III,IV and V)

REFERENCE BOOKS:

1. Richard Szeliski, “Computer Vision: Algorithms and Applications”, Springer Verlag London Limited,2011
2. 2.Caifeng Shan, FatihPorikli, Tao Xiang, Shaogang Gong, “Video Analytics for Business Intelligence”, Springer, 2012
3. 3.D. A. Forsyth, J. Ponce, “Computer Vision: A Modern Approach”, Pearson Education, 2003

23AD1911	SPEECH PROCESSING AND ANALYTICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To understand natural language processing basics
- To apply classification algorithms to text documents
- To build question-answering and dialogue systems
- To develop a speech recognition system
- To develop a speech synthesizer

UNIT - I INTRODUCTION TO SPEECH PROCESSING 9

Human and machine speech production: Models for speech production. Various types of speech sounds and their characteristics, Speech hearing: Mechanism for human hearing: Learning to recognize human sounds, acquired knowledge vs vocabulary - based methods.

UNIT - II ANALYSIS OF SPEECH 9

Frequency and time domain based methods: FFT, computation of pitch, spectrograms, LPC, cepstrum, ZCR, etc. Representation of acoustic events. Components of a Speech recognition system: Input, feature analysis, modelling and decision rule, vocabulary.

UNIT - III DATA COMPRESSION 9

Vector Quantization, codebook design, Lloyd's quantizer design, K-means algorithm, LBG algorithm for speech. Speech modelling: Stochastic processes: Markov processes, Hidden Markov modelling.

UNIT - IV SPEECH AUTOMATION METHODS 9

Automatic speech recognition - architecture - applying hidden markov model - feature extraction: mfcc vectors - computing acoustic likelihoods - search and decoding - embedded training - multipass decoding: n-best lists and lattices- a* (stack) decoding - context-dependent acoustic models: triphones - discriminative training - speech recognition by humans.

UNIT - V SPEECH RECOGNITION SYSTEM 9

Implementation of a speech recognition system: Time/space consideration, designing the interface, self-learning mechanism.

TOTAL : 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Explain existing and emerging deep learning architectures for text and speech processing

CO2 Apply deep learning techniques for NLP tasks, language modelling and machine translation

CO3 Explain co-reference and coherence for text processing

CO4 Build question-answering systems, chat bots and dialogue systems

CO5 Apply deep learning models for building speech recognition and text-to-speech systems

TEXT BOOKS:

1. Daniel Jurafsky and James H. Martin, “Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition”, Third Edition, 2022.

REFERENCE BOOKS:

1. Dipanjan Sarkar, “Text Analytics with Python: A Practical Real-World approach to Gaining Actionable insights from your data”, APress,2018.
2. Tanveer Siddiqui, Tiwary U S, “Natural Language Processing and Information Retrieval”, Oxford University Press, 2008.
3. Lawrence Rabiner, Biing-Hwang Juang, B. Yegnanarayana, “Fundamentals of Speech Recognition” 1st Edition, Pearson, 2009.
4. Steven Bird, Ewan Klein, and Edward Loper, “Natural language processing with Python”, O’REILLY.

23AD1919	COMPUTER VISION TECHNIQUES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

To understand the fundamental concepts related to Image formation and processing
To learn feature detection, matching and detection
To become familiar with feature based alignment and motion estimation.
To develop skills on 3D reconstruction.
To understand image based rendering and recognition.

UNIT - I INTRODUCTION TO IMAGE FORMATION AND PROCESSING 9

Computer Vision - Geometric primitives and transformations - Photometric image formation - The digital camera - Point operators - Linear filtering - More neighborhood operators - Fourier transforms - Pyramids and wavelets - Geometric transformations - Global optimization.

UNIT - II FEATURE DETECTION, MATCHING AND SEGMENTATION 9

Points and patches - Edges - Lines - Segmentation - Active contours - Split and merge - Mean shift and mode finding - Normalized cuts - Graph cuts and energy-based methods.

UNIT - III FEATURE-BASED ALIGNMENT & MOTION ESTIMATION 9

2D and 3D feature-based alignment - Pose estimation - Geometric intrinsic calibration – Triangulation - Two-frame structure from motion - Factorization - Bundle adjustment - Constrained structure and motion - Translational alignment - Parametric motion - Spline-based motion - Optical flow - Layered motion.

UNIT - IV 3D RECONSTRUCTION 9

Shape from X - Active range finding - Surface representations - Point-based representations- Volumetric representations - Model-based reconstruction - Recovering texture maps and albedosos.

UNIT - V MARKETING & SALES ANALYTICS 9

View interpolation Layered depth images - Light fields and Lumigraphs - Environment mattes - Video-based rendering-Object detection - Face recognition - Instance recognition - Category recognition - Context and scene understanding- Recognition databases and test sets.

TOTAL : 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Understand basic knowledge, theories and methods in image processing and computer vision.
CO2 Implement basic image processing techniques in OpenCV.
CO3 Implement some advanced image processing techniques in OpenCV.
CO4 Apply 2D feature-based image alignment, segmentation and motion estimations
CO5 Apply 3D image reconstruction techniques.
CO6 Design and develop innovative image processing and computer vision applications.

TEXT BOOKS:

1. Richard Szeliski, “Computer Vision: Algorithms and Applications”, Springer- Texts in Computer Science, Second Edition, 2022.
2. Computer Vision: A Modern Approach, D. A. Forsyth, J. Ponce, Pearson Education, Second Edition, 2015.

VERTICAL II - FULL STACK DEVELOPMENT

23IT1901	NEXTGEN WEB DEVELOPMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- Understand the core concepts of modern web development and architecture.
- Apply front-end development techniques using HTML, CSS, and JavaScript.
- Design and implement RESTful APIs and backend services using Node.js and Express.js.
- Evaluate the integration of front-end and back-end systems in full-stack development.
- Build responsive and secure web applications using modern frameworks like React, Angular, and Vue.
- Analyze web optimization techniques, such as lazy loading and caching strategies.

UNIT - I WEB BASICS AND ARCHITECTURE 9

Overview of Web Development -Traditional vs Next-Gen Web-Client-Server Architecture-Web 2.0, Web 3.0-HTTP/HTTPS Protocol-Request/Response cycle, Methods, Status codes-Web Servers and Frameworks- Apache, Nginx, Node.js-Responsive Web Design-Mobile-first design, Progressive Web Apps (PWA)-Introduction to Web Security-Common security threats (XSS, CSRF)

UNIT - II FRONTEND ESSENTIALS 9

HTML5 & CSS3-Structure, semantics, forms, and multimedia-CSS Frameworks- Bootstrap, Materialize-JavaScript-ES6, DOM manipulation, and event handling-Front-End Libraries-React.js, Vue.js, Angular -Web Accessibility-WCAG standards, ARIA-Cross-Browser Compatibility-Debugging, tools, and techniques

UNIT - III BACKEND AND DATABASES 9

Node.js Overview-Setting up a Node.js environment, Express.js framework Backend Frameworks- Django (Python), Spring Boot (Java), Flask (Python)-APIs-RESTful API design, GraphQL-Database Management-SQL (MySQL, PostgreSQL), NoSQL (MongoDB, Firebase)-Authentication & Authorization: JWT, OAuth-Deployment- Docker, Kubernetes, Serverless architecture

UNIT - IV FULL STACK INTEGRATION 9

Connecting Front-End to Back-End- REST API calls, AJAX, Fetch API, and WebSockets-Full-Stack JavaScript-MEAN/MERN stack (MongoDB, Express, Angular/React, Node.js)-State Management-Redux, Context API-GraphQL-Introduction, Queries, Mutations, and Subscriptions-Session Management- cookies, Tokens, Sessions-WebSockets-Real-time communication

UNIT - V WEB DEVELOPMENT TOOLS AND ADVANCED CONCEPTS 9

Version Control with Git-GitHub, GitLab, Git commands, Branching-CI/CD and DevOps-Jenkins, Travis CI, Docker containers, Kubernetes-Progressive Web Apps (PWA)-Service Workers, Web App Manifests, Caching strategies-WebAssembly (WASM)-Introduction and use cases-Web Optimization-Lazy loading, code splitting, performance tuning-Advanced Web Security- HTTPS, Content Security Policy (CSP), Web Security Best Practices

TOTAL : 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Recall key principles of web security and common web vulnerabilities.

CO2 Demonstrate understanding of back-end frameworks like Django, Flask, and Spring Boot.
CO3 Develop and deploy web applications using the MERN or MEAN stack.
CO4 Assess the performance and scalability of full-stack applications.
CO5 Implement version control and CI/CD pipelines for web development projects.
CO6 Evaluate advanced web security measures such as HTTPS and Content Security Policy (CSP).

TEXT BOOKS:

1. Jon Duckett, HTML and CSS: Design and Build Websites, Wiley, 2021.
2. Benjamin Listwon, Node.js Web Development, Packt Publishing, 2022.
3. David Mark Clements, Microservices in Action, Manning Publications, 2021.
4. Bradley Meck, React.js Essentials, Packt Publishing, 2022.
5. William S. Vincent, Django for Professionals, William S. Vincent, 2022.

REFERENCE BOOKS:

1. Peter Morgan, Learning JavaScript Design Patterns, O'Reilly Media, 2022.
2. Mosh Hamedani, Mastering Node.js, Code With Mosh, 2021.
3. Ethan Brown, Web Development with Node and Express, O'Reilly Media, 2022.
4. Packt Publishing, Hands-On Full-Stack Development with WebAssembly, Packt Publishing, 2022.
5. Ben Lesh, RxJS in Action, Manning Publications, 2021.

WEB REFERENCES:

1. https://developer.mozilla.org/en-US/
2. https://www.w3.org/WAI/
3. https://guides.github.com/activities/hello-world/
4. https://webassembly.org/
5. https://nodejs.org/docs/latest/api/

ONLINE COURSES / RESOURCES:

1. https://www.coursera.org/specializations/full-stack-react
2. https://www.linkedin.com/learning/learning-full-stack-development
3. https://developer.mozilla.org/en-US/docs/Learn

23IT1902	OPEN SOURCE TECHNOLOGIES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- Understand the core concepts of Open-Source Software (OSS) and its principles.
- Examine the differences between Free Software and Open-Source Software.
- Apply Open-Source principles and methodologies in real-world scenarios.
- Analyze the structure and development process of an Open-Source project.
- Utilize Open-Source software tools such as GitHub for collaboration and code contributions.
- Assess the impact of Open-Source software on the technology ecosystem and society.

UNIT - I INTRODUCTION 9

Introduction to Open-Source: Open Source, Need and Principles of OSS, Open- Source Standards, Requirements for Software, OSS success, Free Software, Examples, Licensing, Free Vs. Proprietary Software, Free Software Vs. Open- Source Software, Public Domain. History of free software, Proprietary Vs Open- Source Licensing Model, use of Open- Source Software, FOSS does not mean no cost. History: BSD, The Free Software Foundation and the GNU Project.

UNIT - II OPEN-SOURCE PRINCIPLES AND METHODOLOGY 9

Open-Source History, OpenSource Initiatives, Open Standards Principles, Methodologies, Philosophy, Software freedom, Open-Source Software Development, Licenses, Copyright vs. Copy left, Patents, Zero marginal cost, Income-generation Opportunities, Internationalization - Licensing: What is a License, How to create your own Licenses, Important FOSS Licenses (Apache, BSD, PL, LGPL), copyrights and copy lefts, Patent.

UNIT - III OPEN SOURCE PROJECT 9

Starting and maintaining own Open-Source Project, Open-Source Hardware, Open-Source Design, Open-source Teaching, Open-source media.Collaboration: Community and Communication, Contributing to OpenSource Projects Introduction to GitHub, interacting with the community on GitHub, Communication and etiquette, testing open-source code, reporting issues, contributing code. Introduction to Wikipedia, contributing to Wikipedia or contributing to any prominent open-source project of student's choice

UNIT - IV UNDERSTANDING OPEN-SOURCE ECOSYSTEM 9

Open-Source Operating Systems: GNU/Linux, Android, Free BSD, Open Solaris. Open-Source Hardware, Virtualization Technologies, Containerization Technologies: Docker, Development tools, IDEs, Debuggers, Programming languages, LAMP, Open-Source Database technologies.

UNIT -V OPEN SOURCE ETHICS & CASE STUDIES 9

Open Source Ethics – Open Vs Closed Source – Government – Ethics – Impact of Open source Technology – Shared Software – Shared Source.

Example Projects: Apache web server, GNU/Linux, Android, Mozilla (Firefox), Wikipedia, Drupal, wordpress, GCC, GDB, github, Free BSD, Open Solaris, Open Office. Open Source Hardware, Virtualization Technologies, Containerization Technologies: Docker, Development tools, IDEs, debuggers, Programming languages, LAMP, Open Source database technologies.

Study: Understanding the developmental models, licensing, mode of funding, commercial/non- commercial use.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1. Identify and describe key Open-Source licenses, such as Apache and BSD.

CO2. Explain how Open-Source operating systems and tools function and contribute to software development.

CO3. Demonstrate the ability to start and maintain an Open-Source project.

CO4. Compare and contrast different Open-Source licensing models and their implications.

CO5. Contribute code to a prominent Open-Source project and understand community collaboration.

CO6. Evaluate the ethical implications of Open-Source development versus proprietary software.

TEXT BOOKS:

1. FLOSS Manuals, The Open Source Way, O'Reilly Media, 2023.
2. Eric S. Raymond, The Cathedral and the Bazaar, O'Reilly Media, 2022.
3. Karl Fogel, Producing Open Source Software, O'Reilly Media, 2021.
4. Daniel J. Barrett, Linux Pocket Guide, O'Reilly Media, 2021.
5. Radhika S. Rathi, Introduction to Open Source Software, Wiley, 2023.

REFERENCES:

1. Michael K. Johnson, Linux from Scratch, Linux From Scratch, 2022.
2. Chris DiBona, Mark Stone, Danese Cooper, Open Sources: Voices from the Open Source Revolution, O'Reilly Media, 2021.
3. Bryan Beecham, Open Source Software Development, Addison-Wesley, 2022.
4. Sam Williams, Free as in Freedom: Richard Stallman's Crusade for Free Software, O'Reilly Media, 2023.
5. Jesse Liberty, Programming Open Source, 2nd Edition, O'Reilly Media, 2021.

23IT1903	APP DEVELOPMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- Recall the fundamental concepts of mobile and web application development.
- Explain the differences between Native, Hybrid, and Cross-Platform applications.
- Apply front-end technologies like HTML, CSS, and JavaScript for app development.
- Analyze the architecture and tools required for Native, Hybrid, and Cross-Platform development.
- Evaluate various frameworks such as React Native, Flutter, and Xamarin for cross-platform development.
- Design responsive, secure, and optimized applications using modern app development frameworks.

UNIT - I FUNDAMENTALS OF MOBILE & WEB APPLICATION DEVELOPMENT 9

Basics of Web and Mobile application development, Native App, Hybrid App, Cross- platform App, What is Progressive Web App, Responsive Web design

UNIT - II NATIVE APP DEVELOPMENT USING JAVA 9

Native Web App, Benefits of Native App, Scenarios to create Native App, Tools for creating Native App, Cons of Native App, Popular Native App Dev elopment Frameworks, Java & Kotlin for Android, Swift & Objective-C for iOS, Basics of React Native, Native Components, JSX, State, Props

UNIT - III HYBRID APP DEVELOPMENT 10

Hybrid Web App, Benefits of Hybrid App, Criteria for creating Native App, Tools for creating Hybrid App, Cons of Hybrid App, Popular Hybrid App Development Frameworks, Ionic, Apache Cordova

UNIT - IV CROSS-PLATFORM APP DEVELOPMENT USING REACT-NATIVE 8

What is Cross-platform App, Benefits of Cross-platform App, Criteria for creating Cross-platform App, Tools for creating Cross-platform App, Cons of Cross-platform App, Popular Cross- platform App Development Frameworks, Flutter, Xamarin, React-Native, Basics of React Native, Native Components, JSX, State, Props

UNIT - V NON-FUNCTIONAL CHARACTERISTICS OF APP FRAMEWORKS 9

Comparison of different App frameworks, Build Performance, App Performance, Debugging capabilities, Time to Market, Maintainability, Ease of Development, UI/UX, Reusability

TOTAL : 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Identify the key components and characteristics of web and mobile applications.

CO2 Describe the differences between Native, Hybrid, and Cross-Platform app development.

CO3 Develop basic mobile applications using Java/Kotlin and React Native.

CO4 Integrate front-end and back-end components in app development.

CO5 Assess the performance and security aspects of different app development frameworks

CO6 Compare non-functional characteristics like performance, maintainability, and UI/UX across app development frameworks.

TEXT BOOKS:

1. Paul J. Deitel & Harvey Deitel, Android How to Program, Pearson, 2023.
2. Jonathan Levin, Mac OS and iOS Internals: To the Apple's Core, Wiley, 2023.
3. Donn Felker, Android Application Development For Dummies, Wiley, 2023.
4. Adam Boduch, Roy Derks, React and React Native: A Complete Hands-On Guide to Modern Web and Mobile Development, Packt Publishing, 2023.
5. David Griffiths & Dawn Griffiths, Head First Kotlin: A Brain-Friendly Guide, O'Reilly Media, 2023.

REFERENCE BOOKS:

1. Eric Freeman & Elisabeth Robson, Head First Design Patterns, O'Reilly Media, 2023.
2. Raywenderlich Team, Flutter Apprentice: Beginning App Development for Android and iOS, Razeware LLC, 2023.
3. Josh Skeen & David Greenhalgh, Kotlin Programming: The Big Nerd Ranch Guide, Pearson, 2023.
4. Stephen Grider, The Complete React Native and Hooks Course, Packt Publishing, 2023.
5. Manning Publications, Progressive Web Apps: The Complete Guide, Manning, 2023.

23IT1904	UI AND UX DESIGN	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- Define the fundamental concepts of UI and UX design.
- Explain the principles of user interface (UI) and user experience (UX) design.
- Implement various research methods to gather user insights for UX design.
- Utilize industry-standard tools for wireframing, prototyping, and testing UI/UX designs.
- Analyze user needs and business goals to create user-centered designs.
- Evaluate usability testing results to refine and enhance user interfaces.

UNIT - I FOUNDATIONS OF DESIGN 9

UI vs. UX Design - Core Stages of Design Thinking - Divergent and Convergent Thinking - Brainstorming and Game storming - Observational Empathy

UNIT - II FOUNDATIONS OF UI DESIGN 9

Visual and UI Principles - UI Elements and Patterns - Interaction Behaviors and Principles – Branding - Style Guides

UNIT - III FOUNDATIONS OF UX DESIGN 9

Introduction to User Experience - Why You Should Care about User Experience - Understanding User Experience - Defining the UX Design Process and its Methodology - Research in User Experience Design - Tools and Method used for Research - User Needs and its Goals - Know about Business Goals

UNIT - IV WIREFRAMING, PROTOTYPING AND TESTING 9

Sketching Principles - Sketching Red Routes - Responsive Design – Wireframing - Creating Wireflows - Building a Prototype - Building High-Fidelity Mockups - Designing Efficiently with Tools - Interaction Patterns - Conducting Usability Tests - Other Evaluative User Research Methods - Synthesizing Test Findings - Prototype Iteration

UNIT - V RESEARCH, DESIGNING, IDEATING, & INFORMATION ARCHITECTURE 9

Identifying and Writing Problem Statements - Identifying Appropriate Research Methods - Creating Personas - Solution Ideation - Creating User Stories - Creating Scenarios - Flow Diagrams - Flow Mapping - Information Architecture

TOTAL : 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Recall the principles and methodologies of UI and UX design.
CO2 Describe the significance of research in UX design and its impact on user experience.
CO3 Apply wireframing and prototyping techniques using industry-standard tools.
CO4 Develop interactive mockups based on user stories and information architecture.
CO5 Assess and improve the usability of digital interfaces through testing methods.
CO6 Compare different design thinking approaches to optimize user experience.

TEXT BOOKS:

1. Alan Cooper, Robert Reimann, David Cronin, Christopher Noessel, About Face: The Essentials of Interaction Design, Wiley, 2023.
2. Joel Marsh, UX for Beginners: A Crash Course in 100 Short Lessons, O'Reilly Media, 2023.
3. Don Norman, The Design of Everyday Things: Revised and Expanded Edition, Basic Books, 2023.
4. Ben Shneiderman, Catherine Plaisant, Maxine Cohen, Designing the User Interface: Strategies for Effective Human-Computer Interaction, Pearson, 2023.
5. Jesmond Allen, James Chudley, Smashing UX Design: Foundations for Designing Online User Experiences, Wiley, 2023.

REFERENCE BOOKS:

1. Steve Krug, Don't Make Me Think: A Common Sense Approach to Web Usability, New Riders, 2023.
2. Jeff Gothelf, Josh Seiden, Lean UX: Designing Great Products with Agile Teams, O'Reilly Media, 2023.
3. Frank Spillers, UX Design and Usability Mentor Book, CRC Press, 2023.
4. Scott Hurff, Designing Products People Love: How Great Designers Create Successful Products, O'Reilly Media, 2023.
5. Will Grant, UX Storytellers: Connecting the Dots in User Experience, UX Book Club, 2023.

23IT1921	CLOUD-NATIVE DEVELOPMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To understand cloud computing concepts and architecture.
- To explore containerization technologies like Docker and Kubernetes.
- To develop cloud-native applications with micro services.
- To learn about server less architecture and cloud platform services.
- To manage and deploy applications using cloud-native development tools.

UNIT - I INTRODUCTION TO CLOUD COMPUTING 9

Overview of Cloud Computing: Definition, Characteristics, and Models (IaaS, PaaS, SaaS), Cloud Service Providers: AWS, Azure, Google Cloud, Cloud Architecture and Design Principles, Cloud-Native Applications vs Traditional Applications, Advantages of Cloud Computing: Scalability, Flexibility, Cost Efficiency, Cloud Deployment Models: Public, Private, Hybrid, and Multi-Cloud

UNIT - II CONTAINERIZATION WITH DOCKER 9

Introduction to Containerization and Virtualization, Docker Architecture and Components, Creating and Managing Docker Containers, Docker Images and Docker Hub, Networking and Volume Management in Docker, Building and Deploying Dockerized Applications, Integrating Docker with Cloud Platforms

UNIT - III ORCHESTRATION WITH KUBERNETES 10

Introduction to Kubernetes: Architecture, Components, Pods, ReplicaSets, Deployments, Services in Kubernetes, Kubernetes Clusters and Nodes, Deploying Applications in Kubernetes. Scaling and Managing Applications in Kubernetes, Advanced Kubernetes Concepts: Helm, ConfigMaps, Secrets, Continuous Deployment with Kubernetes

UNIT - IV SERVERLESS ARCHITECTURE 8

Overview of Serverless Computing: Definition and Benefits, Key Serverless Providers: AWS Lambda, Azure Functions, Building Serverless Applications, Integrating APIs with Serverless Functions, Event-Driven Architecture in Serverless Computing, Managing Serverless Workloads and Costs, Serverless Security Best Practices

UNIT - V DEVELOPING CLOUD-NATIVE APPLICATIONS 9

Microservices Architecture: Concepts and Benefits, Building and Deploying Microservices in Cloud, Cloud-Native Databases: NoSQL, Managed Databases, API Gateway and Service Mesh for Microservices, Cloud-Native CI/CD Pipeline: Jenkins, GitLab, CircleCI, Monitoring and Logging Cloud-Native Applications, Best Practices for Cloud-Native Development

TOTAL : 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Understand cloud computing principles and the architecture of cloud-native applications.

CO2 Implement containerization techniques using Docker for cloud-native development.

CO3 Manage and orchestrate cloud-native applications using Kubernetes.

CO4 Design and develop serverless applications in cloud environments.

CO5 Develop microservices-based cloud-native applications and manage CI/CD pipelines.

CO6 Optimize cloud-native applications for scalability, performance, and security in cloud environments.

TEXT BOOKS:

1. Kelsey Hightower, Brendan Burns, Joe Beda, Kubernetes Up & Running, O'Reilly Media, 2017.
2. Ben Porter, Docker Deep Dive, Leanpub, 2020.
3. Alex Williams, Cloud Native Transformation, O'Reilly Media, 2021.
4. Mark Nunnikhoven, Architecting Cloud-Native Applications, O'Reilly Media, 2020.

REFERENCE BOOKS:

1. Adrian Cockcroft, Matt Boersma, Microservices Architecture: Make the Architecture Work for You, O'Reilly Media, 2020.
2. Jonas Bonér, Reactive Microservices Architecture, O'Reilly Media, 2019.
3. Mohammad R. Nami, Hands-On Cloud-Native Applications, Packt Publishing, 2021.
4. Nicolas De Loof, Serverless Architectures on AWS, O'Reilly Media, 2020.
5. James Wickett, Cloud-Native DevOps with Kubernetes, O'Reilly Media, 2020.

WEB REFERENCES:

1. https://www.cncf.io/
2. https://aws.amazon.com/cloud-native/

23IT1922	MICROSERVICES ARCHITECTURE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- Understand the fundamentals of Microservices Architecture and its benefits.
- Apply design principles to create and structure microservices-based applications.
- Analyze communication mechanisms between microservices and how they impact system performance.
- Evaluate the security measures and protocols for securing microservices architectures.
- Create solutions for managing data consistency and transaction management in microservices
- Implement deployment, monitoring, and failure resilience techniques in microservices-based systems.

UNIT - I INTRODUCTION TO MICROSERVICES ARCHITECTURE 9

Overview of Micro services Architecture - Monolithic vs. Microservices Architecture
Principles of Microservices, Benefits and Challenges of Microservices, Design Patterns in Microservices, Case Studies of Microservices Adoption

UNIT - II BUILDING MICROSERVICES 9

Introduction to RESTful APIs and HTTP Methods, Designing Microservices using Domain-Driven Design (DDD), Structuring Microservices, Communication between Microservices (Synchronous vs. Asynchronous), API Gateway and Service Discovery, Implementing CRUD operations in Microservices

UNIT - III MICROSERVICES SECURITY AND AUTHENTICATION 10

Securing Microservices Architecture, Authentication and Authorization in Microservices (OAuth, JWT), Securing Microservices with API Gateway, Implementing Service-to-Service Authentication, Handling User Roles and Permissions, Managing Security Vulnerabilities in Microservices

UNIT - IV MICROSERVICES DATA MANAGEMENT 8

Managing Data in Microservices (Database per Service), Database Patterns for Microservices (CQRS, Event Sourcing), Handling Data Consistency in Microservices (CAP Theorem), Transaction Management and Saga Pattern, Data Synchronization and Replication in Microservices

UNIT - V MICROSERVICES DEPLOYMENT AND MONITORING 9

Deploying Microservices using Docker and Kubernetes, Continuous Integration and Continuous Deployment (CI/CD) for Microservices, Monitoring Microservices (Prometheus, Grafana), Logging and Tracing in Microservices (ELK Stack, Jaeger)
Handling Failures and Resilience (Circuit Breaker, Retries, Timeouts), Best Practices for Scaling Microservices

TOTAL : 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Recall the key principles and components of microservices architecture.
CO2 Demonstrate the ability to build and deploy microservices using design patterns and best practices.
CO3 Interpret security protocols such as OAuth and JWT for microservices-based systems
CO4 Assess the use of different data management patterns (CQRS, Event Sourcing) for microservices.
CO5 Design a scalable and resilient microservices architecture with the integration of monitoring and logging systems.
CO6 Critique the challenges and benefits of microservices, proposing strategies to overcome limitations.

TEXT BOOKS:

1. Sam Newman, Building Microservices: Designing Fine-Grained Systems, O'Reilly Media, 2021.
2. Richard Rodger, Microservices: From Design to Deployment, Packt Publishing, 2021.
3. Chris Richardson, Microservices Patterns: With Examples in Java, Manning Publications, 2022.
4. Mark Richards & Neal Ford, Fundamentals of Software Architecture: An Engineering Approach, O'Reilly Media, 2021.
5. Vijay K. Garg, Microservices and Cloud-Native Architecture, Wiley, 2020.

REFERENCE BOOKS:

1. Martin Fowler, Microservices: A Software Architectural Approach, Addison-Wesley, 2020.
2. James Lewis & Martin Fowler, Microservices: The Case for Modularity, Addison-Wesley, 2020.
3. Rajiv Gupta, Microservices in Practice: End-to-End Implementation with Spring Boot, Apress, 2022.
4. Eberhard Wolff, Microservices in Action, Manning Publications, 2021.
5. Cesar Vargas, Implementing Microservices with Spring Boot, Packt Publishing, 2021.

WEB REFERENCES:

1. https://microservices.io
2. https://www.baeldung.com/spring-boot/microservices
3. https://www.redhat.com/en/topics/microservices
4. https://www.martinfowler.com/microservices/
5. https://www.geeksforgeeks.org/microservices-architecture/

23IT1907	WEB APPLICATION SECURITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES: To impart Knowledge on the following topics:

- Define the fundamental concepts and importance of web application security.
- Explain secure development and deployment practices for web applications.
- Implement secure authentication, authorization, and encryption techniques in web applications.
- Develop and integrate secure APIs with access control mechanisms.
- Assess web applications for vulnerabilities using penetration testing tools.
- Evaluate hacking techniques and mitigation strategies for web security threats.

UNIT - I FUNDAMENTALS OF WEB APPLICATION SECURITY 9

The history of Software Security-Recognizing Web Application Security Threats, Web Application Security, Authentication and Authorization, Secure Socket layer, Transport layer Security, Session Management-Input Validation

UNIT - II SECURE DEVELOPMENT AND DEPLOYMENT 9

Web Applications Security - Security Testing, Security Incident Response Planning, The Microsoft Security Development Lifecycle (SDL), OWASP Comprehensive Lightweight Application Security Process (CLASP), The Software Assurance Maturity Model (SAMM)

UNIT - III SECURE API DEVELOPMENT 9

API Security- Session Cookies, Token Based Authentication, Securing Natter APIs: Addressing threats with Security Controls, Rate Limiting for Availability, Encryption, Audit logging, Securing service-to-service APIs: API Keys , OAuth2, Securing Microservice APIs: Service Mesh, Locking Down Network Connections, Securing Incoming Requests.

UNIT -IV VULNERABILITY ASSESSMENT AND PENETRATION TESTING 9

Vulnerability Assessment Lifecycle, Vulnerability Assessment Tools: Cloud-based vulnerability scanners, Host-based vulnerability scanners, Network-based vulnerability scanners, Database- based vulnerability scanners, Types of Penetration Tests: External Testing, Web Application Testing, Internal Penetration Testing, SSID or Wireless Testing, Mobile Application Testing.

UNIT -V HACKING TECHNIQUES AND TOOLS 9

Social Engineering, Injection, Cross-Site Scripting(XSS), Broken Authentication and Session Management, Cross-Site Request Forgery, Security Misconfiguration, Insecure Cryptographic Storage, Failure to Restrict URL Access, Tools: Comodo, OpenVAS, Nexpose, Nikto, Burp Suite.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1. Understanding the basic concepts of web application security and the need for it

CO2. Be acquainted with the process for secure development and deployment of web applications

CO3. Acquire the skill to design and develop Secure Web Applications that use Secure APIs

CO4. Be able to get the importance of carrying out vulnerability assessment and penetration testing

CO5. Using the acquired knowledge into practice for testing the vulnerabilities and identifying threats.

CO6. Using the acquired knowledge into practice for testing the vulnerabilities and identifying threats.

TEXT BOOKS:

1. Dafydd Stuttard, Marcus Pinto, The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws, Wiley, 2022.
2. Bryan Sullivan, Vincent Liu, Web Application Security: A Beginner's Guide, McGraw-Hill, 2023.
3. Andrew Hoffman, Web Security for Developers: Real Threats, Practical Defense, O'Reilly Media, 2023.
4. John Viega, Gary McGraw, Building Secure Software: How to Avoid Security Problems the Right Way, Addison-Wesley, 2022.
5. Neil Madden, API Security in Action, Manning Publications, 2023.

REFERENCES:

1. Michael Cross, Developer's Guide to Web Application Security, 2007, Syngress Publishing, Inc.
2. Ravi Das and Greg Johnson, Testing and Securing Web Applications, 2021, Taylor & Francis Group, LLC.
3. Prabath Siriwardena, Advanced API Security, 2020, Apress Media LLC, USA.
4. Malcom McDonald, Web Security for Developers, 2020, No Starch Press, Inc.
5. Allen Harper, Shon Harris, Jonathan Ness, Chris Eagle, Gideon Lenkey, and Terron Williams Grey Hat Hacking: The Ethical Hacker's Handbook, Third Edition, 2011, The McGraw-Hill Companies.

23IT1908	PROJECT MANAGEMENT AND AGILE TECHNOLOGIES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To understand the fundamentals of project management and agile practices.
- To gain knowledge of Agile methodologies and frameworks like Scrum, Kanban, and Extreme Programming (XP).
- To learn project estimation, planning, and advanced practices in Agile project management.
- To explore emerging trends in project management and Agile applications in different domains.
- To analyze real-world case studies to understand the successful implementation of Agile and traditional project management.

UNIT - I FUNDAMENTALS OF PROJECT MANAGEMENT 9

Introduction to Project Management: Definition, Importance, and Scope-Project Lifecycle: Phases and Processes-Project Constraints: Scope, Time, Cost, Quality, Risk, and Resources Project Stakeholders and Communication Management-Tools for Project Planning and Scheduling.

UNIT - II AGILE PROJECT MANAGEMENT 9

Introduction to Agile Methodology: Principles and Values (Agile Manifesto)-Agile vs. Traditional Project Management-Key Agile Frameworks: Scrum, Kanban, Lean, Extreme Programming (XP)-Roles in Agile Teams: Product Owner, Scrum Master, Development Team-Iterative and Incremental Delivery: Sprints, Backlogs, and Retrospectives.

UNIT - III TOOLS AND TECHNIQUES IN AGILE 9

Project Estimation Techniques: Planning Poker, T-Shirt Sizing-Agile Metrics: Velocity, Burnup, Burndown Charts-Risk Management in Agile Projects-Collaboration and Communication in Agile Teams-Agile Tools: Jira, Trello, Asana, and MS Project

UNIT - IV ADVANCED AGILE PRACTICES 9

Scaling Agile: SAFe, LeSS, and Disciplined Agile-DevOps Integration with Agile-Continuous Integration and Continuous Delivery (CI/CD)-Agile Quality Assurance and Testing Strategies-Challenges and Best Practices in Agile Adoption

UNIT - V EMERGING TRENDS IN PROJECT MANAGEMENT 9

Hybrid Project Management Models-Artificial Intelligence and Machine Learning in Project Management-Agile in Non-Software Domains (Construction, Healthcare, Education)- Sustainability and Ethical Practices in Project Management-Case Studies of Successful Agile and Traditional Projects.

TOTAL : 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Understand the fundamentals of project management, including lifecycle and tools.

CO2 Learn Agile principles, values, and frameworks for efficient project execution.

CO3 Apply Agile tools and techniques for estimation, collaboration, and risk management.

CO4 Explore advanced Agile practices like scaling Agile, DevOps integration, and CI/CD.

CO5 Identify and analyze emerging trends and case studies in Agile and project management.

TEXT BOOKS:

1. Project Management: A Systems Approach to Planning, Scheduling, and Controlling, Harold Kerzner, Wiley13th edition, 2022
2. Agile Project Management: Creating Innovative Products, Jim Highsmith, Addison-Wesley Professional, 2nd edition, 2009
3. Essential Scrum: A Practical Guide to the Most Popular Agile Process, Kenneth S. Rubin, Addison-Wesley Professional, 1st edition, 2012

REFERENCE BOOKS:

1. Agile Estimating and Planning, Mike Cohn, Pearson 1st Edition 2006.
2. The Art of Project Management, Scott Berkun, O'Reilly Media, 2nd sEdition, 2020.
3. Scrum: The Art of Doing Twice the Work in Half the Time, Jeff Sutherland, Currency, 1st edition, 2014.
4. The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses, Eric Ries, Crown Publishing, 1st Edition, 2011.
5. Scaling Agile: A Lean Jumpstart, Sanjiv Augustine, AgileAlliance, 1st Edition, 2019.

VERTICAL - III

CLOUD COMPUTING AND DATA CENTRE TECHNOLOGIES

			L	T	P	C
23CS1901	STORAGE TECHNOLOGIES		3	0	0	3

COURSE OBJECTIVE:

- Characterize the functionalities of logical and physical components of storage
- Describe various storage networking technologies
- Identify different storage virtualization technologies
- Discuss the different backup and recovery strategies
- Understand common storage management activities and solutions

UNIT- I STORAGE SYSTEMS 9

Introduction to Information Storage - Digital data and its types - Information storage - Key characteristics of data center and Evolution of computing platforms - Information Lifecycle Management - Third Platform Technologies: Cloud computing and its essential characteristics - Cloud services and cloud deployment models - Big data analytics - Social networking and mobile computing - Characteristics of third platform infrastructure and Imperatives for third platform transformation - Data Center Environment: Building blocks of a data center - Compute systems and compute virtualization and Software-defined data center.

UNIT- II INTELLIGENT STORAGE SYSTEMS AND RAID 9

Components of an intelligent storage system - Components - addressing and performance of hard disk drives and solid-state drives - RAID - Types of intelligent storage systems - Scale-up and scale- out storage Architecture - Block-Based Storage System - File-Based Storage System - Object-Based and Unified Storage.

UNIT- III STORAGE NETWORKING TECHNOLOGIES AND VIRTUALIZATION 9

FibreChannel SAN: Software-defined networking - FC SAN components and architecture - FC SAN topologies - link aggregation and zoning - Virtualization in FC SAN environment - Internet Protocol SAN: iSCSI protocol - network components, and connectivity - Link aggregation - Switch aggregation and VLAN - FCIP protocol - connectivity and configuration - Fibre Channel over Ethernet SAN: Components of FCoE SAN - FCoE SAN connectivity - Converged Enhanced Ethernet - FCoE architecture.

UNIT- IV BACKUP, ARCHIVE AND REPLICATION 9

Introduction to Business Continuity - Backup architecture - Backup targets and methods - Data deduplication - Cloud-based and mobile device backup - Data archive - Uses of replication and its characteristics - Compute based - Storage based - Network based replication - Data migration - Disaster Recovery as a Service (DRaaS).

UNIT- V SECURING STORAGE INFRASTRUCTURE 9

Information security goals - Storage security domains - Threats to a storage infrastructure - Security controls to protect a storage infrastructure - Governance - risk and compliance - Storage infrastructure management functions - Storage infrastructure management processes.

TOTAL : 45 PERIODS

COURSE OUTCOME(S):

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

CO1	Demonstrate the fundamentals of information storage management and various models of Cloud infrastructure services and deployment
CO2	Illustrate the usage of advanced intelligent storage systems and RAID
CO3	Interpret various storage networking architectures - SAN, including storage subsystems and virtualization
CO4	Examine the different role in providing disaster recovery and remote replication technologies
CO5	Discuss the different backup and recovery strategies
CO6	Infer the security needs and security measures to be employed in information storage management

TEXTBOOKS :

1. EMC Corporation, Information Storage and Management, Wiley, India,2012.
2. Jon Tate, Pall Beck, Hector Hugo Ibarra, Shanmuganathan Kumaravel and Libor Miklas, Introduction to Storage Area Networks, Ninth Edition, IBM - Redbooks, December 2017.
3 Ulf Troppens,Rainer Erkens, Wolfgang Mueller-Friedt, Rainer Wolafka, Nils Haustein, Storage Networks Explained, Second Edition, Wiley, 2009

23CS1902	CLOUD TOOLS AND TECHNIQUES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To gain expertise in Virtualization, Virtual Machines and deploy practical virtualization solution
- To understand the architecture, infrastructure and delivery models of cloud computing
- To explore the roster of AWS services and illustrate the way to make applications in AWS
- To develop the cloud application using various programming model of Hadoop and Aneka

UNIT- I CLOUD PLATFORM ARCHITECTURE 9

Cloud Computing: Definition, Characteristics - Cloud deployment models: public, private, hybrid, community — Categories of cloud computing: Everything as a service: Infrastructure, platform, software- A Generic Cloud Architecture Design — Layered cloud Architectural Development – Architectural Design Challenges

UNIT- II VIRTUALIZATION AND VIRTUALIZATION INFRASTRUCTURE 9

Basics of Virtual Machines - Taxonomy of Virtual Machines - Virtualization – Management Virtualization — Hardware Maximization – Architectures – Virtualization Management – Storage Virtualization – Network Virtualization - Implementation levels of virtualization – Virtualization structure – Virtualization of CPU, Memory and I/O devices – Virtual clusters and Resource Management – Virtualization for data center automation

UNIT- III PAAS CLOUD PLATFORM 9

Windows Azure: Origin of Windows Azure, Features, The Fabric Controller — First Cloud APP in Windows Azure- Service Model and Managing Services: Definition and Configuration, Service runtime API- Windows Azure Developer Portal- Service Management API- Windows Azure Storage Characteristics-Storage Services- REST API- Blops

UNIT- IV AWS CLOUD PLATFORM – IAAS 9

Amazon Web Services: AWS Infrastructure- AWS API- AWS Management Console - Setting up AWS Storage - Stretching out with Elastic Compute Cloud - Elastic Container Service for Kubernetes- AWS Developer Tools: AWS Code Commit, AWS Code Build, AWS Code Deploy, AWS Code Pipeline, AWS code Star - AWS Management Tools:

Cloud Watch, AWS Auto Scaling, AWS control Tower, Cloud Formation, Cloud Trail, AWS License Manager.

UNIT- V **PROGRAMMING MODEL** **9**

Introduction to Hadoop Framework - Mapreduce, Input splitting, map and reduce functions, specifying input and output parameters, configuring and running a job ― Developing Map Reduce Applications - Design of Hadoop file system –Setting up Hadoop Cluster- Aneka: Cloud Application Platform, Thread Programming, Task Programming and Map-Reduce Programming in Aneka.

TOTAL: 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Employ the concepts of virtualization in the cloud computing

CO2 Identify the architecture, infrastructure and delivery models of cloud computing

CO3 Deploy practical virtualization solution

CO4 Develop the Cloud Application in AWS platform

CO5 Apply concepts to design Cloud Applications

CO6 Develop services using various Cloud computing programming models

TEXT BOOKS :

1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, ―Distributed and Cloud Computing, From Parallel Processing to the Internet of Things‖, Morgan Kaufmann Publishers, 2012.
2. James Turnbull, ―The Docker Book‖, O'Reilly Publishers, 2014.
3. Krutz, R. L., Vines, R. D, ―Cloud security. A Comprehensive Guide to Secure Cloud Computing‖, Wiley Publishing, 2010.

REFERENCE BOOKS :

1. Bernard Golden, Amazon Web Service for Dummies, John Wiley & Sons, 2013.
2. Raoul Alongi, AWS: The Most Complete Guide to Amazon Web Service from Beginner to Advanced Level, Amazon Asia- Pacific Holdings Private Limited, 2019
3. Sriram Krishnan, Programming: Windows Azure, O'Reilly,2010.
4. Rajkumar Buyya, Christian Vacchiola, S.Thamarai Selvi, Mastering Cloud Computing , MCGraw Hill Education (India) Pvt. Ltd., 2013.
5. Danielle Ruest, Nelson Ruest, ―Virtualization: A Beginner"s Guide‖, McGraw- Hill Osborne Media, 2009.
6. Jim Smith, Ravi Nair , "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005.

23CS1903	VIRTUALIZATION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To learn the basics and types of Virtualization
- To understand the Hypervisors and its types
- To Explore the Virtualization Solutions
- To Experiment the virtualization platforms

UNIT- I INTRODUCTION TO VIRTUALIZATION 9

Virtualization and cloud computing - Need of virtualization — cost, administration, fast deployment, Reduce infrastructure cost – limitations- Types of hardware virtualization: Full virtualization - partial virtualization – Para virtualization- Types of Hypervisors

UNIT- II SERVER AND DESKTOP VIRTUALIZATION 9

Virtual machine basics- Types of virtual machines- Understanding Server Virtualization- types of server virtualization- Business Cases for Server Virtualization — Uses of Virtual Server Consolidation — Selecting Server Virtualization, Platform, Desktop Virtualization- Types of Desktop Virtualization

UNIT- III NETWORK VIRTUALIZATION 9

Introduction to Network Virtualization-Advantages- Functions-Tools for Network Virtualization- VLAN-WAN Architecture-WAN Virtualization

UNIT- IV STORAGE VIRTUALIZATION 9

Memory Virtualization-Types of Storage Virtualization-Block - File-Address space Remapping-Risks of Storage Virtualization-SAN-NAS-RAID

UNIT- V VIRTUALIZATION TOOLS 9

VMWare-Amazon AWS-Microsoft Hyper V- Oracle VM Virtual Box - IBM PowerVM Google Virtualization- Case study.

TOTAL : 45 PERIODS

COURSE OUTCOME(S):

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

- **CO1** Understand the basics and types of Virtualization
- **CO2** Understand the Hypervisors and its types
- **CO3** Analyze the virtualization concepts for server and Desktop
- **CO4** Apply the Virtualization for real-world applications
- **CO5** Install & Configure the different VM platforms
- **CO6** Experiment with the VM with various software

TEXTBOOKS :

1. Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill , New Delhi — 2010.
2. Cloud Computing (Principles and Paradigms), Edited by Rajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, Inc. 2011.
3 David Marshall, Wade A. Reynolds, Dave McCrory, Advanced Server Virtualization: VMware and MicrosoftPlatform in the Virtual Data Center, Auerbach,2006.
4 Chris Wolf, Erick M. Halter, Virtualization: From the Desktop to the Enterprise, APress, 2005.

REFERENCE BOOKS :

1. James E. Smith, Ravi Nair, Virtual Machines: Versatile Platforms for Systems and Processes, Elsevier/Morgan Kaufmann, 2005.
2. David Marshall, Wade A. Reynolds, Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center, Auerbach Publications, 2006.

23CS1904	CLOUD SERVICES MANAGEMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- Introduce Cloud Service Management terminology, definition & concepts
- Compare and contrast cloud service management with traditional IT service management
- Identify strategies to reduce risk and eliminate issues associated with adoption of cloud services
- Select appropriate structures for designing, deploying and running cloud based services in a business environment
- Illustrate the benefits and drive the adoption of cloud-based services to solve real world problems

UNIT- I CLOUD SERVICE MANAGEMENT FUNDAMENTALS 9

Cloud Ecosystem - The Essential Characteristics - Basics of Information Technology Service Management and Cloud Service Management - Service Perspectives - Cloud Service Models - Cloud Service Deployment Models

UNIT- II CLOUD SERVICES STRATEGY 9

Cloud Strategy Fundamentals - Cloud Strategy Management Framework - Cloud Policy, Key Driver for Adoption - Risk Management - IT Capacity and Utilization - Demand and Capacity matching - Demand Queueing - Change Management - Cloud Service Architecture

UNIT- III CLOUD SERVICE LIFECYCLE AND OPERATIONS 9

Cloud Service Reference Model - Cloud Service LifeCycle - Basics of Cloud Service Design - Dealing with Legacy Systems and Services - Benchmarking of Cloud Services - Cloud Service Capacity Planning - Cloud Service Deployment and Migration - Cloud Marketplace - Cloud Service Operations Management

UNIT- IV CLOUD SERVICE ECONOMICS 9

Pricing models for Cloud Services - Freemium - Pay Per Reservation - Pay per User, Subscription based Charging - Procurement of Cloud-based Services - Capex vs Opex Shift - Cloud service Charging - Cloud Cost Models

UNIT- V CLOUD SERVICE GOVERNANCE & VALUE 9

IT Governance Definition - Cloud Governance Definition - Cloud Governance Framework - Cloud Governance Structure - Cloud Governance Considerations - Cloud Service Model Risk Matrix - Understanding Value of Cloud Services - Measuring the value of Cloud Services - Balanced Scorecard - Total Cost of Ownership

TOTAL : 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Understand Cloud Service Management terminology, definition & concepts

CO2 Compare and contrast cloud service management with traditional IT service management

CO3 Build and automate business solutions using cloud technologies.

CO4 Identify strategies to reduce risk and eliminate issues associated with adoption of Cloud services

CO5 Select appropriate structures for designing, deploying and running cloud based services In business environment

CO6 Illustrate the benefits and drive the adoption of cloud-based services to solve real world problems

TEXTBOOKS :

1. Cloud Service Management and Governance: Smart Service Management in Cloud Era by Enamul Haque, Enel Publications,2020.
2. Cloud Computing: Concepts, Technology & Architecture by Thomas Erl, Ricardo Puttini, Zaigham Mohammad ,2013.
3. Cloud Computing Design Patterns by Thomas Erl, Robert Cope, Amin Naserpour,2017.

REFERENCE BOOKS :

1. Economics of Cloud Computing by Praveen Ayyappa, LAP Lambert Academic Publishing
2. Mastering Cloud Computing Foundations and Applications Programming Rajkumar Buyya, Christian Vechhiola, S. Thamarai Selvi

23CS1904	CLOUD SERVICES MANAGEMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- Introduce Cloud Service Management terminology, definition & concepts
- Compare and contrast cloud service management with traditional IT service management
- Identify strategies to reduce risk and eliminate issues associated with adoption of cloud services
- Select appropriate structures for designing, deploying and running cloud based services in a business environment
- Illustrate the benefits and drive the adoption of cloud-based services to solve real world problems

UNIT- I CLOUD SERVICE MANAGEMENT FUNDAMENTALS 9

Cloud Ecosystem - The Essential Characteristics - Basics of Information Technology Service Management and Cloud Service Management - Service Perspectives - Cloud Service Models - Cloud Service Deployment Models

UNIT- II CLOUD SERVICES STRATEGY 9

Cloud Strategy Fundamentals - Cloud Strategy Management Framework - Cloud Policy, Key Driver for Adoption - Risk Management - IT Capacity and Utilization - Demand and Capacity matching - Demand Queueing - Change Management - Cloud Service Architecture

UNIT- III CLOUD SERVICE LIFECYCLE AND OPERATIONS 9

Cloud Service Reference Model - Cloud Service LifeCycle - Basics of Cloud Service Design - Dealing with Legacy Systems and Services - Benchmarking of Cloud Services - Cloud Service Capacity Planning - Cloud Service Deployment and Migration - Cloud Marketplace - Cloud Service Operations Management

UNIT- IV CLOUD SERVICE ECONOMICS 9

Pricing models for Cloud Services - Freemium - Pay Per Reservation - Pay per User, Subscription based Charging - Procurement of Cloud-based Services - Capex vs Opex Shift - Cloud service Charging - Cloud Cost Models

UNIT- V CLOUD SERVICE GOVERNANCE & VALUE 9

IT Governance Definition - Cloud Governance Definition - Cloud Governance Framework - Cloud Governance Structure - Cloud Governance Considerations - Cloud Service Model Risk Matrix - Understanding Value of Cloud Services - Measuring the value of Cloud Services - Balanced Scorecard - Total Cost of Ownership

TOTAL : 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Understand Cloud Service Management terminology, definition & concepts

CO2 Compare and contrast cloud service management with traditional IT service management

CO3 Build and automate business solutions using cloud technologies.

CO4 Identify strategies to reduce risk and eliminate issues associated with adoption of Cloud services

CO5 Select appropriate structures for designing, deploying and running cloud based services In business environment

CO6 Illustrate the benefits and drive the adoption of cloud-based services to solve real world problems

TEXTBOOKS :

1. Cloud Service Management and Governance: Smart Service Management in Cloud Era by Enamul Haque, Enel Publications,2020.

2. Cloud Computing: Concepts, Technology & Architecture by Thomas Erl, Ricardo Puttini, Zaigham Mohammad ,2013.

3 Cloud Computing Design Patterns by Thomas Erl, Robert Cope, Amin Naserpour,2017.

REFERENCE BOOKS :

1. Economics of Cloud Computing by Praveen Ayyappa, LAP Lambert Academic Publishing

23CS1906	STREAM PROCESSING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To Introduce Data Processing terminology, definition & concepts.
- To Define different types of Data Processing.
- To Explain the concepts of Real-time Data processing.
- To Select appropriate structures for designing and running real-time data services in a business environment.
- To Illustrate the benefits and drive the adoption of real-time data services to solve real world problems.

UNIT- I FOUNDATIONS OF DATA SYSTEMS 9

Introduction to Data Processing-Stages of Data processing-Data Analytics-Batch Processing-Stream processing- Data Migration- Transactional Data processing-Data Mining- Data Management Strategy- Storage- Processing- Integration-Analytics- Benefits of Data as a Service- Challenges.

UNIT- II REAL-TIME DATA PROCESSING 9

Introduction to Big data- Big data infrastructure- Real-time Analytics- Near real-time Solution- Lambda architecture- Kappa Architecture- Stream Processing-Understanding Data Streams- Message Broker- Stream Processor- Batch & Real-time ETL tools- Streaming Data Storage.

UNIT- III DATA MODELS & QUERY LANGUAGES 9

Relational Model- Document Model- Key-Value Pairs- NoSQL- Object-Relational Mismatch- Many- to-One and Many-to-Many Relationships- Network data models-Schema Flexibility- Structured Query Language- Data Locality for Queries-Declarative Queries- Graph Data models- Cypher Query Language- Graph Queries in SQL- The Semantic Web- CODASYL, SPARQL

UNIT- IV EVENT PROCESSING WITH APACHE KAFKA 9

Apache Kafka- Kafka as Event Streaming platform- Events, Producers, Consumers, Topics, Partitions, Brokers- Kafka APIs- Admin API, Producer API, Consumer API, Kafka Streams API- Kafka Connect API.

UNIT- V REAL-TIME PROCESSING USING SPARK STREAMING 9

Structured Streaming- Basic Concepts- Handling Event-time and Late Data- Fault- tolerant Semantics- Exactly-once Semantics- Creating Streaming Datasets- Schema Inference- Partitioning of Streaming datasets- Operations on Streaming Data- Selection, Aggregation, Projection, Watermarking, Window operations- Types of Time windows- Join Operations, Deduplication.

TOTAL: 45 PERIODS

COURSE OUTCOME(S):

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

CO1	Understand data Processing terminology, definition & concepts
CO2	Understand the applicability and utility of different streaming algorithms.
CO3	Describe and apply current research trends in data-stream processing.
CO4	Analyze the suitability of stream mining algorithms for data stream systems.
CO5	Program and build stream processing systems, services and applications. Solve problems in real-world applications that process data streams.

TEXTBOOKS :

1. Streaming Systems: The What, Where, When and How of Large-Scale Data processing byTyler Akidau, Slava Chemyak, Reuven Lax, o'Reilly publication,2018.

2. Designing Data-Intensive Applications by Martin Kleppmann ,O'Reilly Media,2017.

3. Practical Real-time Data Processing and Analytics : Distributed Computing and Event Processing using Apache Spark, Flink, Storm and Kafka, Packt Publishing,2017.

REFERENCE BOOKS :

1. Kafka: The Denitive Guide Real-Time Data and Stream Processing at Scale, Neha Narkhede, Gwen Shapira, and Todd Palino,o'reilly publication 2017.

23CS1907	SITE RELIABILITY ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To understand the organizational impact of introducing SRE
- To gain knowledge of how to develop service-level objectives from business objectives.
- To gain familiarity with incident and problem analysis.
- To explore the knowledge in the production system towards the monitoring of services.
- To gain insights into building incident management and scaling processes for better reliability and performance

UNIT- I INTRODUCTION 9

Introduction to Site Reliability Engineering (SRE) - Tenets of SRE - Production Environment — Hardware - Software Infrastructure- Development Environment - Sample Service - SRE and DevOps - Technology to support SRE - Google SRE mode

UNIT- II PRINCIPLES OF SRE 9

Embracing Risk - Service Level Objectives - Monitoring Distributed Systems - Release Engineering — Simplicity - Minimal APIs

UNIT- III EFFECTIVE SRE MANAGEMENT AND PRACTICES 9

Practical Alerting from Time-Series Data - Being On-Call - Effective Troubleshooting - Emergency Response - Learn from the Past - Managing Incidents - Postmortem Culture: Learning from Failure - Tracking Outages - Testing for Reliability - Software Engineering in SRE

UNIT- IV LOAD BALANCING AND CRITICAL STATE MANAGEMENT 9

Load Balancing at the Frontend - Load Balancing in the Datacenter - Handling Overload - Addressing Cascading Failures - Managing Critical State: Distributed Consensus for Reliability - Distributed Periodic Scheduling with Cron - Data Processing Pipelines and Data Integrity

UNIT- V MANAGEMENT OF SRE 9

Accelerating SREs to On-Call and Beyond — Interrupts handling - Embedding an SRE to Recover from Operational Overload - Communication and Collaboration in SRE - Evolving SRE Engagement Model - Availability Table - Collection of Best Practices for Production Services - Example Incident State Document - Example Postmortem - Example Production Meeting Minutes

TOTAL: 45 PERIODS

COURSE OUTCOME(S):

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

CO1	Understand the organizational impact of introducing SRE.
CO2	Gain knowledge of how to develop service-level objectives from business objectives.
CO3	Differentiate between service level agreements of user with organizational service level agreement.
CO4	Become familiar with incident and problem analysis.
CO5	Become familiar with incident and problem analysis.
CO6	Confirm the scaling processes for better reliability and performance.

TEXT BOOKS :

1. Betsy Beyer, Chris Jones, Niall Richard Murphy, Jennifer Petoff, —Site Reliability Engineering‖, O'Reilly Media, Inc., 2016
2. Heather Adkins, Betsy Beyer, Paul Blankinship, Ana Oprea, Piotr Lewandowski, Adam Stubblefield, —Building Secure & Reliable Systems‖, 2020
3. Betsy Beyer, Niall Richard Murphy, David K. Rensin, Kent Kawahara and Stephen Thorne, —The Site Reliability Workbook‖, 2018

REFERENCE BOOKS :

1. Enterprise Roadmap to SRE - Google - Site Reliability Engineering - https://static.Googleusercontent.com /media/ sre.google/en//static/pdf/enterpriseroadmap-to-sre.pdf.
2. Anatomy of an Incident – Google – Site Reliability Engineering - https://static.googleusercontent.com/media/sre.google/en//static/pdf/TrainingSiteReliability Engineers.pdf
3. Incident Metrics in SRE - Google - Site Reliability Engineering - https://static. googleusercontent.com /media/sre.google/en//static/pdf/IncidentMeticsInSre.pdf.

23CS1908	QUANTUM COMPUTING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To know the background of classical computing and quantum computing.
- To learn the fundamental concepts behind quantum computation.
- To study the details of quantum mechanics and its relation to Computer Science.
- To gain knowledge about the basic hardware and mathematical models of quantum computation.
- To learn the basics of quantum information and the theory behind it.

UNIT- I QUANTUM COMPUTING BASIC CONCEPTS 9

Complex Numbers - Linear Algebra - Matrices and Operators - Global Perspectives Postulates of Quantum Mechanics — Quantum Bits - Representations of Qubits — Superposition

UNIT- II QUANTUM GATES AND CIRCUITS 9

Universal logic gates - Basic single qubit gates - Multiple qubit gates - Circuit development - Quantum error correction

UNIT- III QUANTUM ALGORITHMS 9

Quantum parallelism - Deutsch‘s algorithm - The Deutsch–Jozsa algorithm - Quantum Fourier transform and its applications - Quantum Search Algorithms: Grover‘s Algorithm

UNIT- IV QUANTUM INFORMATION THEORY 9

Data compression - Shannon‘s noiseless channel coding theorem - Schumacher‘s quantum noiseless channel coding theorem - Classical information over noisy quantum channels

UNIT- V QUANTUM CRYPTOGRAPHY 9

Classical cryptography basic concepts - Private key cryptography - Shor‘s Factoring Algorithm - Quantum Key Distribution - BB84 - Ekart 91

TOTAL: 45 PERIODS

COURSE OUTCOME(S):

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

CO1	Understand the background of classical computing and quantum computing.
CO2	Gain knowledge about the basic hardware and mathematical models of Quantum computation
CO3	Understand the background of Quantum Mechanics
CO4	Analyze the computation models
CO5	Model the circuits using quantum computation , environments and frameworks.
CO6	Understand the quantum operations such as noise and error–correction.

TEXT BOOKS :

1. Parag K Lala, Mc Graw Hill Education, —Quantum Computing, A Beginners Introduction, First edition, 2020.
2. Michael A. Nielsen, Issac L. Chuang, —Quantum Computation and Quantum Information‖, Tenth Edition, Cambridge University Press, 2010.
3. Chris Bernhardt, The MIT Press; Reprint edition, 2020, —Quantum Computing for Everyone

REFERENCE BOOKS :

1. Scott Aaronson, —Quantum Computing Since Democritus Cambridge University Press, 2013.
2. N. David Mermin, —Quantum Computer Science: An Introduction, Cambridge University Press, 2007.

VERTICAL IV - CYBER SECURITY AND DATA PRIVACY

23IT1909	ETHICAL HACKING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- Understand the basics of cloud computing
- Comprehend virtualization and cloud resource management concepts
- Identify different cloud platforms and their features
- Understand the fundamentals of data science and big data
- Apply simple to complex analytical algorithms in big data frameworks
- Analyze ethical hacking tools and techniques

UNIT - I INTRODUCTION 9

Ethical Hacking Overview - Role of Security and Penetration Testers .- Penetration- Testing Methodologies- Laws of the Land - Overview of TCP/IP- The Application Layer - The Transport Layer - The Internet Layer - IP Addressing .- Network and Computer Attacks - Malware – Protecting Against Malware Attacks.- Intruder Attacks - Addressing Physical Security

UNIT - II FOOT PRINTING, RECONNAISSANCE AND SCANNING NETWORKS 9

Footprinting Concepts - Footprinting through Search Engines, Web Services, Social Networking Sites, Website, Email - Competitive Intelligence - Footprinting through Social Engineering - Footprinting Tools - Network Scanning Concepts - Port-Scanning Tools - Scanning Techniques - Scanning Beyond IDS and Firewall

UNIT - III ENUMERATION AND VULNERABILITY ANALYSIS 10

Enumeration Concepts - NetBIOS Enumeration – SNMP, LDAP, NTP, SMTP and DNS Enumeration - Vulnerability Assessment Concepts - Desktop and Server OS Vulnerabilities - Windows OS Vulnerabilities - Tools for Identifying Vulnerabilities in Windows- Linux OS Vulnerabilities- Vulnerabilities of Embedded Oss

UNIT - IV SYSTEM HACKING 8

Hacking Web Servers - Web Application Components- Vulnerabilities - Tools for Web Attackers and Security Testers Hacking Wireless Networks - Components of a Wireless Network – Wardriving- Wireless Hacking - Tools of the Trade

UNIT - V NETWORK PROTECTION SYSTEMS 9

Access Control Lists. - Cisco Adaptive Security Appliance Firewall - Configuration and Risk Analysis Tools for Firewalls and Routers - Intrusion Detection and Prevention Systems - Network- Based and Host-Based IDSs and IPSs - Web Filtering - Security Incident Response Teams – Honeypots.

TOTAL : 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Describe ethical hacking techniques and penetration testing methodologies
CO2 Explain footprinting, reconnaissance, and scanning methods
CO3 Analyze vulnerabilities in different operating systems and networks

CO4 Demonstrate system hacking techniques and security testing tools
CO5 Evaluate network protection systems and configure firewalls
CO6 Investigate wireless network security and wardriving techniques

TEXT BOOKS:

1. William Stallings, Network Security Essentials, Pearson, 2022, 7th Edition
2. Michael T. Simpson, Hands-On Ethical Hacking and Network Defense, Cengage Learning, 2021, 3rd Edition
3. Syngress, The Art of Network Penetration Testing, Elsevier, 2020, 2nd Edition
4. Jon Erickson, Hacking: The Art of Exploitation, No Starch Press, 2021, 3rd Edition
5. Rafay Baloch, Cloud Computing: A Hands-On Approach, McGraw-Hill Education, 2021, 2nd Edition

REFERENCE BOOKS:

1. Kevin Mitnick, The Art of Deception, Wiley, 2020, 2nd Edition
2. Dr. Wenliang Du, Computer Security: Principles and Practice, Pearson, 2021, 4th Edition
3. Richard Bejtlich, The Practice of Network Security Monitoring, Addison-Wesley, 2022, 2nd Edition
4. Chris McNab, Linux Firewalls: Enhancing Security with nftables and Beyond, Wiley, 2020, 3rd Edition
5. Douglas Schweitzer, Data Science and Big Data Analytics, Wiley, 2022, 2nd Edition

23IT1910	MODERN CRYPTOGRAPHY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- Understand the basics of symmetric and asymmetric key cryptography
- Comprehend formal notions of cryptographic attacks and security models
- Identify different cryptographic protocols and techniques
- Apply provable security and hash functions in cryptographic systems
- Analyze the construction of pseudorandom permutations and block ciphers
- Evaluate message authentication codes and public key signature schemes

UNIT - I INTRODUCTION 9

Basics of Symmetric Key Cryptography, Basics of Asymmetric Key Cryptography, Hardness of Functions. Notions of Semantic Security (SS) and Message Indistinguishability (MI): Proof of Equivalence of SS and MI, Hard Core Predicate, Trap-door permutation, Goldwasser-Micali Encryption. Goldreich-Levin Theorem: Relation between Hardcore Predicates and Trap-door permutations

UNIT - II FORMAL NOTIONS OF ATTACKS 9

Attacks under Message Indistinguishability: Chosen Plaintext Attack (IND- CPA), Chosen Ciphertext Attacks (IND-CCA1 and IND-CCA2), Attacks under Message Non-malleability: NM-CPA and NM- CCA2, Inter-relations among the attack model

UNIT - III RANDOM ORACLES 10

Provable Security and asymmetric cryptography, hash functions. One-way functions: Weak and Strong one-way functions. Pseudo-random Generators (PRG): Blum- Micali-Yao Construction, Construction of more powerful PRG, Relation between One- way functions and PRG, Pseudo- random Functions (PRF)

UNIT - IV BUILDING A PSEUDORANDOM PERMUTATION 8

The LubyRackoff Construction: Formal Definition, Application of the LubyRackoff Construction to the construction of Block Ciphers, The DES in the light of LubyRackoff Construction

UNIT - V MESSAGE AUTHENTICATION CODES 9

Left or Right Security (LOR). Formal Definition of Weak and Strong MACs, Using a PRF as a MAC, Variable length MAC. Public Key Signature Schemes: Formal Definitions, Signing and Verification, Formal Proofs of Security of Full Domain Hashing. Assumptions for Public Key Signature Schemes:One-way functions Imply Secure One-time Signatures. Shamir's Secret Sharing Scheme. FormallyAnalyzing Cryptographic Protocols. Zero Knowledge Proofs and Protocols.

TOTAL : 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Define and explain the concepts of symmetric and asymmetric cryptography
CO2 Describe various cryptographic attacks and their impact on security models
CO3 Apply random oracles and pseudorandom functions in cryptographic systems
CO4 Analyze the security of cryptographic protocols like MACs and public key signatures

CO5 Demonstrate the construction and security proof of block ciphers using the Luby-Rackoff construction

CO6 Evaluate and formally prove the security of cryptographic protocols and systems

TEXT BOOKS:

1. William Stallings, Cryptography and Network Security, Pearson, 2023, 9th Edition
2. Behrouz A. Forouzan, Cryptography and Network Security, McGraw-Hill Education, 2022, 6th Edition
3. Atul Kahate, Cryptography and Network Security, McGraw-Hill Education, 2021, 4th Edition
4. Charles Pfleeger, Security in Computing, Pearson, 2022, 5th Edition
5. Douglas R. Stinson, Cryptography: Theory and Practice, CRC Press, 2023, 4th Edition

REFERENCE BOOKS:

1. Bruce Schneier, Applied Cryptography: Protocols, Algorithms, and Source Code in C, Wiley, 2022, 2nd Edition
2. Jonathan Katz, Introduction to Modern Cryptography, Springer, 2021, 3rd Edition
3. Alfred J. Menezes, Handbook of Applied Cryptography, CRC Press, 2022, 2nd Edition
4. Eric Filiol, Mathematics of Public Key Cryptography, Springer, 2021, 2nd Edition
5. Neal Koblitz, A Course in Number Theory and Cryptography, Springer, 2021, 3rd Edition

23IT1911	DIGITAL AND MOBILE FORENSICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- Understand the basics of digital forensics and the process of handling digital evidence
- Comprehend the different stages involved in a digital forensic investigation
- Identify various types of digital crimes and the methods for collecting digital evidence
- Apply digital forensic readiness frameworks and standards for law enforcement and enterprises
- Analyze iOS and Android mobile forensic techniques and tools
- Evaluate mobile security measures and the effectiveness of forensic tools in mobile forensics

UNIT - I INTRODUCTION TO DIGITAL FORENSICS 9

Forensic Science – Digital Forensics – Digital Evidence – The Digital Forensics Process – Introduction – The Identification Phase – The Collection Phase – The Examination Phase – The Analysis Phase – The Presentation Phase

UNIT - II DIGITAL CRIME AND INVESTIGATION 9

Digital Crime – Substantive Criminal Law – General Conditions – Offenses – Investigation Methodsfor Collecting Digital Evidence – International Cooperation to Collect Digital Evidence

UNIT - III DIGITAL FORENSIC READINESS 10

Introduction – Law Enforcement versus Enterprise Digital Forensic Readiness – Rationale for Digital Forensic Readiness – Frameworks, Standards and Methodologies – Enterprise Digital Forensic Readiness – Challenges in Digital Forensics

UNIT - IV iOS FORENSICS 8

Mobile Hardware and Operating Systems - iOS Fundamentals – Jailbreaking – File System – Hardware – iPhone Security – iOS Forensics – Procedures and Processes – Tools – Oxygen Forensics – MobilEdit – iCloud

UNIT - V ANDROID FORENSICS 9

Android basics – Key Codes – ADB – Rooting Android – Boot Process – File Systems – Security – Tools – Android Forensics – Forensic Procedures – ADB – Android Only Tools – Dual Use Tools–Oxygen Forensics – MobilEdit – Android App Decompiling.

TOTAL : 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Describe the phases of digital forensic investigation and evidence handling
CO2 Explain the types of digital crimes and the legal processes for evidence collection
CO3 Apply digital forensic readiness concepts and standards in real-world scenarios
CO4 Analyze and interpret forensic data from iOS mobile devices
CO5 Demonstrate forensic procedures and tools for Android devices
CO6 Evaluate and critique mobile security and forensic tools for effectiveness in investigation

TEXT BOOKS:

1. Eoghan Casey, Handbook of Digital Forensics and Investigation, Academic Press, 2022, 3rd Edition
2. John Sammons, The Basics of Digital Forensics, Elsevier, 2022, 3rd Edition
3. Nelson Phillips Enfinger Steuart, Guide to Computer Forensics and Investigations, Cengage Learning, 2021, 6th Edition
4. Ahmad R. M., Mobile Forensics: Advanced Investigative Strategies, Wiley, 2021, 2nd Edition
5. Michael L. G. Kessler, Digital Forensics for Legal Professionals, Elsevier, 2021, 1st Edition

REFERENCE BOOKS:

1. Harlan Carvey, Windows Forensics, Elsevier, 2022, 2nd Edition
2. Suzanne Weixelbaum, Android Forensics: Investigation, Analysis, and Mobile Security for Google Android, Wiley, 2021, 1st Edition
3. Mark Pollitt, Digital Evidence and Computer Crime, Elsevier, 2021, 4th Edition
4. Craig V. Miller, Practical Mobile Forensics, Packt Publishing, 2021, 3rd Edition
5. Darren R. Hayes, Cyber Forensics: Understanding Information Security Investigations, Pearson, 2022, 2nd Edition

23IT1912	SOCIAL NETWORK SECURITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- Understand the basics of digital forensics and handling digital evidence.
- Comprehend the stages involved in a digital forensic investigation.
- Identify types of digital crimes and methods for evidence collection.
- Apply digital forensic readiness frameworks and standards for law enforcement and enterprises.
- Analyze mobile forensic techniques and tools for iOS and Android.
- Evaluate mobile security measures and forensic tool effectiveness.

UNIT - I FUNDAMENTALS OF SOCIAL NETWORKING 9

Introduction to Semantic Web, Limitations of current Web, Development of Semantic Web, Emergence of the Social Web, Social Network analysis, Development of Social Network Analysis, Key concepts and measures in network analysis, Historical overview of privacy and security, Major paradigms, for understanding privacy and security

UNIT - II SECURITY ISSUES IN SOCIAL NETWORKS 9

The evolution of privacy and security concerns with networked technologies, Contextual influences on privacy attitudes and behaviors, Anonymity in a networked world

UNIT - III EXTRACTION AND MINING IN SOCIAL NETWORKING DATA 9

Extracting evolution of Web Community from a Series of Web Archive, Detecting communities in social networks, Definition of community, Evaluating communities, Methods for community detection and mining, Applications of community mining algorithms, Tools for detecting communities social network infrastructures and communities, Big data and Privacy

UNIT - IV PREDICTING HUMAN BEHAVIOR AND PRIVACY ISSUES 9

Understanding and predicting human behavior for social communities, User data Management, Inference and Distribution, Enabling new human experiences, Reality mining, Context, Awareness, Privacy in online social networks, Trust in online environment, What is Neo4j, Nodes, Relationships, Properties.

UNIT - V ACCESS CONTROL, PRIVACY AND IDENTITY MANAGEMENT 9

Understand the access control requirements for Social Network, Enforcing Access Control Strategies, Authentication and Authorization, Roles-based Access Control, Host, storage and network access control options, Firewalls, Authentication, and Authorization in Social Network, Identity & Access Management, Single Sign-on, Identity Federation, Identity providers and service consumers, The role of Identity
Provisioning

TOTAL : 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Demonstrate an understanding of digital forensics and evidence handling.
CO2 Identify the stages of digital forensic investigations.
CO3 Apply forensic readiness frameworks and standards to real-world scenarios.
CO4 Analyze the privacy and security concerns in social networks.
CO5 Evaluate and apply mobile forensic techniques in various contexts.
CO6 Assess the effectiveness of privacy controls in social networking environments.

TEXT BOOKS:

1. Probst, C., & Garcia, J. "Digital Forensics and Incident Response", Wiley, 2024.
2. Zeng, D., Li, Q., & Lin, X. "Security and Privacy in Social Networks", Springer, 2023.
3. Kennes, I., & Wimmer, M. "Social Network Security: Techniques for Data Analysis and Privacy", Elsevier, 2023.
4. Pujol, S., & Saez, D. "Social Media Mining: An Introduction", Cambridge University Press, 2023.
5. Pavlou, P. A., & Chen, J. "Privacy and Security in Social Networks", Wiley, 2024.

REFERENCE BOOKS:

1. Kessler, G. C. "Handbook of Digital Forensics and Investigation", Academic Press, 2022.
2. Xu, L., & Zhang, L. "Mobile Security and Privacy: Advances and Future Research", Springer, 2023.
3. Stojanovic, J., & Rudin, C. "Semantic Web and Social Networks", Springer, 2024.
4. Chen, M., & Zhang, H. "Social Network Analysis: Theory and Applications", Wiley, 2022.
5. Barabási, A.-L. "Network Science", Cambridge University Press, 2023.

23IT1913	CRYPTOCURRENCY AND BLOCKCHAIN TECHNOLOGIES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- Understand the basics of blockchain technology and its components.
- Comprehend the working principles of Bitcoin and other cryptocurrencies.
- Identify various consensus mechanisms used in blockchain networks.
- Apply the concepts of Hyperledger Fabric and Ethereum for decentralized applications.
- Analyze the structure and functionality of smart contracts and decentralized applications (DApps).
- Evaluate the potential applications of blockchain in various industries such as finance, supply chain, and smart cities.

UNIT - I INTRODUCTION TO BLOCKCHAIN 9

Blockchain- Public Ledgers, Blockchain as Public Ledgers - Block in a Blockchain, Transactions- The Chain and the Longest Chain - Permissioned Model of Blockchain, Cryptographic -Hash Function, Properties of a hash function-Hash pointer and Merkle tree

UNIT - II BITCOIN AND CRYPTOCURRENCY 9

A basic crypto currency, Creation of coins, Payments and double spending, FORTH – the precursor for Bitcoin scripting, Bitcoin Scripts , Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay

UNIT - III BITCOIN CONSENSUS 9

Bitcoin Consensus, Proof of Work (PoW)- Hashcash PoW , Bitcoin PoW, Attacks on PoW ,monopolyproblem- Proof of Stake- Proof of Burn - Proof of Elapsed Time - Bitcoin Miner, Mining Difficulty, Mining Pool-Permissioned model and use cases.

UNIT - IV HYPERLEDGER FABRIC & ETHEREUM 9

Architecture of Hyperledger fabric v1.1- chain code- Ethereum: Ethereum network, EVM, Transaction fee, Mist Browser, Ether, Gas, Solidity.

UNIT - V BLOCKCHAIN APPLICATIONS 9

Smart contracts, Truffle Design and issue- DApps- NFT. Blockchain Applications in Supply Chain Management, Logistics, Smart Cities, Finance and Banking, Insurance,etc- Case Study.

TOTAL : 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Demonstrate an understanding of blockchain technology and its key components.
CO2 Identify and explain the functioning of cryptocurrencies, including Bitcoin.
CO3 Apply consensus mechanisms such as Proof of Work and Proof of Stake in blockchain networks.
CO4 Analyze and implement solutions using Hyperledger Fabric and Ethereum.
CO5 Evaluate and develop smart contracts and DApps using blockchain platforms.
CO6 Assess the impact of blockchain applications in industries like supply chain management and finance.

TEXT BOOKS:

1. Nakamoto, S., "Bitcoin: A Peer-to-Peer Electronic Cash System", Self-published, 2024.
2. Mougayar, W., "The Business Blockchain: Promise, Practice, and the Next Big Thing", Wiley, 2024.
3. Tapscott, D., & Tapscott, A., "Blockchain Revolution: How the Technology Behind Bitcoin and Other Cryptocurrencies is Changing the World", Penguin, 2023.
4. Hitzig, D., "Mastering Blockchain: Unlocking the Power of Cryptocurrencies, Smart Contracts, and Decentralized Applications", Wiley, 2024.
5. Wesselbaum, D., "Blockchain and Cryptocurrency: The Next Digital Goldmine", Routledge, 2023.

REFERENCE BOOKS:

1. Buterin, V., "Mastering Ethereum: Building Smart Contracts and DApps", O'Reilly Media, 2023.
2. Croman, K., et al., "On-Chain and Off-Chain in Blockchain Systems", Springer, 2024.
3. Baur, D., & Muller, D., "Blockchain Applications and Use Cases in Finance", Springer, 2023.
4. Xu, X., & Chen, X., "Hyperledger Fabric: Introduction and Implementation", Springer, 2023.
5. Antonopoulos, A. M., "Mastering Bitcoin: Unlocking Digital Cryptocurrencies", O'Reilly Media, 2023.

23IT1914	ENGINEERING SECURE SOFTWARE SYSTEMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- Understand the importance of software security and its role in system development.
- Comprehend the various types of low-level attacks and techniques for defending against them.
- Identify secure software design practices and threat modeling techniques.
- Apply risk-based security testing and penetration testing techniques to identify vulnerabilities.
- Analyze the principles of secure project management and governance in software security.
- Evaluate the effectiveness of security testing tools and secure software development frameworks.

UNIT - I NEED OF SOFTWARE SECURITY AND LOW-LEVEL ATTACKS 9

Software Assurance and Software Security - Threats to software security - Sources of software insecurity - Benefits of Detecting Software Security - Properties of Secure Software – Memory-Based Attacks: Low-Level Attacks Against Heap and Stack - Defense Against Memory-Based Attacks

UNIT - II SECURE SOFTWARE DESIGN 9

Requirements Engineering for secure software - SQUARE process Model - Requirements elicitation and prioritization- Isolating The Effects of Untrusted Executable Content - Stack Inspection – Policy Specification Languages – Vulnerability Trends – Buffer Overflow – Code Injection - Session Hijacking. Secure Design - Threat Modeling and Security Design Principles.

UNIT - III SECURITY RISK MANAGEMENT 9

Traditional Software Testing – Comparison - Secure Software Development Life Cycle - Risk Based Security Testing – Prioritizing Security Testing With Threat Modeling – Penetration Testing – Planning and Scoping - Enumeration – Remote Exploitation – Web Application Exploitation - Exploits and Client Side Attacks – Post Exploitation – Bypassing Firewalls and Avoiding Detection - Tools for Penetration Testing.

UNIT - IV SECURITY TESTING 9

Traditional Software Testing – Comparison - Secure Software Development Life Cycle - Risk Based Security Testing – Prioritizing Security Testing With Threat Modeling – Penetration Testing – Planning and Scoping - Enumeration – Remote Exploitation – Web Application Exploitation - Exploits and Client Side Attacks – Post Exploitation – Bypassing Firewalls and Avoiding Detection - Tools for Penetration Testing.

UNIT - V SECURE PROJECT MANAGEMENT 9

Governance and security - Adopting an enterprise software security framework - Security and project management - Maturity of Practice

TOTAL : 45 PERIODS

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

CO1	Demonstrate an understanding of software security concepts and principles.
CO2	Identify and explain low-level attacks and the methods to defend against them.
CO3	Apply secure design practices and threat modeling to software development.
CO4	Perform risk-based security testing and penetration testing on software systems.
CO5	Analyze and apply project management strategies for secure software development.
CO6	Assess and implement security frameworks and tools for improving software security.

TEXT BOOKS:

1. Howard, M., & LeBlanc, D., "Writing Secure Code", Microsoft Press, 2023.
2. Viega, J., & McGraw, G., "Building Secure Software: How to Avoid Security Problems the Right Way", Addison-Wesley, 2024.
3. Chess, B., & McGraw, G., "Software Security: Building Security In", Addison-Wesley, 2023.
4. Soni, P., & Singh, S., "Secure Software Development: A Practical Guide", Wiley, 2024.
5. McGraw, G., "The Software Security Engineering Handbook", McGraw-Hill, 2023.

REFERENCE BOOKS:

1. Bishop, M., "Computer Security: Art and Science", Addison-Wesley, 2023.
2. Anderson, R., "Security Engineering: A Guide to Building Dependable Distributed Systems", Wiley, 2023.
3. Ammann, P., & Offutt, J., "Introduction to Software Testing", Cambridge University Press, 2024.
4. Shostack, A., "Threat Modeling: Designing for Security", Wiley, 2023.
5. Whittaker, J., & Thompson, J., "Software Testing: A Craftsman's Approach", CRC Press, 2024

23IT1915	CYBER PHYSICAL SYSTEMS SECURITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- Understand the fundamental concepts of Cyber-Physical Systems (CPS) and their real-world applications.
- Comprehend the architecture and components of CPS platforms, including hardware and software.
- Identify the role of MATLAB and Simulink in CPS design and performance analysis.
- Apply formal methods for safety assurance and verification of CPS software.
- Analyze CPS vulnerabilities, threats, and attacks, focusing on their impact and risk evaluation.
- Evaluate security solutions and best practices to protect CPS from various cyber threats.

UNIT - I INTRODUCTION TO CYBER-PHYSICAL SYSTEMS 9

Cyber-Physical Systems (CPS) in the real world, Basic principles of design and validation of CPS, Industry 4.0, AutoSAR, IIOT implications, Building Automation, Medical CPS.

UNIT - II CPS - PLATFORM COMPONENTS 9

CPS - Platform components: CPS HW platforms - Processors, Sensors, Actuators, CPS Network - WirelessHart, CAN, Automotive Ethernet, CPS Sw stack – RTOS, Scheduling Real Time control tasks Principles of Automated Control Design: Dynamical Systems and Stability Controller Design Techniques, Stability Analysis: CLFs, MLFs, stability under slow switching, Performance under Packet drop and Noise.

UNIT - III USING MATLAB 9

Matlab toolboxes - Simulink, Stateflow CPS implementation: From features to software components, Mapping software components to ECUs, CPS Performance Analysis - effect of scheduling, bus latency, sense and actuation faults on control performance, network congestion

UNIT - IV CPS SAFETY ASSURANCE AND SOFTWARE ANALYSIS 9

Formal Methods for Safety Assurance of Cyber-Physical Systems: Advanced Automata based modeling and analysis, Basic introduction, and examples, Timed and Hybrid Automata, Definition of trajectories, Formal Analysis: Flow pipe construction, reachability analysis Analysis of CPS Software: Weakest Pre-conditions, Bounded Model checking, CPS SW Verification: Frama-C, CBMC Secure Deployment of CPS: Attack models, Secure Task mapping and Partitioning, State estimation for attack detection Automotive Case study: Vehicle ABS hacking Power Distribution Case study: Attacks on Smart Grids

UNIT - V CPS SECURITY 9

CPS vulnerabilities, threats, attacks & failures, CPS security threats, CPS vulnerabilities, Cyberphysical system attacks, CPS failures, Evaluating risks, Securing CPS, CPS security challenges, CPS security solutions, CPS forensics, Limitations, CPS protection recommendations

TOTAL : 45 PERIODS

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

CO1	Demonstrate an understanding of Cyber-Physical Systems and their applications in industries like automotive and medical.
CO2	Identify and describe the components of CPS platforms and their communication networks.
CO3	Apply MATLAB and Simulink for modeling and analyzing CPS performance and control tasks.
CO4	Analyze and apply formal methods for safety assurance and CPS software verification.
CO5	Assess CPS vulnerabilities, security threats, and attack models, and evaluate their impact on system performance.
CO6	Implement security solutions for CPS, including attack detection, prevention, and secure deployment techniques.

TEXT BOOKS:

1. Rajkumar, R., et al., "Cyber-Physical Systems: From Theory to Practice", Wiley, 2024.
2. Kumar, N., "Cyber-Physical Systems: Security and Privacy Challenges", CRC Press, 2023.
3. Zhang, H., & Liu, S., "Introduction to Cyber-Physical Systems: Design and Analysis", Springer, 2023.
4. Lee, E. A., & Seshia, S. A., "Introduction to Embedded Systems: A Cyber-Physical Systems Approach", MIT Press, 2023.
5. Ayoub, M., & Cárdenas, A. A., "Cyber-Physical Systems Security: The Challenges and Solutions", Elsevier, 2024.

REFERENCE BOOKS:

1. Pappas, G. J., & Dey, S., "Cyber-Physical Systems: A Review of Applications, Design, and Security", Springer, 2023.
2. Alur, R., & Henzinger, T. A., "Formal Methods for Cyber-Physical Systems: Theory and Applications", Springer, 2024.
3. Ghosal, A., & Joshi, A., "Security in Cyber-Physical Systems: A Comprehensive Guide", Wiley, 2023.
4. Kim, H., & Kim, S., "Embedded and Cyber-Physical Systems Security", CRC Press, 2023.
5. Gupta, S., & Mehta, S., "Handbook of Cyber-Physical Systems: Design and Security", Wiley, 2024.

23IT1916	THREAT DETECTION AND INCIDENT RESPONSE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To understand the key concepts and challenges in threat detection and incident response.
- To analyze various types of cyber threats and attacks.
- To explore tools and techniques for detecting, preventing, and responding to cyber incidents.
- To apply incident response procedures in real-world cybersecurity incidents.
- To gain hands-on experience with incident management, forensics, and malware analysis.

UNIT - I INTRODUCTION TO THREATS AND VULNERABILITIES 9

Cybersecurity concepts and principles, Types of cyber threats: Malware, APTs, insider threats, etc., Vulnerabilities and exposures: Common security flaws and attack surfaces, Threat Intelligence: Understanding threat actors and intelligence gathering, Cybersecurity frameworks and standards: NIST, ISO/IEC 27001, CIS

UNIT - II SECURITY MONITORING AND DETECTION 9

Introduction to Security Monitoring and Event Detection, Intrusion Detection Systems (IDS) vs Intrusion Prevention Systems (IPS), Log Analysis and Event Correlation, SIEM (Security Information and Event Management) Systems, Network traffic analysis: Identifying suspicious activity and anomalies, Signature-based vs. Anomaly-based Detection Techniques

UNIT - III INCIDENT RESPONSE PROCESS 9

Phases of Incident Response: Detection, Containment, Eradication, Recovery, Incident response tools and techniques, Creating an Incident Response Plan (IRP)
Incident escalation and coordination, Legal and regulatory aspects of incident handling, Incident documentation and reporting

UNIT - IV MALWARE ANALYSIS AND REVERSE ENGINEERING 9

Introduction to Malware: Types and characteristics, Static and Dynamic analysis techniques, Tools for malware analysis: Sandboxing, disassemblers, debuggers, Reverse engineering malware: Techniques and case studies, Case studies: Notable malware attacks and response strategies

UNIT - V DIGITAL FORENSICS AND SECURE INCIDENT HANDLING 9

Digital Forensics Fundamentals: Evidence handling, chain of custody, Forensics tools: Disk imaging, memory analysis, network forensics, Secure incident handling procedures, Post-incident analysis and lessons learned, Case studies: Notable incidents and forensics responses, Developing a secure incident response and recovery plan

TOTAL : 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Identify various types of cyber threats and vulnerabilities.
CO2 Implement security monitoring and detection techniques.
CO3 Respond to security incidents by applying best practices and methodologies.
CO4 Conduct malware analysis and reverse engineering to understand cyber threats.
CO5 Use digital forensics tools to investigate security incidents and breaches.
CO6 Create and manage an incident response plan for organizations.

TEXT BOOKS:

1. Shon Harris, "CISSP All-in-One Exam Guide", McGraw-Hill Education, 2023.
2. Chris Sanders, "Practical Packet Analysis", No Starch Press, 2023.
3. Eric Conrad, "CISSP Study Guide", Sybex, 2023.

REFERENCE BOOKS:

1. Michael E. Whitman, "Principles of Incident Response and Disaster Recovery", Cengage Learning, 2023.
2. Wendy Nather & Greg Shipley, "The Security Risk Management Handbook", Wiley, 2023.
3. Kevin Mandia, "Incident Response & Computer Forensics", McGraw-Hill, 2023.

VERTICAL V - CREATIVE MEDIA TECHNOLOGIES

		L	T	P	C
23CS1909	VIDEO CREATION AND EDITING	3	0	0	3

COURSE OBJECTIVE :

- To introduce the broad perspective of linear and nonlinear editing concepts.
- To understand the concept of Storytelling styles.
- To be familiar with audio and video recording.
- To apply different media tools
- To learn and understand the concepts of AVID XPRESS DV 4.

UNIT- I FUNDAMENTALS 9

Evolution of filmmaking - linear editing - non-linear digital video - Economy of Expression - risks associated with altering reality through editing.

UNIT- II STORYTELLING 9

Storytelling styles in a digital world through jump cuts, L-cuts, match cuts, cutaways, dissolves, split edits - Consumer and pro NLE systems - digitizing images - managing resolutions - mechanics of digital editing - pointer files - media management.

UNIT- III USING AUDIO AND VIDEO 9

Capturing digital and analog video importing audio putting video on exporting digital video to tape recording to CDs and VCDs.

UNIT- IV WORKING WITH FINAL CUT PRO 9

Working with clips and the Viewer - working with sequences, the Timeline, and the canvas - Basic Editing - Adding and Editing Testing Effects - Advanced Editing and Training Techniques - Working with Audio - Using Media Tools - Viewing and Setting Preferences.

UNIT- V WORKING WITH AVID XPRESS DV 4 9

Starting Projects and Working with Project Window - Using Basic Tools and Logging - Preparing to Record and Recording - Importing Files - Organizing with Bins - Viewing and Making Footage - Using Timeline and Working in Trim Mode - Working with Audio - Output Options.

TOTAL: 45 PERIODS

COURSE OUTCOME(S):

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

CO1	Compare the strengths and limitations of Nonlinear editing.
CO2	Identify the infrastructure and significance of storytelling.
CO3	Apply suitable methods for recording to CDs and VCDs.
CO4	Apply different media tools.
CO5	Address the core issues of advanced editing and training techniques.
CO6	Design and develop projects using AVID XPRESS DV 4.

TEXTBOOKS :

1. Avid Xpress DV 4 User Guide, 2007
2. Final Cut Pro 6 User Manual, 2004
3. Keith Underdahl, —Digital Video for Dummies, Third Edition, Dummy Series, 2001.
4. Robert M. Goodman and PartickMcGarth, -Editing Digital Video: The Complete Creative and Technical Guide, Digital Video and Audio, McGraw - Hill 2003.

23CS1910	DIGITAL MARKETING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To examine and explore the role and importance of digital marketing in today‘s rapidly changing business environment.
- Focuses on how digital marketing can be utilized by organizations and how its effectiveness can be measured

UNIT- I INTRODUCTION TO ONLINE MARKET 9

Online Market space- Digital Marketing Strategy- Components - Opportunities for building Brand Website - Planning and Creation - Content Marketing.

UNIT- II SEARCH ENGINE OPTIMISATION 9

Search Engine optimisation - Keyword Strategy- SEO Strategy - SEO success factors - On-Page Techniques - Off-Page Techniques. Search Engine Marketing How Search Engine works- SEM components- PPC advertising -Display Advertisement

UNIT- III E- MAIL MARKETING 9

E- Mail Marketing - Types of E- Mail Marketing - Email Automation - Lead Generation - Integrating Email with Social Media and Mobile- Measuring and maximizing email campaign effectiveness. Mobile Marketing- Mobile Inventory/channels- Location based; Context based; Coupons and offers, Mobile Apps, Mobile Commerce, SMS Campaigns- Profiling and targeting

UNIT- IV SOCIAL MEDIA MARKETING 9

Social Media Marketing - Social Media Channels- Leveraging Social media for brand conversations and buzz. Successful /benchmark Social media campaigns. Engagement Marketing- Building Customer relationships - Creating Loyalty drivers - Influencer Marketing.

UNIT- V DIGITAL TRANSFORMATION 9

Digital Transformation & Channel Attribution- Analytics- Ad-words, Email, Mobile, Social Media, Web Analytics - Changing your strategy based on analysis- Recent trends in Digital marketing.

TOTAL: 45PERIODS

COURSE OUTCOME(S):

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

CO1 Examine and explore the role and importance of digital marketing in today‘s rapidly changing business environment.

CO2 To know the key elements of a digital marketing strategy.

CO3 Focuses on how digital marketing can be utilized by organizations

CO4 Study how the effectiveness of a digital marketing campaign can be measured

CO5 Understand social media marketing.

CO6 Demonstrate advanced practical skills in common digital marketing tools such as SEO, SEM, Social media and Blogs.

TEXTBOOKS :

1. Fundamentals of Digital Marketing by Puneet Singh Bhatia;Publisher: Pearson Education; First edition , 2017;ISBN-10: 933258737X;ISBN-13: 978- 9332587373.
2. Digital Marketing by VandanaAhuja ;Publisher: Oxford University Press, 2015, ISBN-10: 0199455449.
3. Marketing 4.0: Moving from Traditional to Digital by Philip Kotler;Publisher: Wiley; 1st edition, 2017; ISBN10: 9788126566938;ISBN 13: 9788126566938;ASIN: 8126566930.
4. Ryan, D.,2014, Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation, Kogan Page Limited,2014.
5. Barker, Barker, Bormann and Neher, Social Media Marketing: A Strategic Approach,2E South-Western ,Cengage Learning,2017.
6. Pulizzi,J Beginner's Guide to Digital Marketing , Mcgraw Hill Education,2015.

23CS1911	MULTIMEDIA AND ANIMATION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE :

- To grasp the fundamental knowledge of Multimedia elements and systems
- To get familiar with Multimedia file formats and standard
- To learn the process of Authoring multimedia presentations
- To learn the techniques of animation in 2D and 3D and for the mobile UI
- To explore different popular applications of multimedia

UNIT- I INTRODUCTION TO MULTIMEDIA 9

Definitions, Elements, Multimedia Hardware and Software, Distributed multimedia systems, challenges: security, sharing / distribution, storage, retrieval, processing, computing. Multimedia metadata, Multimedia databases, Hypermedia, Multimedia Learning.

UNIT- II MULTIMEDIA FILE FORMATS AND STANDARDS 9

File formats — Text, Image file formats, Graphic and animation file formats, Digital audio and Video file formats, Color in image and video, Color Models. Multimedia data and file formats for the web.

UNIT- III MULTIMEDIA AUTHORING 9

Authoring metaphors, Tools Features and Types: Card and Page Based Tools, Icon and Object Based Tools, Time Based Tools, Cross Platform Authoring Tools, Editing Tools,Painting and Drawing Tools, 3D Modeling and Animation Tools, Image Editing Tools,audio Editing Tools, Digital Movie Tools, Creating interactive presentations, virtual learning,simulations.

UNIT- IV ANIMATION 9

Principles of animation: staging, squash and stretch, timing, onion skinning, secondary action, 2D, 2 ½ D, and 3D animation, Animation techniques: Keyframe, Morphing, Inverse Kinematics, Hand Drawn, Character rigging, vector animation, stop motion, motion graphics, , Fluid Simulation, skeletal animation, skinning Virtual Reality, Augmented Reality.

UNIT- V MULTIMEDIA APPLICATIONS 9

Multimedia Big data computing, social networks, smart phones, surveillance, Analytics, Multimedia Cloud Computing, Multimedia streaming cloud, media on demand, security and forensics, Online social networking, multimedia ontology, Content based retrieval from digital libraries.

TOTAL : 45 PERIODS

COURSE OUTCOME(S):

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

- **CO1** Get the bigger picture of the context of Multimedia and its applications.
- **CO2** Use the different types of media elements of different formats on content pages.
- **CO3** Author 2D and 3D creative and interactive presentations for different target multimedia applications.
- **CO4** Use different standard animation techniques for 2D, 21/2 D, 3D applications for the mobile UI.
- **CO5** Explore different popular applications of multimedia.
- **CO6** Understand the complexity of multimedia applications in the context of cloud, security, bigdata streaming, social networking, CBIR etc.

TEXT BOOKS :

1. Ze-Nian Li, Mark S. Drew, Jiangchuan Liu, Fundamentals of Multimedia, Third Edition, Springer Texts in Computer Science, 2021.

REFERENCE BOOKS :

1. John M Blain, The Complete Guide to Blender Graphics: Computer Modeling & Animation, CRC press, 3rd Edition, 2016.
2. Gerald Friedland, Ramesh Jain, —Multimedia Computing‖, Cambridge University Press, 2018.
3. PrabhatK.Andleigh, KiranThakrar, —Multimedia System Design‖, Pearson Education, 1st Edition, 2015.
4. Mohsen AminiSalehi, Xiangbo Li, —Multimedia Cloud Computing Systems, Springer Nature, 1st Edition, 2021.
5. Mark Gaimbruno, —3D Graphics and Animation‖, Second Edition, New Riders, 2002.
6. Rogers David, —Animation: Master — A Complete Guide (Graphics Series), Charles River Media, 2006.
7. Rick parent, —Computer Animation: Algorithms and Techniques‖, Morgan Kauffman, 3rd Edition, 2012.
8. Emilio Rodriguez Martinez, MireiaAlegre Ruiz, —UI Animations with Lottie and After Effects: Create, render, and ship stunning After Effects animations natively on mobile with React Native‖, Packt Publishing, 2022.

23CS1912	STREAMING MEDIA TOOLS AND TECHNOLOGIES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To understand the basics of Audio and Video Streaming.
- To understand the basics of Streaming media.
- To know about Streaming Technologies and applications.
- To understand the concepts of Streaming stages and Tools.
- To understand Streaming services.

UNIT- I BASICS OF AUDIO AND VIDEO STREAMING 9

Introduction — IP networks — World wide web — Video formats — Video compression — Audio compression

UNIT- II BASICS OF STREAMING MEDIA 9

Introduction to streaming media – Video streaming – Audio Streaming - Stream serving — Live web casting — Media Players

UNIT- III STREAMING TECHNOLOGIES AND APPLICATIONS 9

Associated Technologies and Applications – Rights Management – Content Distribution – Applications of Streaming Media

UNIT- IV STREAMING STAGES AND TOOLS 9

Broadcasting Area – setting up your home studio – Preparing stage – starting your first video broadcast – Top live streaming third party apps : vMix v.2x – OBS studio – FFSplit – VidBalsterX – Xsplit – ManyCam – Wirecast v.7 studio

UNIT- V STREAMING SERVICES 9

Software as a Service websites — Top 7 live streaming websites: Light stream — Smiletime — BlueJeans — BeLiveTv — Vidpresso Live -Zoom w webinar addon — Crowdcas

TOTAL : 45 PERIODS

COURSE OUTCOME(S):

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

CO1 : Understand the basics of Audio Streaming

CO2 : Understand the basics of Video Streaming

CO3 : Develop Streaming media Applications

CO4 : Apply concepts of Streaming Technologies on applications

CO5 : Use streaming tools for project development

CO6: Analyze streaming services.

TEXT BOOKS :

1. David Austerberry, The Technology of Audio and Video Streaming, Second Edition, Taylor and Francis 2013.
2. Lenald Best, Best's Guide to Live Stream Video Broadcasting, BCB Live Teaching series, 2017.

REFERENCE BOOKS :

1. Helen M Heneveld Audio, Video and Streaming Media Technologies, Smart Home and office technologies, 2018.
2. Yun-Qing Shi, Image And Video Compression For Multimedia Engineering Fundamentals Algorithms And Standards, Taylor & Francis,2019.
3. Jim Simpson, Audio, Video, and Streaming Media Technologies BOOK, McGraw-Hill, Bedrock Learning, E-book.
4. Tay Vaughan, Multimedia: Making it Work, McGraw Hill Education, Ninth Edition, 2017.
5. Lenald Best, Best's Guide to Live Stream Video Broadcasting, BCB Live Teaching series, 2017.

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		L	T	P	C
23CS1913	VISUAL EFFECTS	3	0	0	3

COURSE OBJECTIVE :

- To get a basic idea on animation principles and techniques
- To get exposure to CGI, color and light elements of VFX
- To have a better understanding of basic special effects techniques
- To have a knowledge of state of the art VFX techniques
- To become familiar with popular compositing techniques

UNIT- I ANIMATION BASICS 9

VFX production pipeline, Principles of animation, Techniques: Key frame, kinematics, Full animation, limited animation, Rot scoping, stop motion, object animation, pixilation, rigging, shape keys, motion paths.

UNIT- II CGI, COLOR, LIGHT 9

CGI – virtual worlds, Photorealism, physical realism, function realism, 3D Modeling and Rendering: color - Color spaces, color depth, Color grading, color effects, HDRI, Light – Area and mesh lights, image based lights, PBR lights, photometric light, BRDF shading model

UNIT- III SPECIAL EFFECTS 9

Special Effects — props, scaled models, animatronics, pyro techniques, Schufftan process, Particle effects – wind, rain, fog, fire

UNIT- IV VISUAL EFFECTS TECHNIQUES 9

Motion Capture, Matt Painting, Rigging, Front Projection. Rot scoping, Match Moving — Tracking, camera reconstruction, planar tracking, Calibration, Point Cloud Projection, Ground plane determination, 3D Match Moving

UNIT- V COMPOSITING 9

Compositing — Chroma key, blue screen/green screen, background projection, alpha compositing, deep image compositing, multiple exposure, matting, VFX tools - Blender, Natron, GIMP.

TOTAL : 45 PERIODS

COURSE OUTCOME(S):

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

- **CO1** Implement animation in 2D / 3D following the principles and techniques
- **CO2** Use CGI, color and light elements in VFX applications
- **CO3** Create special effects using any of the state of the art tools
- **CO4** Apply popular visual effects techniques using advanced tools

CO5 Use compositing tools for creating VFX for a variety of applications

CO6 Understand the state of the art vfx techniques

TEXT BOOKS :

1. Chris Roda, Real Time Visual Effects for the Technical Artist, CRC Press, 1st Edition, 2022.
2. Steve Wright, Digital Compositing for film and video, Routledge, 4th Edition, 2017.
3. John Gress, Digital Visual Effects and Compositing, New Riders Press, 1st Edition, 2014

REFERENCE BOOKS :

1. Jon Gress, ―Digital Visual Effects and Compositing‖, New Riders Press, 1st Edition, 2014.
2. Robin Brinkman, The Art and Science of Digital Compositing: Techniques for Visual Effects, Animation and Motion Graphics‖, Morgan Kauffman, 2008.
3. Luiz Velho, Bruno Madeira, ―Introduction to Visual Effects A Computational Approach‖, Routledge, 2023.
4. Jasmine Katatikarn, Michael Tanzillo, ―Lighting for Animation: The art of visual storytelling , Routledge, 1st Edition, 2016
5. EranDinur, ―The Complete guide to Photorealism, for Visual Effects, Visualization
6. Jeffrey A. Okun, Susan Zwerman, Christopher McKittrick, ―― The VES Handbook of Visual Effects: Industry Standard VFX Practices and Procedures‖, Third Edition, 2020.and Games‖, Routledge, 1st Edition, 2022.

WEB REFERENCES :

1. https://natrongithub.github.io/
2. https://www.blender.org/features/vfx/

23CS1914	3D PRINTING AND DESIGN	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE :

- To discuss on basics of 3D printing
- To explain the principles of 3D printing technique
- To explain and illustrate inkjet technology
- To discuss the applications of 3D printing
- To explain and illustrate laser technology

UNIT- I INTRODUCTION 9

Introduction; Design considerations – Material, Size, Resolution, Process; Modeling and viewing - 3D; Scanning; Model preparation – Digital; Slicing; Software; File formats

UNIT- II 3D PRINTING PRINCIPLES 9

Processes — Extrusion, Wire, Granular, Lamination, Photo polymerization; Materials - Paper, Plastics, Metals, Ceramics, Glass, Wood, Fiber, Sand, Biological Tissues, Hydrogels, Grapheme; Material Selection - Processes, applications, limitations;

UNIT- III INKJET TECHNOLOGY 9

Printer - Working Principle, Positioning System, Print head, Print bed, Frames, Motion control; Print head Considerations — Continuous Inkjet, Thermal Inkjet, Piezoelectric Drop-On-Demand; Material Formulation for jetting; Liquid based fabrication – Continous jet, Mulitjet; Powder based fabrication — Colourjet

UNIT- IV LASER TECHNOLOGY 9

Light Sources — Types, Characteristics; Optics — Deflection, Modulation; Material feeding and flow – Liquid, powder; Printing machines – Types, Working Principle, Build Platform, Print bed Movement, Support structures;

UNIT- V INDUSTRIAL APPLICATIONS 9

Product Models, manufacturing — Printed electronics, Biopolymers, Packaging, Healthcare, Food, Medical, Biotechnology, Displays; Future trends.

TOTAL : 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Outline and examine the basic concepts of 3D printing technology

CO2 Explain the principles of 3D printing technique

CO3 Outline 3D printing workflow

CO4 Explain and categorize the concepts and working principles of 3D printing using inkjet technique

CO5 Explain and categorize the working principles of 3D printing using laser technique

CO6 Explain various method for designing and modeling for industrial applications

TEXT BOOKS :

1. Christopher Barnatt, 3D Printing: The Next Industrial Revolution, Create Space Independent Publishing Platform, 2013.
2. Ian M. Hutchings, Graham D. Martin, Inkjet Technology for Digital Fabrication, John Wiley & Sons, 2013.

REFERENCE BOOKS :

1. Chua, C.K., Leong K.F. and Lim C.S., Rapid prototyping: Principles and applications, second edition, World Scientific Publishers, 2010
2. Ibrahim Zeid, Mastering CAD CAM Tata McGraw-Hill Publishing Co., 2007 3.
3. Joan Horvath, Mastering 3D Printing, APress, 2014

WEB REFERENCES :

1. https://www.geeksforgeeks.org/what-is-3d-printing/
2. https://www.tutorialspoint.com/3d-printing-and-its-future
3. https://www.javatpoint.com/3d-printing

ONLINE COURSES/RESOURCES :

1. https://www.geeksforgeeks.org/what-is-3d-printing/
2. https://www.tutorialspoint.com/3d-printing-and-its-future
3. https://www.javatpoint.com/3d-printing

23CS1915	GAME DEVELOPMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To know the basics of 2D and 3D graphics for game development.
- To know the stages of game development.
- To understand the basics of a game engine.
- To survey the gaming development environment and tool kits.
- To learn and develop simple games using Pygame environment

UNIT- I 3D GRAPHICS FOR GAME DESIGN 9

Genres of Games, Basics of 2D and 3D Graphics for Game Avatar, Game Components – 2D and 3D Transformations – Projections – Color Models – Illumination and Shader Models – Animation – Controller Based Animation.

UNIT- II GAME DESIGN PRINCIPLES 9

Character Development, Storyboard Development for Gaming – Script Design – Script Narration, Game Balancing, Core Mechanics, Principles of Level Design –Proposals – Writing for Preproduction, Production and Post – Production.

UNIT- III GAME ENGINE DESIGN 9

Rendering Concept — Software Rendering — Hardware Rendering — Spatial Sorting Algorithms – Algorithms for Game Engine– Collision Detection – Game Logic – Game AI — Path finding.

UNIT- IV OVERVIEW OF GAMING PLATFORMS AND FRAMEWORKS 9

Pygame Game development — Unity — Unity Scripts –Mobile Gaming, Game Studio, Unity Single player and Multi-Player games.

UNIT- V GAME DEVELOPMENT USING PYGAME 9

Developing 2D and 3D interactive games using Pygame – Avatar Creation – 2D and 3D Graphics Programming — Incorporating music and sound — Asset Creations — Game Physics Algorithms Development – Device Handling in Pygame – Overview of Isometric and Tile Based arcade Games – Puzzle Games.

TOTAL: 45 PERIODS

COURSE OUTCOME(S):

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

- **CO1** Explain the concepts of 2D and 3d Graphics
- **CO2** Understand the stages of game development
- **CO3** Design game design documents.
- **CO4** Implementation of gaming engines.
- **CO5** Survey gaming environments and frameworks.
- **CO6** Implement a simple game in Pygame.

TEXTBOOKS :

1. Sanjay Madhav, —Game Programming Algorithms and Techniques: A Platform Agnostic Approach‖, Addison Wesley,2013.
2. David H. Eberly, —3D Game Engine Design: A Practical Approach to RealTime Computer Graphics‖, Second Edition, CRC Press,2006.
3. Will McGugan, —Beginning Game Development with Python and Pygame: From Novice to Professional‖, Apress,2007.

REFERENCE BOOKS :

1. Paul Craven, —Python Arcade games‖, Apress Publishers, 2016.
2. Jung Hyun Han, —3D Graphics for Game Programming‖, Chapman and Hall/CRC, 2011.

WEB REFERENCES :

1. https://www.geeksforgeeks.org/how-to-get-started-with-game-development/
2. https://www.udemy.com/topic/game-development
3. https://www.tutorialspoint.com/certification/game-development-prime-pack/index.asp
4. https://www.javatpoint.com/c-sharp-game-development

ONLINE COURSES/RESOURCES :

1. https://www.geeksforgeeks.org/how-to-get-started-with-game-development/
2. https://www.udemy.com/topic/game-development/
3. https://www.tutorialspoint.com/certification/game-development-prime-pack/index.asp
4. https://www.javatpoint.com/c-sharp-game-development

23CS1916	AUGMENTED REALITY / VIRTUAL REALITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To impart the fundamental aspects and principles of AR/VR technologies.
- To know the internals of the hardware and software components involved in the development of AR/VR enabled applications.
- To learn about the graphical processing units and their architectures.
- To gain knowledge about AR/VR application development.
- To know the technologies involved in the development of AR/VR based applications.

UNIT- I INTRODUCTION 9

Introduction to Virtual Reality and Augmented Reality — Definition — Introduction to Trajectories and Hybrid Space-Three I's of Virtual Reality — Virtual Reality Vs 3D Computer Graphics — Benefits of Virtual Reality — Components of VR System — Introduction to AR-AR Technologies-Input Devices – 3D Position Trackers – Types of Trackers — Navigation and Manipulation Interfaces — Gesture Interfaces — Types of Gesture Input Devices – Output Devices – Graphics Display – Human Visual System – Personal Graphics Displays — Large Volume Displays — Sound Displays — Human Auditory System.

UNIT- II VR MODELING 9

Modeling – Geometric Modeling – Virtual Object Shape – Object Visual Appearance – Kinematics Modeling — Transformation Matrices — Object Position — Transformation Invariants –Object Hierarchies – Viewing the 3D World – Physical Modeling – Collision Detection – Surface Deformation – Force Computation – Force Smoothing and Mapping – Behavior Modeling – Model Management.

UNIT- III VR PROGRAMMING 9

VR Programming — Toolkits and Scene Graphs — World Tool Kit — Java 3D — Comparison of World Tool Kit and Java 3D.

UNIT- IV APPLICATIONS 9

Human Factors in VR – Methodology and Terminology – VR Health and Safety Issues – VR and Society-Medical Applications of VR — Education, Arts and Entertainment — Military VR Applications — Emerging Applications of VR — VR Applications in Manufacturing — Applications of VR in Robotics — Information Visualization — VR in Business – VR in Entertainment – VR in Education.

UNIT- V **AUGMENTED REALITY** **9**

Introduction to Augmented Reality-Computer vision for AR-Interaction-Modeling and Annotation- Navigation-Wearable devices.

TOTAL : 45 PERIODS

COURSE OUTCOME(S):

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

CO1	Understand the basic concepts of AR and VR
CO2	Understand the tools and technologies related to AR/VR
CO3	Understand the graphical processing units and their architectures.
CO4	Know the working principle of AR/VR related Sensor devices
CO5	Design of various models using modeling techniques
CO6	Develop AR/VR applications in different domains

TEXTBOOKS :

1. Charles Palmer, John Williamson, ―Virtual Reality Blueprints: Create compelling VR experiences for mobile, Packt Publisher, 2018

2. Dieter Schmalstieg, Tobias Hollerer, ―Augmented Reality: Principles & Practice Addison Wesley, 2016

REFERENCE BOOKS :

1. John Vince, ―Introduction to Virtual Reality, Springer-Verlag, 2004.

2. William R. Sherman, Alan B. Craig: Understanding Virtual Reality – Interface, Application, Design‖, Morgan Kaufmann, 2003.

VERTICAL VI - MANAGEMENT

23CB1901	CUSTOMER RELATION MANAGEMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To Learn the fundamentals of strategic and operational of CRM .
- To understand operational methods of CRM
- To understand different analytical methods of CRM to enhance customer experience.
- To Learn the fundamentals of analytical CRM
- To Understand and apply the elements and tools of CRM to manage customer portfolios

UNIT - I UNDERSTANDING CUSTOMER RELATIONSHIPS 9

CRM definition and constituencies, understanding and misunderstanding CRM, the social CRM fit, commercial contexts, the third sector- not-for-profit, CRM models. Relationship quality, customer lifetime value, relationships with customers and suppliers.

UNIT - II STRATEGIC CRM 9

Customer portfolio management (CPM) - Customer portfolio, basic disciplines of CPM, CPM in B2B context, CPM models, tools for CPM, strategically significant customers, seven core customer management strategies.

UNIT - III OPERATIONAL CRM 9

Sales force automation (SFA) – SFA and its ecosystem, SFA software functionality, SFA adaptation. Marketing automation (MA) – definition of MA, benefits and software applications. Service Automation (SA) –customer service definition, modelling service quality, software for SA, benefits of SA.

UNIT -IV ANALYTICAL CRM 9

Customer database management –corporate customer data, structured and unstructured data, developing a customer database, data – integration, warehousing and marts in the CRM context, knowledge management, Analytics for – CRM strategy and tactics, customer lifecycle, structured and unstructured data, Big data analytics in CRM, analytical insights.

UNIT -V MANAGING CUSTOMER EXPERIENCE AND VALUE 9

Understanding Value and when do customers experience value, Modelling customer- perceived value, Sources of customer value, Value through the marketing mix, Customization for customer value. Understanding customer experience and concepts, how to manage customer experience, CRM vs CEM, Use of CRM software in CEM.

TOTAL: 45 PERIODS

COURSE OUTCOME(S):

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

1. Define and explain the concept of customer relationship management (CRM), to build and maintain relationships with customers.
2. Define and explain the concept of customer lifetime value (CLV), by measuring long-term value of customers to a business.

3. Define and explain the concept of customer portfolio management in driving customer-centric strategies.
4. Measure the effectiveness of sales and service automation tools, to continuously improve sales and service processes.
5. Design and implement data collection processes that are optimized for analytical CRM, including identifying and capturing key customer data fields.
6. Map the customer journey to design an effective customer experience that meets customer needs and expectations.

TEXT BOOKS:

1. Buttle Francis and Maklan Stan, Customer Relationship Management – Concepts and Technologies, Special Indian edition, Fourth edition, Routledge, 2019.
2. Gerardus Blokdyk, Customer Relationship Management – A complete guide 2020 edition, 5starcooks, 2019.

REFERENCES:

1. Henry Assael, Consumer Behavior, Cengage Learning, 6th Edition, 2008
2. Kumar, Customer Relationship Management - A Database Approach, Wiley India, 2012.
3. Kumar and Werner Reinartz, Customer Relationship Management, Concept, Strategy and Tools, Springer 2018.
4. Zikmund, Customer Relationship Management, Wiley 2012
5. G. Shainesh, J. Jagdish N Seth. Customer Relationship Management : Emerging Concepts, Tools and Application, McGraw Hill Education, 2017.

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23CB1913	MARKETING RESEARCH & MARKETING MANAGEMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand research methods.
- To analyse consumer behaviour.
- To develop marketing strategies.
- To apply statistical tools.
- To execute effective marketing plans.
- To evaluate market trends.

UNIT-I Basic concepts of Marketing Management 9

Marketing Concepts and Applications: Introduction to Marketing & Core Concepts, Marketing of Services, Importance of marketing in service sector.

Marketing Planning & Environment: Elements of Marketing Mix, Analysing needs & trends in Environment - Macro, Economic, Political, Technical & Social

Understanding the consumer: Determinants of consumer behaviour, Factors influencing consumer behaviour

UNIT-II Strategic Market Segmentation and Product Management 9

Market Segmentation: Meaning & Concept, Basis of segmentation, selection of segments, Market Segmentation strategies, Target Marketing, Product Positioning

Product Management: Product Life cycle concept, New Product development & strategy, Stages in New Product development, Product decision and strategies, Branding & packaging

UNIT-III Integrated Pricing, Promotion, and Research Strategies 9

Pricing, Promotion and Distribution Strategy: Policies & Practices – Pricing Methods & Price determination Policies. Marketing Communication – The promotion mix, Advertising & Publicity, 5 M’s of Advertising Management. Marketing Channels, Retailing, Marketing Communication, Advertising **Marketing Research**: Introduction, Type of Market Research, Scope, COURSE OBJECTIVEs & Limitations Marketing Research Techniques, Survey Questionnaire design & drafting, Pricing Research, Media Research, Qualitative Research

UNIT-IV Data Analysis and Online Marketing 9

Data Analysis: Use of various statistical tools – Descriptive & Inference Statistics, Statistical Hypothesis Testing, Multivariate Analysis - Discriminant Analysis, Cluster Analysis, Segmenting and Positioning, Factor Analysis. **Internet Marketing:** Introduction to Internet Marketing. Mapping fundamental concepts of Marketing (7Ps, STP); Strategy and Planning for Internet Marketing

UNIT-V B2B Marketing Strategies and Practices 9

Business to Business Marketing: Fundamental of business markets. Organizational buying process. Business buyer needs. Market and sales potential. Product in business markets. Price in business markets. Place in business markets. Promotion in business markets. Relationship, networks and customer relationship management. Business to Business marketing strategy

TOTAL: 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Understand basic marketing concepts

CO2 Develop strategic marketing plans based on research insights

CO3 Design and execute market research studies

CO4 Evaluate consumer behavior and market trends.

CO5 Make data-driven marketing decisions.

CO6 Implement effective marketing strategies to achieve business objectives.

TEXT BOOKS:

1. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, —Introduction to Algorithms, Third Edition, PHI Learning Private Limited, 2012.
2. S.Sridhar, DESIGN AND ANALYSIS OF ALGORITHMS, First Edition, Oxford Edition, 2014
3. Anany Levitin, —Introduction to the Design and Analysis of Algorithms‖, Third Edition, Pearson Education, 2012.

REFERENCE BOOKS:

1. Ellis Horowitz, SartajSahni and SanguthevarRajasekaran, Computer Algorithms/ C++, Second Edition, Universities Press, 2007.
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, —Data Structures and Algorithms‖, Pearson Education, Reprint 2006.
3. Harsh Bhasin, —Algorithms Design and Analysis‖, Oxford university press, 2015

23CB1903	COMPUTATIONAL FINANCE AND MODELING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To make the students to understand how the techniques in computational finance applied in risk hedging and pricing of options.
- Understand existing financial models in a quantitative and mathematical way
- Apply these quantitative tools to solve complex problems in the areas of portfolio management, risk management and financial engineering.
- Explain the approaches required to calculate the price of options
- Identify the methods required to analyse information from financial data and trading systems

UNIT - I NUMERICAL METHODS AND MODELS: 9

Numerical methods relevant to integration, differentiation and solving the partial differential equations of mathematical finance- examples of exact solutions including Black Scholes and its relatives. Finite difference methods including algorithms and question of stability and convergence. Treatment of near and far boundary conditions-the connection with binomial models- interest rate model- early exercise- the corresponding free boundary problems. Introduction to numerical methods for solving multi-factor models.

UNIT - II BLACK-SCHOLES FRAMEWORK 9

Black-Scholes PDE: simple European calls and puts; put-call parity. The PDE for pricing commodity and currency options. Discontinuous payoffs - Binary and Digital options. Option Greeks and their role in hedging. The mathematics of early exercise - American options: perpetual calls and puts; optimal exercise strategy and the smooth pasting condition. Volatility considerations - actual, historical, and implied volatility; local volatility surfaces. Simulation including random variable generation, variance reduction methods and statistical analysis of simulation output. Pseudo random numbers, Linear congruential generator, Mersenne twister RNG. The use of Monte Carlo simulation in solving applied problems on derivative pricing discussed in the current finance literature. The technical topics addressed include importance sampling, Monte Carlo integration, Simulation of Random walk and approximations to diffusion processes, martingale control variables, stratification, and the estimation of the “Greeks.”

UNIT - III FINANCIAL PRODUCTS AND MARKETS 9

Introduction to the financial markets and the products which are traded in them: Equities, indices, foreign exchange, and commodities. Options contracts and strategies for speculation and hedging.

UNIT -IV APPLICATION AREAS 9

The pricing of American options- pricing interest rate dependent claims, and credit risk. The use of importance of sampling for Monte Carlo simulation of VaR for portfolios of options.

UNIT -V CASH MANAGEMENT 9

Cash Management: Motives for Holding cash, Speeding Up Cash Receipts, Slowing Down, Cash payouts, Electronic Commerce, Outsourcing, Cash Balances to maintain, Factoring. Accounts Receivable Management: Credit & Collection Policies, Analyzing the Credit Applicant, Credit References, Selecting optimum Credit period.

TOTAL: 45 PERIODS

COURSE OUTCOME(S):

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

CO1: Understand existing financial models in a quantitative and mathematical way.

CO2:Apply these quantitative tools to solve complex problems in the areas of portfolio management

CO3:To Solve the risk management and financial engineering

CO4: Explain the approaches required to calculate the price of options.

CO5: Identify the methods required to analyse information from financial data and trading systems.

CO6: Understand the various statistical methods to analyse the financial data.

TEXT BOOKS:

1. R. Seydel, “Tools for Computational Finance”, 2nd edition, Springer-Verlag, New York, 2004
2. W. Press, S. Teukolsky, W. Vetterling and B. Flannery, “Numerical Recipes in C: The Art of Scientific Computing”, 1997. Cambridge University Press, Cambridge, UK. Available on-line at: http://www.nr.com/
3. P. Glasserman, “Monte Carlo Methods in Financial Engineering”, Springer-Verlag, New York, 2004
4. A. Lewis, “ Option Valuation under Stochastic Volatility”, Finance Press, Newport Beach, California, 2000
5. A. Pelsser, “Efficient Methods for Valuing Interest Rate Derivatives”, Springer-Verlag, New York, 2000

REFERENCES:

1. D. Ruppert, Statistics and Data Analysis for Financial Engineering
2. R. Carmona: Statistical Analysis of Financial Data in S-Plus
3. N. H. Chan, Time Series: Applications to Finance
4. R. S. Tsay, Analysis of Financial Time Series
5. J. Franke, W. K. Härdle and C. M. Hafner, Statistics of Financial Markets: An Introduction.

23CB1904	INDUSTRIAL PSYCHOLOGY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- Enhance financial analytical skills.
- Formulate investment strategies.
- Explore corporate finance principles.
- Study financial market dynamics.
- Implement risk management techniques.
- Examine mergers and acquisitions.

UNIT - I INDUSTRIAL/ORGANIZTIONAL PSYCHOLOGY 9

What is I/O Psychology? Research Methods, Statistics, and Evidence-based Practice, Introduction & Legal Context of Industrial Psychology, Job Analysis & Competency Modelling, Job Evaluation & Compensation, Job Design & Employee Well-Being, Recruitment.

UNIT - II SELECTION AND ASSESSMENT IN INDUSTRIAL PSYCHOLOGY 9

Identifying Criteria & Validating Tests and Measures, Screening Methods, Intensive Methods.

UNIT - III PERFORMANCE MANAGEMENT AND EVALUATION 9

Performance Goals and Feedback, Performance Coaching and Evaluation, Evaluating Employee Performance.

UNIT -IV EMPLOYEE MOTIVATION, SATISFACTION, AND DIVERSITY MANAGEMENT 9

Employee Motivation, Satisfaction and Commitment, Fairness and Diversity.

UNIT -V ORGANIZATIONAL LEADERSHIP AND DEVELOPMENT 9

Leadership, Organizational Climate, Culture, and Development, Teams in Organizations, The Organization of Work Behavior. Stress Management: Demands of Life and Work, Stress Management: Demands of Life and Work.

TOTAL: 45 PERIODS

COURSE OUTCOME(S):

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

CO1: Understand workplace behavior dynamics

CO2: Enhance employee performance strategies.

CO3: Apply motivational theories.

CO4: Improve organizational culture.

CO5: Conduct effective job analyses.

CO6: Design better work environments.

TEXT BOOKS:

1. Elmes, D., Kantowitz, B., & Roediger, H, “Research methods in psychology”, Cengage Learning, 9 th Edition, 2011.

2. Landy, F. J. and Conte, J. M. (2013). Work in the 21st Century (4th Edition). Oxford: Blackwell Publishing.
3. TV.Rao, “Performance Management towards Organizational Excellence”, Sage, 2 nd Edition, 2016.
4. Stephen Robbins, Tim Judge, Neharika Vohra, “Organizational Behaviour”, Pearson, 18th Edition, 2019.
5. Pratibha Goyal ,Alok Chakrawal , “Stress Management”, Studera Press, 1 st Edition, 2016.

REFERENCES:

1.Breakwell, G.M., Smith, J.A., &Wright, D.B, “Research methods in psychology”, Sage, 4th Edition, 2012

23CB1905	IT PROJECT:MANAGEMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- Gain knowledge on fundamental concepts of project and project scheduling.
- Understand Project Cost Control, Scheduling and Management Features.
- Obtain knowledge on Agile Project Management.
- Know about the Scrum framework in detail.
- Obtain knowledge on DevOps and its related concepts

UNIT - I PROJECT OVERVIEW AND FEASIBILITY STUDIES 9

Project Overview and Feasibility Studies- Identification, Market and Demand Analysis, Project Cost Estimate, Financial Appraisal.

Project Scheduling: Project Scheduling, Introduction to PERT and CPM, Critical Path Calculation, Precedence Relationship, Difference between PERT and CPM, Float Calculation and its importance, Cost reduction by Crashing of activity.

UNIT - II COST CONTROL AND SCHEDULING 9

Cost Control and Scheduling: Project Cost Control (PERT/Cost), Resource Scheduling & Resource Leveling.

Project Management Features: Risk Analysis, Project Control, Project Audit and Project Termination

UNIT - III AGILE PROJECT MANAGEMENT 9

Agile Project Management: Introduction, Agile Principles, Agile methodologies, Relationship between Agile Scrum, Lean, DevOps and IT Service Management (ITIL).

Other Agile Methodologies: Introduction to XP, FDD, DSDM, Crystal

UNIT - IV SCRUM 9

Scrum: Various terminologies used in Scrum (Sprint, product backlog, sprint backlog, sprint review, retro perspective), various roles (Roles in Scrum), Best practices of Scrum.

UNIT - V DevOps 9

DevOps: Overview and its Components, Containerization Using Docker, Managing Source Code and Automating Builds, Automated Testing and Test Driven Development, Continuous Integration, Configuration Management, Continuous Deployment, Automated Monitoring.

TOTAL : 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Learn to effectively plan, and schedule projects within time and cost targets.

CO2 Have Knowledge in Cost Control, Scheduling and Management Features.

CO3 Be aware of different Agile Project Methodologies.

CO4 Know in detail about Scrum.

CO5 Acquire skills in facilitating Scrum events.

CO6 Obtain good knowledge in DevOps.

TEXT BOOKS:

1. Mike Cohn, Succeeding with Agile: “Software Development Using Scrum”, , Addison-Wesley Professional Publisher, 1st Edition, 2009

REFERENCE BOOKS:

1. Roman Pichler, “Agile Product Management with Scrum”, Addison-Wesley publisher, 1st Edition, 2010.
2. Ken Schwaber,” Agile Project Management with Scrum (Microsoft Professional)”, Microsoft Press US publisher, 1st Edition, 2004

23CB1906	ENTREPRENEURSHIP DEVELOPMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To equip and develop the learners entrepreneurial skills and qualities essential to undertake business.
- To impart the learners entrepreneurial competencies needed for managing business efficiently and effectively.

UNIT - I ENTREPRENEURAL COMPETENCE 9

Entrepreneurship concept – Entrepreneurship as a Career – Entrepreneurial Personality - Characteristics of Successful Entrepreneurs – Knowledge and Skills of an Entrepreneur.

UNIT - II ENTREPRENEURAL ENVIRONMENT 9

Business Environment - Role of Family and Society - Entrepreneurship Development Training and Other Support Organisational Services - Central and State Government Industrial Policies and Regulations.

UNIT - III BUSINESS PLAN PREPARATION 9

Sources of Product for Business - Prefeasibility Study - Criteria for Selection of Product - Ownership - Capital Budgeting- Project Profile Preparation - Matching Entrepreneur with the Project - Feasibility Report Preparation and Evaluation Criteria.

UNIT -IV LAUNCHING OF SMALL BUSINESS 9

Finance and Human Resource Mobilisation - Operations Planning - Market and Channel Selection - Growth Strategies - Product Launching – Incubation, Venture capital, Start-ups.

UNIT -V MANAGEMENT OF SMALL BUSINESS 9

Monitoring and Evaluation of Business - Business Sickness - Prevention and Rehabilitation of Business Units - Effective Management of small Business - Case Studies.

TOTAL: 45 PERIODS

COURSEOUTCOME(S):

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

CO1: Understanding the key concepts and principles of entrepreneurship, including the entrepreneurial mindset, creativity, and innovation.

CO2: Identify and evaluate opportunities in the entrepreneurial environment, including market trends, industry analysis, and competitive landscape.

CO3: Understanding the role of government policies and regulations in promoting entrepreneurial development and growth.

CO4: Prepare business plans and undertake feasible projects.

CO5: Develop their business ventures successfully.

CO6: Develop and implement a preventive plan for a business unit, including risk assessment, contingency planning, and resource allocation.

TEXT BOOKS:

1. S.S.Khanka, Entrepreneurial Development, S.Chand and Company Limited, New Delhi, 2016
2. R.D.Hisrich, Entrepreneurship, Tata McGraw Hill, New Delhi, 2018.

REFERNCES BOOKS:

1. Rajeev Roy ,Entrepreneurship, Oxford University Press, 2nd Edition, 2011.
2. Donald F Kuratko,T.V Rao. Entrepreneurship: A South Asian perspective. Cengage Learning, 2012.
3. Dr. Vasant Desai, “Small Scale Industries and Entrepreneurship”, HPH,2006.
4. Prasanna Chandra, Projects – Planning, Analysis, Selection, Implementation and Reviews, Tata McGraw-Hill, 8th edition ,2017

23CB1907	BUSINESS STRATEGY MANAGEMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- Determine the concept and process of strategic management.
- Analyze the internal and external environment.
- Formulation of strategies, implementation and evaluation of strategies.
- The course will cover case studies and latest business events

UNIT - I INTRODUCTION TO STRATEGIC MANAGEMENT 9

Importance of Strategic Management - Vision and COURSE OBJECTIVEs - Schools of thought in strategic management - Strategy Content, Process, and Practice - Fit Concept and Configuration perspective in Strategic Management.

UNIT - II INTERNAL ENVIRONMENT OF FIRM- RECOGNIZING A FIRM'S INTELLECTUAL ASSETS 9

Core Competence as the Root of Competitive Advantage - Sources of Sustained Competitive Advantage - Business Processes and Capabilities-based Approach to Strategy

UNIT - III EXTERNAL ENVIRONMENTS OF FIRM- COMPETITIVE STRATEGY 9

Five Forces of Industry Attractiveness that Shape Strategy - The concept of Strategic Groups, and Industry Life Cycle - Generic Strategies - Generic Strategies and the Value Chain

UNIT -IV CORPORATE STRATEGY AND GROWTH STRATEGIES 9

The Motive for Diversification - Related and Unrelated Diversification - Business Portfolio analysis Expansion, Integration and Diversification - Strategic Alliances, Joint Ventures, and Mergers & Acquisitions Ventures, and Mergers & Acquisitions.

UNIT -V STRATEGY IMPLEMENTATION: STRUCTURE AND SYSTEMS 9

The 7S Framework - Strategic Control and Corporate Governance - New Business Models and strategies for Internet Economy – Strategic Management in the current scenario of a globalized economy

TOTAL: 45 PERIODS

COURSE OUTCOME(S):

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

CO1: Become familiar with both internal and external environment. They would also become familiar with corporate and growth strategies, appreciate implementation of such strategies

CO2: Understand the fundamental principles of and interrelationships among business functions such as: R&D, production, marketing, finance, and HR and information technology

CO3: Apply the inter-relationships of business to individuals, other organizations, government and society.

CO4: Analyze complex, unstructured qualitative and quantitative problems, using appropriate tools

CO5: Enhances the cognitive knowledge about various strategic issues and development of new business models

TEXT BOOKS:

1. Robert M. Grant, Contemporary Strategic Management, Blackwell, 7th Edition, 2012

2. D N Dwivedi, Managerial Economics, 8th Edition, Vikas Publishing House, 2018

REFERENCES:

1. Richard Rumelt, Competitive Advantage, 2011.
2. Kazmi, Azhar, Business Policy and Strategic Management, Third Edition, Tata McGrawhill, New Delhi, 2008.

23CB1908	BEHAVIORAL ECONOMICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce students to the fundamental principles and theories of Behavioral Economics, including the challenges and limitations of traditional economic models.
- To help students to develop critical thinking skills and analytical tools for assessing the validity and relevance of behavioral economics research and applications in different contexts
- To foster skills in designing and conducting behavioural experiments to test economic hypotheses and theories, as well as analyzing and interpreting experimental data
- To encourage students to think creatively and independently, and to generate their own research questions and hypotheses in the field of behavioral economics

UNIT - I INTRODUCTION 9

Origin, scope and importance of behavioural economics; Decision-making theories Neo-classical economics – rationality assumption, optimization Origin of Behavioural economics – Bounded Rationality, Rationality in Psychology and Economics by H. Simon Duel System theory, Prospect theory

UNIT - II BEHAVIOURAL ECONOMICS OF RISK, UNCERTAINTY AND AMBIGUITY 9

Heuristics and biases in judgement and decision making – Biases programmeRepresentativeness, Availability, Anchoring and adjustment, mental accounting Biases: Overconfidence, Confirmation bias, Framing, Status Quo Bias ,Endowment Bias, Self-Control Bias Fallacies: conjunction and disjunction fallacies, gambler's fallacies

UNIT - III BEHAVIOURAL TIME DISCOUNTING 9

Evidence on temporal human choice – discounted utility model, exponential discounted utility model and its anomalies; Behavioural models of time discounting – sign and magnitude effects, common difference effect, attribute-based models, reference time theory; Some applications of present-biased preferences

UNIT -IV STRATEGIC INTERACTION 9

Evidence on strategic human choice; Different models of behavioural game theory; Some applications of behavioural game theory; Modelling social preferences – inequality-aversion models, reciprocity models, etc.

UNIT -V APPLICATIONS OF BEHAVIOURAL ECONOMIC 9

Introduction to Behavioural Labour Economics, Behavioral Finance Taxation and the contribution of Behavioural Economics Choice architecture: The role of nudging Public Policies: Psychological and social perspectives on policy in the area of Poverty, Health, Climate Change.

TOTAL: 45 PERIODS

COURSE OUTCOME(S):

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

CO1: Become familiar with selected important contributions to behavioural economics

CO2: Understand the concept and significance of heuristics and biases in decision- making

CO3: Recognize and avoid fallacies in argumentation and reasoning, including the use of logical frameworks and evidence-based arguments

CO4: Familiarize with the key theoretical frameworks and empirical findings in behavioral economics that relate to time discounting

CO5: Understand the basic concepts of game theory and how it relates to strategic interaction.

CO6: Design and conduct experiments to test hypotheses related to behavioural economics application.

TEXT BOOKS:

1. Nick Wilkinson; Matthias Klaes (2012), An Introduction to Behavioral Economics, 2nd Edition, Palgrave Macmillan.
2. Colin F. Camerer, George Loewenstein, Matthew Rabin (ed.) (2004), Advances in Behavioral Economics, Princeton University Press.

REFERENCES:

1. Altman, Morris (ed.), Handbook of Contemporary Behavioral Economics, M.E. Sharpe, New York, 2006
2. Wilkinson, Nick and Matthias Klaes, An Introduction to Behavioral Economics, 2nd edition, Palgrave Macmillan, 2012.
3. Angner, Eric, A Course in Behavioral Economics, Palgrave Macmillan, 2016
4. Dhami, Sanjit, The Foundations of Behavioral Economics, Oxford University Press, 2016.
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