AMRITA VISHWA VIDYAPEETHAM

PROGRAM

AMRITA AHEAD

Bachelor of Computer Applications

(BCA)

2021

Program Outcomes (PO) 3

Curriculum 4

Syllabus 5

Semester 1 6

Semester 2 15

Semester 3 23

Semester 4 33

Semester 5 40

Semester 6 46

Program Outcomes (PO)

PO-01: Computational Knowledge: Apply knowledge of computing fundamentals, mathematics, and domain knowledge appropriate for developing computing applications.

PO-02: Problem Analysis: Identify, formulate and solve complex computing problems using fundamental principles of mathematics and computer science.

PO-03: Design/Development of Solutions: Design and evaluate solutions for complex problems in societal and environmental domains.

PO-04: Conduct Investigations of Complex Computing Problems: Use knowledge-based computing techniques for the design and analysis of the system to provide optimal solutions.

PO-05: Modern Tool Usage: Create, select, adapt and apply appropriate techniques, resources, and modern tools to solve real world problems.

PO-06: Professional Ethics: Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practice.

PO-07: Life-long Learning: Recognize the need, and have the ability, to engage in independent learning for continual development as a computing professional.

PO-08: Project management and finance: Demonstrate knowledge and understanding of the computing and management principles to develop projects in multidisciplinary environments.

PO-09: Communication Efficacy: Communicate effectively with the scientific community, and with society at large, be able to write effective reports, make effective presentations.

PO-10: Societal and Environmental Concern: Understand and assess societal, environmental and cultural issues within local and global contexts

PO-11: Individual and Teamwork: Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary environments.

PO-12: Innovation and Entrepreneurship: Identify and pursue a timely opportunity to create value and wealth for the betterment of the individual and society.

Curriculum

	Course Code	Course Title	L T P	Cr			Course Title	L T P	Cr
SEMESTER 1					**SEMESTER 2**				
1	21ENG101A	Communicative English -1	2 0 2	3	**1**	21ENG111A	Professional Communication	1 0 2	2
2	21MAT101A	Foundations of Applied Mathematics - Part I	3 0 0	3	**2**	21MAT111A	Foundations of Applied Mathematics - Part II	3 0 0	3
3	21CSA101A	Principles of Management	3 1 0	4	**3**	21CSA111A	Database Management System	3 1 0	4
4	21CSA102A	Computer Essentials	3 0 2	4	**4**	21CSA112A	Object Oriented Programming using Java	3 1 0	4
5	21CSA103A	Problem Solving and Algorithmic Thinking	3 0 0	3	**5**	21CSA113A	Operating System and Computer Architecture	3 1 0	4
6	21CSA181A	Problem Solving and Algorithmic Thinking Lab	0 0 2	1	**6**	21CSA182A	Database Management System Lab	0 0 2	1
					7	21CSA183A	Object Oriented Programming using Java	0 0 2	1
		TOTAL		**18**			TOTAL		**19**
SEMESTER 3					**SEMESTER 4**				
1	21MAT201A	Discrete Mathematics	3 1 0	4	**1**	21CSA211A	Distributed Systems	3 1 0	4
2	21CSA201A	Data Structures and Algorithms	3 1 0	4	**2**	21CSA212A	Web Application Development	3 1 0	4
3	21CSA202A	Computer Networks	3 1 0	4	**3**	21CSA213A	Software Engineering	3 1 0	4
4		Elective A	3 0 0	3	**4**		Elective C	3 0 0	3
5		Elective B	3 0 0	3	**5**		Elective D	3 0 0	3
6	21CSA281A	Data Structures and Algorithms Lab	0 0 2	1	**6**	21CSA283A	Web Application Development -Lab	0 0 2	1
7	21CSA282A	Computer NetworksLab	0 0 2	1					
		TOTAL		**20**			TOTAL		**19**
SEMESTER 5					**SEMESTER 6**				
1	21CSA301A	C# and .NET Framework	3 0 2	4	**1**	21CSA399A	Industry Project		15
2	21CSA302A	Advanced Java and J2EE	3 10	4					
3	21CSA303A	Mobile Application Development	3 0 2	4					
4		Elective E	3 0 0	3					
5		Elective F	3 0 0	3					
6	21CSA381A	Advanced Java and J2EE Lab	0 0 2	1					
		TOTAL		**19**			**TOTAL**		**15**
Overall Credits					**18+19+20+19+19+15 = 110**				

Streams and Electives		
Artificial Intelligence and Data Science		
21CSA331A	Introduction to Artificial Intelligence	3 0 0
21CSA332A	Applications of Machine Learning	3 0 0
21CSA333A	Data Mining	3 0 0
21CSA334A	Linear Algebra and Optimization for Data Science	3 0 0
21CSA335A	AI for Drug Discovery & Target Validation	3 0 0
21CSA336A	Applied Predictive Analytics	3 0 0
21CSA337A	Big Data Analytics & Visualization	3 0 0
21CSA338A	Natural Language Processing	3 0 0
21CSA339A	Probability and Statistics for Data Science	3 0 0
21CSA340A	Business Analytics	3 0 0
21CSA341A	Bio medical & Health Informatics	3 0 0
Virtual and Augmented Reality (Google)		
21CSA351A	Introduction to VR Programming	3 0 0
21CSA352A	Game programming	3 0 0
21CSA353A	3D interaction design and 3D models for virtual reality	3 0 0
21CSA354A	Cross platform game development	3 0 0
21CSA355A	Designing human computer interfaces	3 0 0
21CSA356A	Augmented Reality for Marketing and Business Integrations	3 0 0
Other Industry-relevant Electives		
21CSA361A	Parallel & Distributed Data Management	3 0 0
21CSA362A	Modelling & Simulation	3 0 0
21CSA363A	Bioinformatics	3 0 0
21CSA364A	Representation Learning	3 0 0
21CSA365A	Pattern Recognition	3 0 0
21CSA366A	Information Retrieval	3 0 0
21CSA367A	GPU Architecture & Programming	3 0 0
21CSA368A	Multimedia and Graphics	3 0 0
21CSA369A	Semantic Web	3 0 0
21CSA370A	Algorithm Analysis	3 0 0
21CSA371A	Compiler design	3 0 0

Syllabus
Semester 1

SEMESTER 1		L T P	Cr
21ENG101A	Communicative English-1	2 0 2	3
21MAT101A	Foundations of Applied Mathematics - Part I	3 0 0	3
21CSA101A	Principles of Management	3 1 0	4
21CSA102A	Computer Essentials	3 0 2	4
21CSA103A	Problem Solving and Algorithmic Thinking	3 0 0	3
21CSA181A	Problem Solving and Algorithmic Thinking Lab	0 0 2	1
Total			**18**

21ENG101A Communicative English -1 (2 0 2-3)

Course Description:

English is now the international official language; it is necessary to master the language to stay connected with the world. This course is a speaking course designed to guide the students to use the language with confidence and without committing errors. In order to facilitate their overall ability to interact in English we have incorporated Soft Skills to develop their self-confidence, thus help acclimatize to the requirements and expectations of life, both professional and personal.

Course Outcomes:

CO1	Gain awareness on the importance of rules of netiquette in presenting oneself in the virtual class, in chat rooms or on discussion boards. Reinforce protecting one's private information and respecting the online privacy of others when on social media.
CO2	Learn to communicate effectively and professionally via e mails or telephones.
CO3	Develop self-confidence and positive attitude necessary to compete and challenge themselves. Know oneself well, discover their competencies to achieve their goals, enable them to identify one's communication style and to adapt to

	different communication styles.They would be able to introduce themselves in a professional manner.
CO4	Hone their presentation skills by understanding the nuances of content creation, effective delivery, use of appropriate body language and the art of overcoming nervousness to create an impact in the minds of a target audience.
CO5	Develop public speaking skills, and story- telling skills, learn to create a digital image of oneself.

Syllabus:

Unit 1 Netiquette : Etiquette to be followed in online classes – code of conduct, usage of audio, video, lighting, dress code and other physical settings, Email Etiquette: Understand the rules of drafting a professional email, Telephone Etiquette: How to make a call, how to answer a call.

Unit 2 Know thyself: Series of activities undertaken to identify one's hidden potential. Students identify their core values, strengths, skills, and weakness. Activities that help students consciously tap into their inner potential and use these to set and accomplish goals. Knowing your style of communication.

Unit 3 Elevator Pitch: Elevator Pitch – Create a script- Practice to deliver it confidently – create self-introduction videos.

Unit 4 Presentation skill, Public Speaking and Story Telling Content creation and delivery.

Unit 5 Resume Making- To help students understand the difference between a CV, Bio Data, Resume. How to create a resume, things to be taken care of while creating a resume.

Unit 6 Personal Branding through LinkedIn: Purpose of LinkedIn – Creating an impressive profile – how to network. To create an impressive brand for self for better reach.

Textbooks:

1. Netiquette: Internet Etiquette in the Age of the Blog, M. Strawbridge, Software Reference Ltd
2. Unleash the Power of Storytelling: Win Hearts, Change Minds, Get Results,Rob Biesenbach, Eastlawn Media, 2018
3. Five Stars: The Communication Secrets to Get from Good to Great by Carmine Gallo,Macmillan 2018
4. Presenting to Win: The Art of Telling Your Story Jerry Weiss, FT Press; 1st edition, 2008
5. The Professional by Subroto Bagchi ,Portfolio

References:

1. Organizational Behaviour – Stephen Robbins, Pearson Education.
2. Personality Development & Soft Skills – Barun.K.Mitra , Oxford
3. Effective Presentation Skills, Revised Edition: A Practical Guide for Better Speaking – Steve Mandel, Crisp Publications;
4. The One Minute Manager – Ken Blanchard, Simon & Schuster Audio/Nightingale-Conant;

CO-PO Affinity Map:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	-	-	-	-	-	3	-	-	3	3	-	-
CO 2	-	-	-	-	-	-	-	-	3	3	3	-
CO 3	-	-	-	-	-	-	-	-	3	3	2	-
CO 4	-	-	-	-	-	-	-	-	3	3	3	-
CO 5	-	-	-	-	-	-	-	-	3	3	3	-

3-strong, 2-moderate, 1-weak

21MAT101A Foundations of Applied Mathematics - Part I (3 0 0-3)

Course Description:

Foundations of Applied Mathematics –Part 1 is the first of the two-part course on Foundations of Applied Mathematics. The two courses offer basic mathematical foundations necessary to become computer science professionals. They also form the pre-requisite courses for various other mathematical courses and electives offered throughout the program.

Unlike conventional methods, these courses are designed to teach mathematics through programming. The curriculum with the combination of pedagogy and online learning tools will help students to engage with and express mathematical concepts easily, through programming. More emphasis is laid on mathematical understandings and interpretations, while less emphasis is laid on manipulations and memorizations. At the same time, mathematical concepts taught throughout the course will be motivated and connected to various real-life applications. Thus, the students will be able to learn mathematics in a new, meaningful, and generalizable ways. We do not learn abstract mathematics in this course nor focus on mathematical rigor through theorems and proofs.

Course Outcomes (CO):

CO	Statement
CO1	Learn mathematical principles and techniques to model and solve real life problems
CO2	Familiarize with various computational tools to learn and apply mathematics
CO3	Build foundations to learn advanced mathematical concepts necessary to become computational engineer/scientist, machine learning or data science practitioner
CO4	Be able to communicate mathematical ideas orally and in writing with precision, clarity and organization

Syllabus

Unit-I: Mathematical Modelling

Roadmap of the mathematics curriculum - Problem solving -Real life applications- Mathematical modeling.

Unit-II: Description of data,Learning Computational Tools

Data observation, recording, representation and visualization (single variable and multi variable) - Introduction to Excel, Python and Jupyter - Simple data structures - Learning mathematical libraries (Matplotlib, Sympy, Numpy).

Unit-III: Algebra and Trignometry

Order of operations - Variables and expressions - Bases and exponents - Evaluation of algebraic expressions - Linear equations and inequalities - System of linear equations - Trigonometry - Degrees and radians.

Unit-IV: Functions

Definition of functions - Independent and dependent variables - Function visualization- Algebraic functions- Polynomial functions- Exponential functions- Logarithmic functions-Trigonometric functions - Inverse functions - Arithmetic operation on functions - Composition of functions - Functional transformations.

Unit-V: Probablity & Statistics

Description of data with statistics - Measures of central tendency - Basics of probability - Random numbers - Probability density functions - Normal distributions - Central limit theorem

Textbooks:

1. Vadakkeppatt, Ajay. Course Notes- Foundations of Applied Mathematics, 2021

References:

1. Bird, Basic Engineering Mathematics, 7th Edition, Newnes, India

2. Stewart 2015, CALCULUS: Early Transcendentals, 8th Edition, Cengage learning, India
3. Amit Saha 2015, Doing Math with python, 1st edition, No Starch Press
4. Morley 2020, Applying Math with Python, Packt Publishing
5. Gowers 2002, Mathematics: A Very Short Introduction, 1st edition, Oxford University press

CO PO Affinity Map:

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

3-strong, 2-moderate, 1-weak

21CSA101A Principles of Management (3 1 0-4)

Course Description:

This course is designed to

- acquaint the students with the challenges and opportunities they will face whenmanaging their lives, the time and skills of other people, and the resources of an organization;
- help the students understand management theory from functional perspectives;
- provide students with opportunities to develop the basic managerial skills of planning, organizing, leading & controlling;
- gain experience in working as part of a team and to develop skills necessary for effective work team performance.

Course Outcomes:

CO1:	To understand the basic concepts and theories in management, its application in the real life and to know about the functions and role of managers in the organization.
CO2:	To appreciate the importance and knowhow of planning before action.

CO3:	To be familiar with the different organization structure and departmentalization and its importance.
CO4:	To recognise the importance of hiring, leading, and directing people at work and to learn the techniques of motivating them.
CO5:	To understand the necessity of a good control system and to effectively manage the resistance to control.

Syllabus:

Unit 1 Management Concepts

Management: Meaning – Process - Science or Art - a Profession - Administration vs Management – Significance - Functions of Management - Levels of Management - Managerial Skills - Roles of Managers. Classical Theory - Scientific Management - Administrative Management - Bureaucracy Modern Theory - System approach - Contingency Theory - Z quality management, Behavioural Theory - Hawthorne Studies - Maslow's need theory - Theory X, Y and Z.

Unit 2 Planning

Definition – Need – Benefits – Steps - Nature and Importance – Objectives - Concepts of Management by Objective – Steps - Difficulties in MBO.

Unit 3 Organising

Nature – Purpose – Steps - Types of Organization: Formal & Informal – Power - Authority and Responsibility - Centralisation vs Decentralisation - Span of control – Departmentalization - Project organization - matrix organization.

Unit 4 Staffing and Directing

Nature – Significance - Recruitment & Selection Meaning - Training and Placement – Meaning - Difference between Recruitment and Selection - Difference between Training and development.

Directing - Meaning – Definition - Key elements.

Unit 5 Managerial Control

Definition, Characteristics - Significance – Limitations – Process - Requirement of an effective control system - Feedback mechanisms resistance to control - Overcoming resistance to control.

Textbooks:

1. Management : Stephen P. Robins and Marry Coulter,Pearson
2. Samuel C Creto And S. TrevisCerto, Modern Management-Concepts and skills, Prentice Hall

References:

1. L. M Prasad, Principles and Practices of Management, Sultan Chand & Sons
2. Koontz, Essentials of Management, Tata McGraw-Hill Education
3. Daft, R. L, Management.
4. T. N Chhabra, Principles of Management

CO-PO Affinity Map

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

3-strong, 2-moderate, 1-weak

21CSA102A Computer Essentials (3 0 2 – 4)

Course Description:

The course gives students an overview of computer science: A foundation from which they can appreciate the relevance and interrelationships of further courses in the field. This course provides an insight into the general structures of operating systems, database management systems, and computer networks. Operating System acts as a platform of information exchange between a computer's hardware and the applications running on it. Database Management Systems have

become a part of all computer-based systems automating real word applications to handle data storage. Computer Networks deal with components and principles of networks and their protocols.

Course Outcomes:

CO1	Understand the basic components of computer systems and their functionality.
CO2	Demonstrate the functions of operating system and its role as a resource manager to execute any application.
CO3	Understand the need for database storage and learn to retrieve using SQL.
CO4	Understand the basics of computer networks.
CO5	Understand the basics of Internet and web.

Syllabus:

Unit-1 Introduction to computers: Characteristics of computers, Classification of Digital Computer Systems: Microcomputers, Minicomputers, Mainframes, Supercomputers. Anatomy of Computer: Introduction, Functions & Components of a Computer, Central Processing Unit, Microprocessor, Storage units, Input and output Devices. How CPU and memory works. Program execution with illustrative examples. Introduction to microcontrollers.
Lab Component- PC Assembly.

Unit-2 Operating System Fundamentals: Operating Systems: Introduction, Functions of an operating System, Classification of Operating Systems, System programs, Application programs, Utilities, The Unix Operating System, Basic Unix commands, Microkernel Based Operating System, Booting

Lab Component- OS installation, Basic Unix commands

Unit-3 Introduction to Database Management Systems: Database, DBMS, Why Database -File system vs DBMS, Database applications, Database users, Introduction to SQL, Data types, Classification of SQL-DDL with constraints, DML, DCL, TCL
Lab Component - Querying a database using simple SQL commands.

Unit-4 Computer Networks: Data transmission media, Network types and Topologies, Network devices, Network architecture, Application layer protocols, obtaining essential system network information using system tools: network interfaces and their addresses, active processes using network communication. Basic network debugging: using traceroute to discover route to a remote computer, ping to check network connectivity, nslookup for DNS lookup. Understanding basic HTTP client and server using netcat.

Lab Component - Basic Linux Networking Commands

Unit-5 Internet & Web Basics: Introduction, Features of Internet, Internet application, Services of Internet, Logical and physical addresses, Internet Service Providers, Domain Name System. Web Basics: Introduction to web, webpages and websites, web browsers, http/https, URL.

Textbooks:

1. J. Glenn Brookshear," Computer Science: An Overview", Addision-Wesley, Twelfth Edition, 2014

References:

1. Silberschatz A, Gagne G, Galvin PB. Operating system concepts. Ninth Edition, Wiley; 2012.
2. Cobbaut P. Linux Fundamentals. Samurai Media Limited; 2016.
3. Silberschatz A, Korth HF, Sudarshan S. Database system concepts. Sixth Edition, McGraw Hill;2010.
4. Kurose JF, Ross KW. Computer networking: a top-down approach. Sixth Edition, Pearson;2013.

CO-PO Affinity Map

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

3-strong, 2-moderate, 1-weak

21CSA103A Problem Solving and Algorithmic Thinking(3 0 0 – 3)

Course Description:

Algorithmic Thinking is a fundamental skill in this 21st Century. This course provides the foundations of Computational Problem Solving. It focuses on principles and methods rather than on systems and tools thus providing transferable skills to any other domain. It also provides foundation for developing computational perspectives of one's own discipline. This course imparts the ability to read and understand the problem, analyse and interpret the problem, take out the relevant aspects of it and represent the problem technically, give proper representation to the input data, know what constitutes a solution, design an appropriate solution methodology and implement the solution.

Course Outcomes:

CO1	Apply algorithmic thinking to understand, define and solve problems.
CO2	Design and implement algorithm(s) for a given problem.
CO3	Apply the basic programming constructs for problem-solving.
CO4	Understand an algorithm by tracing its computational states, identifying bugs and correcting them.

Syllabus:

Unit I

Problem-Solving - understand problem definition, constraints on input/output, sample input and expected output; Algorithmic thinking - reading input/writing output, data representation, choice of data types, formulating solutions to basic problems by applying sequence, selection, and repetition constructs, modularity.

Unit II

Representing and manipulating composite data - lists, strings, tuples, and dictionaries, problem-solving on lists- performing a search, aggregation, range and ordering operations on lists; Manipulating string data - concatenation, splitting, reversal, comparison, pattern matching on strings.

Unit III

Using recursion for problem-solving, practical examples of recursion, iteration vs. recursion, simple and binary recursion; Evaluating algorithms, error handling, writing test cases, the importance of documentation/ comments.

Textbooks:

1. Riley DD, Hunt KA. Computational Thinking for the Modern Problem Solver. CRC press; 2014 Mar 27.

2. Charles Dierbach, Introduction to Computer Science using Python: A computational Problem-Solving Focus,2012.www.it-ebooks.info

References:

1. Ferragina P, Luccio F. Computational Thinking: First Algorithms, Then Code. Springer; 2018.
2. Beecher K. Computational Thinking: A beginner's guide to Problem-solving and Programming. BCS Learning & Development Limited; 2017.
3. Curzon P, McOwan PW. The Power of Computational Thinking: Games, Magic and Puzzles to help you become a computational thinker. World Scientific Publishing Company; 2017.

CO-PO Affinity Map:

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

3-strong, 2-moderate, 1-weak

21CSA181A Problem Solving and Algorithmic Thinking- Lab (0 0 2 – 1)

Familiarity with Google colab, codeforces, autolab. Problem solving with basic Python constructs. Problem solving with Strings. Problem solving with Lists. Patterns in problem solving and exercises. Towards solving harder problems. Recursion exercises. Sorting and searching**.** Binary recursion and exercises. Using RegEx, Math, Random and File packages. Tuples, Set, Map and solving problems with them. Exception handling

Semester 2

SEMESTER 2		L T P	Cr
21ENG111A	Professional Communication	10 2	2
21MAT111A	Foundations of Applied Mathematics - Part II	3 0 0	3
21CSA111A	Database Management System	3 1 0	4
21CSA112A	Object Oriented Programming using Java	3 1 0	4
21CSA113A	Operating System and Computer Architecture	3 1 0	4
21CSA182A	Database Management System Lab	0 0 2	1
21CSA183A	Object Oriented Programming using Java Lab	0 0 2	1
Total			**19**

21ENG111A Professional Communication 1 0 2 – 2

Course Description:

This course is designed to o convey and document information in a formal environment; to acquire the skill of self-projection in professional circles; and to inculcate critical and analytical thinking.

Course Outcomes:

CO1	Understand the importance of communication and its various strategies in professional success.
CO2	To be adept at quilling out the meaning of written and spoken communication.
CO3	To stimulate critical thinking by identifying the barriers in communication and rectifying them.
CO4	To use English with a high degree of fluency for spoken communication by participating in discussions and delivering presentations.
CO5	To enhance soft skills and non-verbal communication through discussions, conversations, and presentations.
CO6	To draft effective business correspondence with brevity, clarity, and accuracy.

CO7	To develop competency in new media communication skills required for the careers of today.

Syllabus:

UNIT I (Introduction to Professional English)

Business English as Language of Business Communication, Verbal and Non-Verbal Communication, Effective Communication – Strategies and Barriers. Importance of English in Professional Communication

UNIT II (Listening and Speaking)

Principles of Effective Listening, Problems in Effective Listening, Characteristics of Effective and Ineffective Listeners, Guidelines for Effective Oral Communication, Communications to Lead, Persuade & Negotiate, Sounds of English: Stress, Intonation, Situational Dialogues, Group Discussion, Presentations, Interview

UNIT III (Reading)

Business Reading: Significance and Purpose, The SQ3R Method of Reading: Survey, Question, Read, Recite, and Review

UNIT IV (Writing)

Skills required in written communication (7 Cs of communication), Elements of effective writing- (Use familiar, concrete and specific words; Avoid jargon, redundancy, discriminatory writing etc.) Modal auxiliaries, Error Analysis, Planning, Writing, and Revising: Business Messages, Instruction, Recommendation, Business Proposals and reports, Circulars, Memos and Business Letters

UNIT V

New Media Communication, Cross-cultural communication, Cambridge Business English

References:

1. Raman, Meenakshi & Sangeeta Sharma. Technical Communication: Principles and Practice. Third Edition. New Delhi: Oxford University Press, 2015.
2. Thill, John V. & Courtland L. Bovée, Excellence in Business Communication, 12th edition. Boston: Pearson, 2016.
3. Bonet, Diana. The Business of Listening: Fourth Edition. Axzo Press, 2009.

4. Neuliep, James W. Intercultural Communication: A Contextual Approach. Boston: Houghton Mifflin Co., 2017.
5. Thorpe, Edgar &Showick Thorpe. Winning at Interviews. Fifth Edition. Delhi: Dorling Kindersley, 2013. 6. http://www.albion.com/netiquette/corerules.html 7. https://brians.wsu.edu/common-errors/
6. 8. https://networketiquette.net/en-gb/

CO-PO Affinity Map:

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	3	-	-	-
CO2	-	-	-	-	-	-	-	-	3	-	-	-
CO3	-	-	-	-	-	-	-	-	3	-	-	-
CO4	-	-	-	-	-	-	-	-	3	-	3	-
CO5	-	-	-	-	-	-	-	-	3	-	3	-
CO6	-	-	-	-	-	-	-	-	3	-	-	-
CO7	-	-	-	-	-	-	-	-	3	-	-	-

3-strong, 2-moderate, 1-weak

21MAT111A Foundations of Applied Mathematics - Part II (3 0 0-3)

Course Description:

Foundations of Applied Mathematics – Part II is the second part of the two-part course on Foundations of Applied Mathematics following Part I. The two courses offer basic mathematical foundations necessary to become computer science professionals. They also form the pre-requisite courses for various other mathematical courses and electives offered throughout the program.

Unlike conventional methods, these courses are designed to teach mathematics through programming. The curriculum with the combination of pedagogy and online learning tools will help students to engage with and express mathematical concepts easily, through programming. More emphasis is laid on mathematical understandings and interpretations, while less emphasis is

laid on manipulations and memorizations. At the same time, mathematical concepts taught throughout the course will be motivated and connected to various real-life applications. Thus, the students will be able to learn mathematics in a new, meaningful, and generalizable ways. We do not learn abstract mathematics in this course nor focus on mathematical rigor through theorems and proofs.

Course Outcomes:

CO1	Learn mathematical principles and techniques to model and solve real life problems.
CO2	Familiarize with various computational tools to learn and apply mathematics.
CO3	Build foundations to learn advanced mathematical concepts necessary to become computational engineer/scientist, machine learning or data science practitioner.
CO4	Be able to communicate mathematical ideas orally and in writing with precision, clarity and organization

Syllabus:

Unit-I: Introduction to Calculus, Limits

History of calculus – Overview of calculus – Single variable and multivariable calculus - Calculus and mathematics modeling – Limits of functions – Continuity of functions.

Unit-II: Differential Calculus

Differentiating a function – Slopes and derivatives - Algebra of derivatives - The chain rule of differentiation - Extreme values of functions – The mean value theorem - First and second derivative tests.

Unit-III: Integral Calculus

Area under the curve – Indefinite integral - Integration by substitution – Definite integral – Fundamental theorem of calculus – Integration by parts – Numerical Integration - Applications of the definite integral in geometry, science and engineering

Unit-IV: Differential equations

Introduction to differential equations – Mathematical modeling with differential equations – Separation of variables – First Order Differential Equations – Second Order Constant Coefficient Linear Equations – Fourier transforms - Laplace transforms – First Order Systems – Convolution.

Unit-V: Elementary Linear Algebra

Systems of linear equations – Gauss elimination – Matrix operations, including inverses – Least square problem – Determinants and their properties – Eigenvalues and eigenvectors – Matrix decompositions

Textbooks:

1. Vadakkeppatt, Ajay. Course Notes- Foundations of Applied Mathematics, 2021

References:

1. Stewart 2015, CALCULUS: Early Transcendentals, 8th Edition, Cengage learning, India.
2. Strang 2005, Linear Algebra and its Applications, 4th Edition, Cengage Learning (RS).

CO-PO Affinity Map:

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

3-strong, 2-moderate, 1-weak

21CSA111A Database Management System (31 0 – 4)

Course Description:

This course is designed to cover the fundamental aspects of Database Management Systems including design and implementation of a relational database for a specific domain or application.

Course Outcomes:

CO1	Have a broad understanding of database concepts and database management system software including a high-level understanding of major DBMS components and their functions
CO2	Understanding Query processing in DBMSs
CO3	Able to model an application's data requirements using conceptual modeling tools like ER diagrams and design database schemas based on the conceptual model so as to successfully design a complete application.
CO4	Understand Data Normalization and its usage in database design so as to successfully design a complete application.
CO5	Learn transaction properties and types in a DBMS including concurrency control and recovery.

CO6	Able to write SQL statements to create tables and indexes, set constraints, insert/update/delete data, query data and PL/SQL programs in a relational DBMS thereby building a successful application.

Syllabus:

Unit 1

Introduction - Data Independence - The Three Levels Of Architecture - The External Level - Conceptual Level - Internal Level - Client/Server Architecture- System Structure , Instance and schema, Data Models, Types of DBMS

Unit 2

Keys - CODD's Rules, Design Issues -ER – Model –Attribute types- Weak Entity Sets - Extended ER Features –ER to Relational Mapping, Structure Of Relational Databases

Unit 3

Normalization –Anomalies- Functional Dependency: Armstrong's axioms- closure of a relation and closure of attribute– Lossless decomposition-1NF, 2NF, 3NF, Boyce - Codd Normal Form

Unit 4

The Relational Algebra -- Query Processing and Optimization

Transaction Processing: ACID properties, states of a transaction-Introduction to concurrency control

Unit 5

DDL, Constraints, LIKE, BETWEEN, Conjunction and disjunction, Order by, Group by, Built in SQL functions- Set operations, Sub Queries-Joins-DCL – TCL- Views – Sequences – Index

PL/SQL Basics – Exceptions – Cursors - Stored Functions – Triggers

Textbooks:

1. Database System Concepts - Silberschatz.Korth. Sudarshan, 6th Edition, Mcgraw-Hill International Edition
2. PostGreSQL Documentation
3. Head First SQL : Lynn Beighley, O'Reilly Media, Inc., August 2007

References:

1. An Introduction To Database Systems - C.J. Date, Eighth Edition - Pearson Education Asia
2. Fundamentals of Database Systems: Elmasri and Navathe, Fifth Edition, Pearson Education

CO-PO Affinity Map:

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	3	-	2	3	3	3	-	-	-	1

CO2	3	-	-	-	-	-	-	-	-	3	-	-
CO3	-	3	3	1	-	-	-	-	-	-	2	-
CO4	-	3	3	1	-	-	-	-	-	-	2	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	3	-	-	-	3	-	2	-

3-strong, 2-moderate, 1-weak

21CSA182A Database Management System Lab (0 0 2-1)

DDL, Constraints, LIKE, BETWEEN, Conjunction and disjunction, Order by, Group by, Built in SQL functions- Set operations, Sub Queries-Joins-DCL – TCL- Views – Sequences – Index

PL/SQL – Exceptions – Cursors - Stored Functions – Triggers

21CSA112A Object Oriented Programming using Java (31 0 – 4)

Course Description:

The main objective of this course is to understand the basic concepts and techniques which form the object-oriented programming paradigm using Java Language.

Course Outcomes:

CO1	Understand Object Oriented concepts and represent the problem using objects and classes
CO2	Apply the Object-Oriented concepts to design and develop effective models using UML
CO3	Develop programs using Object oriented concepts in Java
CO4	Understanding parallelizing of tasks and synchronization using threads
CO5	Design applications in Java using Java libraries

Syllabus:

Unit1

Introduction to object oriented software design, Comparison of programming paradigms, Object Basics, Java Environment, Classes and Object, Data Members, Access Specifiers, Arrays, Array of Objects, Constructors, Default Constructors, Static Members, Constant Members, Object Oriented Design with UML, Class, object diagrams and sequence diagrams.

Unit2

Polymorphism, Inheritance, Interfaces and Abstract Classes, Packages, Exception Handling, Libraries: Numbers, Math, Strings, StringBuilder, Regex, File object, Accessing and Modifying Files, Generics and Collections.

Unit3

Introduction to Threads, Creating Threads, Thread States, Thread Synchronization, Serialization, Basics of GUI Programming, Java Sockets and JDBC, SOLID principles, UML.

Textbooks:

1. Naughton P. and Schildt H., "Java2 Complete Reference", Eighth Edition, Tata McGraw-Hill, 2011.
2. Ali Bahrami, "Object Oriented Systems Development", Second Edition, McGraw-Hill, 2008.

References:

1. Grady Booch and Robert A. Maksimchuk, "Object-oriented Analysis and Design with Applications", Third Edition, Pearson Education, 2009.
2. Jaime Nino, Fredrick A Hosch, "An Introduction to Programming and Object Oriented Design using Java", Wiley India Private Limited, 2010.

CO-PO Affinity Map:

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

3-strong, 2-moderate, 1-weak

21CSA183A Object Oriented Programming using Java- Lab (002 – 1)

Java Practical Lab Session provides a basic knowledge to develop the programming skills in Java Programming. This course is to apply the object-oriented concepts in various software development applications. The course also provides the platform for students to solve the inter disciplinary applications through the Java Programming Language.

21CSA113A Operating System and Computer Architecture (31 0 – 4)

Course Description:

This course is intended to introduce basic concepts of digital systems, processor architecture and operating systems.

Course Outcomes:

CO1	To understand basic concepts of digital systems, and its design using both sequential and combinational circuits
CO2	Tolearn internal units of a CPU and instruction level execution
CO3	To analyze different process scheduling algorithms and their empirical comparison using numerical examples.
CO4	To study process synchronization concepts and deadlock handling methods.
CO5	To study memory allocation strategies and page replacement algorithms

Syllabus:

Unit1

Digital System Design: SOP and POS Expressions, Karnaugh Map Simplification - Universal gates, Sequential circuits and combinational circuits, Flip Flops, Registers, Counters, Decoder, Encoder. Arithmetic circuits,

Unit 2

Computer Organization and Design - Instruction Codes- Computer Registers- Computer Instructions - Instruction Cycle - Memory Reference Instructions, Central Processing Unit: Address bus, data bus, control lines. Instruction Formats - Addressing Modes - Data Transfer and Manipulation - Conditional Branch Instructions - Program Interrupts

Unit 3

Introduction to Operating Systems, Operating System Structures System components-Operating System services-System calls-System Programs, Process Management, Process Scheduling, CPU Scheduling Algorithms. Process synchronisation and critical section problem (Introductory concepts).

Unit 4

Deadlocks: System Model-Deadlock Characterization-Methods for handling Deadlocks-Deadlock Prevention-Deadlock Avoidance-Deadlock detection-Recovery from deadlock.

Unit 5

Memory Management: Background-Swapping-Contiguous Memory allocation-Paging-Segmentation-Segmentation with Paging. Virtual Memory: Background-Demand paging-Process creation-Page replacement-Allocation of Frames-Thrashing.

Textbooks:

1. M Morris Mano - Computer System Architecture - PHI - Third Edition
2. Gideon Langholz, Abraha& Joe L Mott - Digital Logic Design - World Scientific Publishing Co Ltd
3. Abraham SilberSchartz- peter B Galvin-Greg Gagne, Operating system Concepts. Eighth Edition, Addison-Wesley(2003)

References:

1. P Pal Chaudhuri - Computer Organization and Design - PHI - Second Edition
2. Thomas C Bartee - Digital Computer Fundamentals - Tata Mc Graw Hill - Sixth Edition
3. Carl V Hamcher - Computer Organization 5th Edition – Mc Graw Hill
4. S.Godbole - Operating Systems - Tata McGraw Hill Publications
5. H.M Deitel - Operating Systems - Second Edition - Pearson Edition Asia

CO-PO Affinity Map:

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

3-strong, 2-moderate, 1-weak

Semester 3

SEMESTER 3		L T P	Cr
21MAT201A	Discrete Mathematics	310	4
21CSA201A	Data Structures and Algorithms	3 1 0	4
21CSA202A	Computer Networks	3 1 0	4
	Elective A	3 0 0	3
	Elective B	3 0 0	3
21CSA281A	Data Structures and Algorithms Lab	0 0 2	1
21CSA282A	Computer Networks Lab	0 0 2	1
Total			**20**

21MAT201A Discrete Mathematics (3 1 0 -4)

Course Description:

Discrete Mathematics is regarded as the language of computer science. Anyone who aspires to excel in fields like data science, machine learning & software engineering should be fluent in this. Through a blended learning approach, students are taught in detail about Combinations, graph theory, logical statements, algebraic structures and number theory which form the basis for many daily computations.

Course Outcomes:

CO1	Use logical notation to define and reason sets and relations
CO2	Explain applications of elementary properties of modular arithmetic in Computer science.
CO3	Calculate number of outcomes possible in permutations and combinations
CO4	Analyze sets and relations
CO5	Apply graph theory concepts in solving practical problems.
CO6	Understand binary operations in group.

Syllabus:

Unit-I: Logic and Counting

Logic: Propositional – Predicate – Truth tables - Sequences and summations - Proof methods
Counting: Sum and product rule – Inclusion exclusion principle - Pigeonhole principle – Permutations – Combinations

Unit-II: Sets and Relations

Sets: Basic operations – Union – Intersection – Cartesian product – Difference Relations: Properties of relations – Equivalence of relations – Hasse diagram

Unit-III: Graph Theory

Definition of graph – Undirected graph– Directed graph – Complete graph – Bipartite graph - Connectivity - Partitioning – Clustering – Coloring - Heuristics – Cuts – Modularity – Trees.

Unit-IV: Group

Definition of groups – Generators – Cosets – Definition of rings – Definition of Fields.

Unit-V: Number Theory

Modular arithmetic – Euclids algorithm – Prime number factorization – Inverse calculation – Chinese remainder theorem.

Textbook:

1. Rosen, Discrete Mathematics and its Applications, 7^{th} edition, Mc Graw hill international editions.

References:

1. R. P. Grimaldi, "Discrete and Combinatorial Mathematics", Pearson Education, Fifth Edition, 2007.
2. Thomas Koshy, "Discrete Mathematics with Applications", Academic Press, 2005.
3. Burton, Elementary Number Theory, 7^{th} edition, Mc Graw hill India

CO-PO Affinity Map:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12

CO1	3	3	3	3	3	2	2	2	1	1	1	1
CO2	3	3	2	3	3	3	2	1	1	1	2	1
CO3	3	3	2	3	3	2	3	3	1	1	2	2
CO4	1	1	1	2	2	1	1	3	3	1	3	2
CO5	3	3	3	2	1	1	2	1	1	1	2	1
CO6	3	3	3	2	1	2	2	1	2	1	1	1

3-strong, 2-moderate, 1-weak

21CSA201A Data Structures and Algorithms (3 1 0 -4)

Course Description:

Data Structure and Algorithms is the course offered to 3rd semester Online MCA program. This course aims to provide the students an in-depth understanding of structure and implementation of the common data structures used in computer science. It imparts the ability to solve problems by choosing and applying the right data structure. It also introduces the concept of analyzing algorithms in terms of asymptotic notation

Course Outcomes:

CO1	Learn the foundations of algorithm analysis using asymptotic notation.
CO2	Implement the basic data structures like Linked list, Stack, Queue, Tree, Graph.
CO3	Defining operations on the above data structures.
CO4	Analyze application problems and formulate solutions using suitable data structure.
CO5	Analyzing correctness of the Algorithms

Syllabus:

Unit 1

Basic complexity analysis – Analyzing Programs – Best, Worst, and Average Cases - Asymptotic Analysis. Overview of Data Structures – Abstract Data Types and Data Structures. Linked List: Implementation - Analysis = Variations – LL ADT – LL Applications. Stack: Implementation - Recursion - Expression Evaluation and other applications. Queues - Implementation - Variations - Applications.

Unit 2
Trees: Tree Definition and Properties – Binary tree - Representation - Traversals. Priority queues: ADT – Implementing Priority Queue using List – Heaps - Heap sort. Search trees: Binary search tree - AVL tree - Implementation - Analysis. Maps and Dictionaries: Hash Tables - Collisions - Dynamic Resizing.

Unit 3
Sorting and Selection: Divide and Conquer Strategy – Merge Sort - Quick Sort - Quick Select. Graphs: ADT- Data structure for graphs - Graph traversals - Reachability, Cycles and Connectedness - Shortest Paths - Minimum spanning tree – Greedy Methods for MST.

Textbooks:

1. Michael T Goodrich and Roberto Tamassia and Michael H Goldwsasser, "Data Structures and Algorithms in Java", John Wiley publication, 2013.
2. Clifford A. Shaffer, "Data Structures and Algorithm Analysis", Third Edition, Dover Publications, 2012.

References:

1. Adam Drozdek, "Data Structures and Algorithms in Java", Cengage Learning Asia, Paperback, 2013.
2. Tremblay J P and Sorenson P G, "An Introduction to Data Structures with Applications", Second Edition, Tata McGraw-Hill, 2002.

CO-PO Affinity Map:

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

3-strong, 2-moderate, 1-weak

21CSA281A Data Structures and Algorithms- Lab (0 0 2-1)

Linked List implementation , Problems based on linked lists , Stack implementation , Problems based on Stack , Circular queue implementation , Binary Heap implementation , Binary Search Tree implementation , Problems based on Binary Search Tree , AVL Tree implementation , Graph representation and traversals , Connectivity problems on Graphs, Shortest path and MST implementation , Disjoint-Set / Union-Find overview , Hashing overview .

21CSA202A Computer Networks (3 1 0 -4)

Course Description:

This course presents an in-depth discussion of the most important networking protocols comprising the TCP/IP protocol suite. Students will be able to understand state of the art in network protocols, architectures, and applications.

Course Outcomes:

CO1	Under the core concepts of Computer network and become familiar with various components
CO2	Learn how to configure different Cisco switches, end devices and routers and also build a small network at the end of the course
CO3	Analyse protocols and algorithms applicable at various layers such as Data Link layer, Routing, Transport layers and Application layer services.
CO4	Use various tools to analyse network operations in practise.

Syllabus:

Unit 1

Role of Networks in our lives - Network Components - Network representations - Evolution of Computer Networking-Types of Network- networks topologies-Network Representations and Topologies – Common types of Networks- Internet Connections – Reliable Network requirements - Network Security. End Device Configuration - on a network switch and end devices. Protocols and Models: The Rules- Protocol Suites, Standard Organization, Reference Model, data encapsulation allows data to be transported across the network, data access local and remote network resources.

Unit 2

Physical Layer - Purpose- Characteristic and cabling-Wireless media. Number System - Hexadecimal and binary formats for Addressing in MAC & IP. Data Link Layer-

Functioning of the DLL -media access method both in WAN and LAN Technologies. Ethernet Switching -Ethernet Frame - Building MAC Address Table- switch forwarding methods and port settings.

Unit 3

Network Layer - Network layer characteristics-IPv4 and IPv6 Packets- Introduction to Routing - Static vs Dynamic Routing -IPv4 Routing table-Address Resolution-Basic Router Configuration- Configure initial settings and the default gateway. IPv4 Addressing - IPv4 address structure- Network Segmentation - Subnet an IPv4 Network - IPv4 Address Conservation-VLSM topology address assignment. IPv6 Addressing - IPv4 Issues, IPv6 Address Representation, GUA and LLA static and Dynamic addressing – Subnet an IPv6 Network. ICMP

Unit 4

Transport Layer - TCP and UDP overview – Port Numbers – TCP Communication Process – Reliability and Flow Control- UDP Communication. Application Layer - Application, Presentation and Session - Peer-to-peer, web and Email Protocols - File sharing services. Network Security

Security Threats and Vulnerabilities – Network Attacks and Mitigation- Device Security. Build a Small Network - Put applications and Protocols – Scale to larger Networks

Textbooks:

1. Computer Networking A Top-Down Approach(Fifth Edition)-James F. Kurose-Keith W. Ross (Pearson)
2. Computer Networks (Fifth Edition) – Andrew S. Tanenbaum (Prentice Hall of India)

References:

1. Computer Networks - Protocols, Standards and Interfaces (Second Edition) – UylessBlack(Prentice Hall of India Pvt. Ltd.)
2. Data communication and Networking (Fourth Edition)- Behrouz A Forouzan(Tata Mcgraw Hill)

CO-PO Affinity Map:

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	2	3	2	-	-	-	-	-	-	-	-	-

CO3	2	2	3	-	-	-	-	-	-	-	-	-
CO4	2	1	2	3	2	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-

3-strong, 2-moderate, 1-weak

21CSA282A Computer Networks Lab (0 0 2 -1)

Network Representation, Implementing basic Connectivity, Switch, Router, Gateway and End device configuration. Building a LAN and WLAN,
Examine ARP, MAC & Routing table, Subnetting & VLSM. Implementing troubleshooting commands.
TCP & UDP communication,
Wireshark to analyse the Packet in the network.
Configuring Application Protocol – HTTP,FTP, DNS,SMTP, DHCP Services

Semester 4

SEMESTER 4		**L T P**	**Cr**
21CSA211A	Distributed Systems	3 1 0	4
21CSA212A	Web Application Development	3 1 0	4
21CSA213A	Software Engineering	3 1 0	4
	Elective C	3 0 0	3
	Elective D	3 0 0	3
21CSA283A	Web Application Development lab	0 0 2	1
Total			**19**

21CSA211A **Distributed Systems** **(3 1 0-4)**

Course Description:

The course focuses on the fundamentals of distributed systems. It deals with the layer of software that needs to be built on top of computer networks to enable the development of distributed applications. It also focuses on the design, implementation and management of distributed systems.

Course Outcomes:

CO1	Able to understand the conceptual model of distributed systems
CO2	Able to explain the components of a distributed system and evaluate the tradeoffs of alternative architectural models
CO3	Suggest algorithm suitable for application in distributed systems
CO4	Understand how communication and synchronization is achieved in a distributed system
CO5	Study the relevance of maintaining consistency and replication in a distributed system
CO6	Understand the concept of fault tolerance and security in a distributed system

Syllabus:

Unit 1

Introduction: Distributed systems and their goals, hardware and software concepts, types of distributed systems, traditional and modern architectures for distributed systems.

Unit 2

Processes: Threads, Virtualization, Clients, servers, code migration and software agents.
Communication: Basics of communication, remote procedure calls, remote object invocation, message-oriented, stream-oriented communication, multicast Communication.

Unit 3

Naming: Naming and locating entities, removing unreferenced entities, Flat, Structured and Attribute-based naming
Synchronization: Synchronization in distributed systems, logical time, global state, elections and mutual exclusion.

Unit 4

Consistency and replication: Data centric, client centric, Data replication, scalability, and consistency protocols

Fault tolerance: Making distributed systems fault tolerant; distributed commit, reliable and resilient multicasting, Recovery

Security: Secure communication and authorization in distributed systems.

Unit 5

Review of major distributed systems paradigms: object systems, file systems, web-based systems, and coordination-based systems

Textbooks:

1. Distributed Systems: Principles and Paradigms. Andrew S. Tanenbaum and Maarten van Steen. Prentice Hall, 2nd Ed., 2006

References:

1. Distributed Computing, Fundamentals, Simulations and Advanced topics, 2nd Edition, HagitAttiya and Jennifer Welch, Wiley India
2. Distributed Systems: Concepts and Design, G. Coulouris, J. Dollimore, and T. Kindberg, 5th Edition, Addison-Wesley

CO-PO Affinity Map:

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

3-strong, 2-moderate, 1-weak

21CSA212A **Web Application Development** **(3 1 0-4)**

Course Description:

This course focuses on design and development of web-based applications using different languages like HTML, CSS, JavaScript and PHP. This course also gives and introduction to developing web applications using MVC architecture, usage of web framework Angular JS and XML.

Course Outcomes:

CO1	Design and develop responsive web pages using HTML5 and CSS3.
CO2	Explain concepts of Document Object Model and AJAX and develop client- side scripts using Java Script.
CO3	Develop simple applications using Angular JS.
CO4	Develop web-based applications with PHP and MySQL using a web application framework.
CO5	Create XML files and explain its applications.

Syllabus:

Unit -1

HTML5 and CSS3 :HTML5- Basic Tags, Tables,Forms.HTML5 Tags,HTML Graphics, HTML media, HTML Graphics,HTML APIs.

CSS - Background, Borders,margin, Box model. Styling text, fonts,list,links,tables,

CSS overflow,float,inline blocks, pseudo-classes,pseudoelements.CSS

border images,rounded corners

Unit-2

Java Script

Client side scripting using java script, Introduction to java script, internal and external Java script files, variables, control statements, loops, Arrays, string handling , How to write functions in JavaScript, inputting and outputting from form elements to JavaScript. DOM concept, creating html elements using java script. Drawing 2D shapes, handling events. Introduction to AJAX, JQUERY

Unit-3

Building Single page applications with Angular JS

Single page application – introduction , two way data binding, MVC in Angular JS, controllers, getting user inputs , loops , Client side routing – accessing URL data , various ways to provide data in angular JS.

Unit -4

Server Side Programming

Server side scripting, Difference between client side and server side scripting languages. Introduction to PHP, variables, control statements, loops, Arrays, string handling, PHP forms, Global variables in PHP, Regular expression and pattern matching, Database programming: inputting and outputting data from MySQL using PHP, insertion, deletion and updating data.
State management in web applications, cookies, Application and session state.

Unit-5

Introduction to Xml, usage of XML, XML tags, elements and attributes, attribute type, XML validation: DTD and XSD, XML DOM

Textbooks:

1. Learning PHP, MySQL & JavaScript,2018, 5th Edition by Robin Nixon, O'Reilly Media, Inc.
2. HTML and CSS - The Complete Reference, by Thomas A Powell, McGraw Hill
3. AngularJS: Up and Running - Enhanced Productivity with Structured Web Apps, Shyam Seshadri and Brad Green, Shroff/O'Reilly; First edition
4. XML Bible by Horold, Ellotte Rusty

CO-PO Affinity Map:

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

3-strong, 2-moderate, 1-weak

21CSA283A Web Application Development Lab (0 0 2-1)

This lab course focuses on various technologies, frameworks and languages for developing web based applications.
Web application development using HTML5,CSS,Javascript, PHP and XML.
Single page applications with Angular JS.
Case study:-Application Development using Laravel framework

21CSA213A Software Engineering (3 1 0-4)

Course Description:

Software Engineering presents a broad perspective on software systems engineering, concentrating on widely used techniques for developing large-scale software systems. This course covers a wide spectrum of software processes from initial requirements elicitation through design and development to system evolution.

Course Outcomes:

CO 1	Understand and apply the principles of software engineering techniques.
CO 2	Understand various software process models
CO 3	Apply the right software design methodology for a given scenario
CO 4	Evaluate a system developed for real-world applications
CO 5	Understand and implement various industry standards in software development and maintenance.

Syllabus:

UNIT 1 Introduction:
Software - Software characteristics -- Software life-cycle models: Basics of Life cycle and Waterfall Model, Prototyping and Spiral life cycle models - Agile Manifesto, Principles of agile manifesto, Various Agile methodologies: Scrum, Extreme programming.

UNIT 2. Requirements Engineering:
Tasks Initiation, Elicitation-Developing Use Cases, Building the analysis Mode, Negotiation, Validation - Requirements Modelling: building Analysis model, Scenario based methods, UML (Unified Modelling Language) Models, Data Models. Design. Software requirements specification, formal requirements specification and verification.

UNIT 3 Software Design:
Design Concepts - Function-oriented software design: Data Flow Diagram - Architectural design styles - Object-oriented design: Class and Interaction Diagram, Activity and State Chart Diagram, Design Patterns.

UNIT 4. - User interface design:
Concepts of User Design, Types of User Interfaces. - Coding and testing: Black-box testing, White Box Testing, Unit, Integration and Systems testing -Debugging techniques.

UNIT 5 Software Quality:
SEI CMM and ISO-900 - Software maintenance – Computer Aided Software Engineering (CASE) - Reverse Engineering and Reengineering

Textbooks:

1. Roger S. Pressman, "Software Engineering", Tata McGraw-Hill Publishing Company Pvt. Ltd, Sixth Edition.

References:

1. Shooman, "Software Engineering", Tata McGraw-Hill Publishing Company, Pvt. Ltd, 1987
2. Rajib Mall, Fundamentals of Software Engineering, Prentice Hall India.
3. Pankaj Jalote,, An integrated approach to Software Engineering, Springer/Narosa..

CO – PO Affinity Map:

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

3-strong, 2-moderate, 1-weak

Semester 5

SEMESTER 5		L T P	Cr
21CSA301A	C# and .NET Framework	3 0 2	4
21CSA302A	Advanced Java and J2EE	3 1 0	4
21CSA303A	Mobile Application Development	3 0 2	4
	Elective E	3 0 0	3
	Elective F	3 0 0	3
21CSA381A	Advanced Java and J2EE Lab	0 0 2	1
Total			**19**

21CSA301A C# and .NET Framework (3 0 2-4)

Course Description:

This course is designed to introduce the student a new object -oriented programming language C# within Microsoft.Net Framework. This course covers the essentials to use managed programming to create the windows Applications using C#.NET.

Course Outcomes:

CO1	Understand .Net Framework and its architecture.
CO2	Able to create console applications in C# language.
CO3	Able to build Window applications with event handling and MDI.
CO4	Design and implement a database application using ADO.Net.
CO5	Able to build Web applications using ASP.Net

Syllabus:

Unit 1

.Net Framework Overview- Architecture-.Net Framework class Libraries-CLR-Metadata-Interoperability-Assemblies-the .net Packaging system-CLR-MSIL,

Introduction to Visual Studio.Net-C# Programming Concepts-Predefined Types- Value types and reference type, Classes and Objects, Constructors and methods , Conditional statements, loops, arrays , Collection classes: ArrayList , HashTable, Stack ,Queue, indexers and properties.

Unit 2

String class: methods and properties of string class, enumerations, boxing and unboxing,

OOPS concepts: Encapsulation, data hiding, inheritance, interfaces, polymorphism, operator overloading, overriding Methods, Static Class members, Delegates and events. Exception Handling, garbage collector, generics and collection, Using I/O, Streams and Files

Unit 3

Basics of Windows Programming- Event Driven Programming, Windows Forms, Using common controls-Labels, textboxes, buttons, check boxes, radio button, progress bar, combo box, list box. Components-timer, imagelist, Menus, Modal and Modeless Dialog Boxes, MDI, Mouse and keyboard event handling.

Unit 4:

Introduction to ADO.Net-Object Model- System, LINQ, Data Namespace- Data Bound controls- Connected Mechanism-Disconnected mechanism-.Net Data Providers.

Unit 5

Introduction to ASP.NET, programming model,Web Forms and Web controls, server controls, data binding, Master Pages, ASP.NET state management.

Textbooks:

1. C# 4.0 the Complete Reference by Herbert Schildt, McGraw-Hill
2. ASP.NET Complete Reference, Matthew Macdonald and Robert Standefer, McGraw-Hill

References:

1. Pro C# 5.0 and the .NET Framework 4.5, Andrew Trolsens, Apress
2. Robert Powel, Richard Weeks, C# and the .NET Framework, Techmedia

CO-PO Affinity Map:

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	Po7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1		2							
CO2	2	1	1	3	2							
CO3	2	2	3	1	2	1		1			1	
CO4	1	2	3	1	2	1		1			1	
CO5	2	2	3	1	2	1		1			1	

3-strong, 2-moderate, 1-weak

21CSA302A Advanced Java and J2EE (3 1 0-4)

Course Description:

This course is designed to teach the student how to write, test, and debug advanced-level Object-Oriented programs using Java with a heavy emphasis toward network and web programming. The course covers Graphical User Interface (GUI) networking, database manipulation, Networking and N-Tier programming.

Course Outcomes:

CO1	Understand Socket Programming and remote method invocation using **Java** API
CO2	Develop java application to interact with database by using relevant software component (JDBC Driver)
CO3	Understand the process of design console based, GUI based and web based applications.
CO4	Understand integrated development environment to create, debug and run multi-tier and enterprise-level applications

Syllabus:

Unit 1

Networking: Classes to be covered Socket, ServerSocket, IPAddress, URL connections – Swing controls – JDBC - Writing JDBC applications using select, insert, delete, update.

Unit 2

SERVLETS: Introduction to Servlets (Life cycle of servlets, Java Servlets Development Kit, creating, Compiling and running servlet). The servlet API: javax. servlet package. Reading the servlet Parameters, Reading Initialization parameter. The javax.servlet.http.

Unit 3
JAVA SERVER PAGES: Configuring Tomcat JSP/Servlet server. Brief Introduction to J2EE Architecture. Advantage of JSP technology. JSP Architecture, JSP Access Model. JSP Syntax Basic (Directions, Declarations, Expression, Scriplets, Comments) JSP Implicit Object (Out, HttpServlet Request, Http Servlet Respose, Exception Handling, Session Management.

Unit 4
Package Handling HTTP Request and Response (GET/ POST Request), Using Cookies, Session Tracking. Exception Handling.

Unit 5
Introduction to EJB – Understanding MVC – Building Controllers, models and views – Integrating hibernate with spring.

Textbooks:

1. Deitel&Deitel, "Java How to program", Prentice Hall, 4 th Edition, 2000.
2. Gary Cornell and Cay S. Horstmann, "Core Java Vol 1 and Vol 2", Sun Microsystems Press, 1999.
3. Stephen Asbury, Scott R. Weiner, Wiley, "Developing Java Enterprise Applications", 1998.

References:

1. Java 6 Programming, Black Book, Dreamtec
2. Java Server Programming, Java EE6 (J2EE 1.6), Black Book, Dreamtech
3. Advanced Java Technology, By M.T. Savaliya, Dreamtech

CO-PO Affinity Map:

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	Po7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2		3							
CO2	2	3	2	2	3							
CO3		2	2		3							
CO4			2	2	3							

3-strong, 2-moderate, 1-weak

21CSA381A Advanced Java and J2EE Lab (0 0 2-1)

Programs using Swing, JDBC, SQL Command execution, TCP communication for server and client, Servlets, JSP, MVC

21CSA303A Mobile Application Development (3 1 0-4)

Course Description:

This course covers the principles of mobile application design and development. Students will learn application development on the Android platform. Topics will include basic introduction to Android platform, Android Java Basics, application development and debugging, basic and advanced UI design, Android Notifications and SQLite database for Android applications. Students are expected to work on a project that produces a professional-quality mobile application.

Course Outcomes:

CO1	Understand the aspects of mobile programming that makes it unique from other programming platforms.
CO2	Develop the skills to analyse and assess the mobile applications on their design pros and cons.
CO3	Utilize the skillset gained to design and develop sophisticated mobile interfaces.
CO4	Able to develop mobile applications for the Android operating system that use basic and advanced phone features.
CO5	Deploy applications to the Android marketplace for distribution.

Syllabus:

Unit 1

Introduction: About Android, Pre-requisites to learn Android, Dalvik Virtual Machine & .apk file extension, Android API levels (versions & version names)

Android Java Basics: Getting started with Android development, project folder structure, simple programming, running project, generating build/APK of the app from Android Studio
First application: Creating Android Project, Android Virtual Device Creation, Set up debugging environment, Workspace set up for development, Launching emulator, debugging on mobile devices.

Unit 2
Basic UI design: Basics about Views, Layouts, Drawable Resources, Input controls, Input Events, Toasts.
More UI Components: Layouts - GridView and ListView, Action bar, Adapters, Menus: Option menu, context menu, sub menu, Pickers - Date and Time, Spinners.

Unit 3
Activity and Fragment: Activity, Fragment, Activity Lifecycle and Fragment Lifecycle.
Intents: Implicit Intents, Explicit intents, communicating data among Activities.
Navigation Drawer: Panel that displays the app's main navigation screens on the left edge of the screen
Android Notifications – Toast, Dialogs (TimePicker, DatePicker, Progress, Alert), Notification Manager and Push Notification

Unit 4
Introducing SQLite - SQLiteOpenHelper and creating a database - Opening and closing a database, Working with cursors Inserts, updates, and deletes

Lab: Understand the app idea and design user interface/wireframes of mobile app • Set up the mobile app development environment

Textbooks:

1. HeadFirst Android Development, by Dawn Griffiths, David Griffiths, 2017, O'Reilly Media, Inc.
2. Android Programming: Pushing the Limits, Wiley By Erik Hellman
3. Android Application Development Black Book, Pradeep Kothari, KLSI ,Dreamtech Press

References:

1. Internet tutorials on Android app development**:** https://developer.android.com/

CO-PO Affinity Map:

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	Po7	PO8	PO9	PO10	PO11	PO12

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

3-strong, 2-moderate, 1-weak

Semester 6

SEMESTER 6		**L T P**	**Cr**
21CSA399A	Industry Project		15
Total			**15**

21CSA399A Industry Project (15)

Course Description:

The goal of Industry Project course is to help the student experienced in industrial projects. Give the students opportunity to apply the skills they acquired through the different courses in this program, to solve real world problems.

Course Outcomes:

CO1	Apply the skills a student acquired through the different courses in this program to design software solutions for real world problems
CO2	To expose the student to the industry-standard project practices, under time and deliverable constraints.
CO3	Provide opportunity to work as a team and evaluate the developed product/algorithm both from individual's and team's perspective

CO4	Demonstrate independence and originality in thought and application and communicate among software professionals to demonstrate the knowledge and principles.

CO-PO Affinity Map:

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	Po7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	2	1	1	2	3	2	3
CO2	3	3	3	3	2	3	1	3	2		2	2
CO3	3	2	3	3	3	2	2	2			3	2
CO4	2	2	1	1	1	3	3			2	3	3

3-strong, 2-moderate, 1-weak