BACHELOROF COMPUTER APPLICATIONS

CURRICULUM AND SYLLABUS
2021

SEMESTER I

Code	Title	L T P	Credit
21CUL101	**Cultural Education I**	**2 0 0**	**2**
21ENG101	**Communicative English**	**2 0 2**	**3**
	Language I	**2 0 0**	**2**
	Mathematics Core I	**3 1 0**	**4**
21ENV200	**Environmental Science and Sustainability**	**3 0 0**	**3**
21CSA103	**Computer Essentials**	**3 0 1**	**4**
21CSA106	**Problem Solving and Algorithmic Thinking**	**3 0 0**	**3**
21CSA182	**Problem Solving and Algorithmic Thinking Lab**	**0 0 1**	**1**
	TOTAL		**22**

SEMESTER II

Code	Title	L T P	Credit
21CUL111	**Cultural Education II**	**2 0 0**	**2**
21ENG111	**Professional Communication**	**1 0 2**	**2**
	Language II	**2 0 0**	**2**
	Mathematics Core II	**3 1 0**	**4**
21CSA112	**Database Management System**	**3 1 0**	**4**
21CSA113	**Programming in C**	**3 1 0**	**4**
21CSA114	**Computer Organization**	**3 1 0**	**4**
21CSA183	**Database Management System Lab***	**0 0 1**	**1**
21CSA186	**Programming in C Lab**	**0 0 1**	**1**
	TOTAL		**24**

SEMESTER III

Code	Title	L T P	Credit
21AVP201	**Amrita Values Programme I**	**1 0 0**	**1**
21SSK201	**Life Skills I**	**1 0 2**	**2**
	Mathematics Core III	**3 1 0**	**4**
21CSA201	**Data Structures and Algorithms**	**3 1 0**	**4**
21CSA202	**Object Oriented Programming using JAVA**	**3 1 0**	**4**
21CSA203	**Operating Systems**	**3 1 0**	**4**
21CSA204	**Principles of Management and Accounting**	**3 0 0**	**3**
21CSA282	**Data Structures and Algorithms Lab**	**0 0 1**	**1**
21CSA283	**Object Oriented Programming Lab using JAVA***	**0 0 1**	**1**
	TOTAL		**24**

SEMESTER IV

Code	Title	L T P	Credit
21AVP211	**Amrita Values Programme II**	**1 0 0**	**1**
21SSK211	**Life Skills II**	**1 0 2**	**2**
21CSA212	**Computer Networks**	**3 1 0**	**4**
21CSA213	**Advanced JAVA and J2EE**	**3 1 0**	**4**
21CSA214	**Web Technologies**	**3 1 0**	**4**
21CSA215	**Software Engineering**	**3 0 1**	**4**
	Open Elective	**3 0 0**	**3**
21CSA285	**Advanced JAVA and J2EE Lab**	**0 0 1**	**1**
21CSA286	**Web Technologies Lab***	**0 0 1**	**1**
	TOTAL		**24**

SEMESTER V

Code	Title	L T P	Credit
21SSK301	**Life Skills III**	**1 0 2**	**2**
21CSA301	**Data Warehousing and Data Mining**	**3 1 0**	**4**
21CSA302	**Python Programming**	**3 0 0**	**3**
21CSA390@	**Live-in-Labs@ / Elective I**	**3 0 0**	**3**
21CSA303	**Mobile Application Development***	**0 1 1**	**2**
21CSA381	**Python Programming Lab**	**0 0 1**	**1**
21CSA391	**Comprehensive Technical Viva Voce**		**2**
21CSA398	**Minor Project**		**4**
	TOTAL		**21**

SEMESTER VI

Code	Title	L T P	Credit
21CSA311	**C# and .NET Framework***	**0 1 1**	**2**
21CSA312	**Cryptography and Cyber Security**	**4 0 0**	**4**
	Elective II	**3 0 0**	**3**
	Professional Elective I	**3 0 1**	**4**
21CSA399	**Major Project**		**8**
	TOTAL		**21**
	TOTAL CREDITS		**136**

***** Project based course. Proper weightage may be given for the project in the continuous assessment.

LANGUAGES

Paper I			
Code	**Title**	**L T P**	**Credit**
21HIN101	**Hindi I**	**2 0 0**	**2**
21KAN101	**Kannada I**	**2 0 0**	**2**
21MAL101	**Malayalam I**	**2 0 0**	**2**
21SAN101	**Sanskrit I**	**2 0 0**	**2**
21TAM101	**Tamil I**	**2 0 0**	**2**
Paper II			
Code	**Title**	**L T P**	**Credit**
21HIN111	**Hindi II**	**2 0 0**	**2**
21KAN111	**Kannada II**	**2 0 0**	**2**
21MAL111	**Malayalam II**	**2 0 0**	**2**
21SAN111	**Sanskrit II**	**2 0 0**	**2**
21TAM111	**Tamil II**	**2 0 0**	**2**

MATHEMATICS CORES

Code	Title	L T P	Credit
21MAT231	**Mathematical Foundation for Computer Science**	**3 1 0**	**4**
21MAT232	**Discrete Mathematics**	**3 1 0**	**4**
21MAT233	**Statistical and Numerical Methods**	**3 1 0**	**4**
21MAT234	**Algebra and Number Theory**	**3 1 0**	**4**
21MAT235	**Foundations of Applied Mathematics - Part I**	**3 1 0**	**4**
21MAT236	**Foundations of Applied Mathematics - Part II**	**3 1 0**	**4**

PROFESSIONAL ELECTIVES

Code	Title	L T P	Credit
21CSA342	**IoT Architectures and Programming**	**3 0 1**	**4**
21CSA343	**Advanced Software Engineering and Design Patterns**	**3 0 1**	**4**
21CSA344	**Advanced Data Mining and Applications**	**3 0 1**	**4**
21CSA345	**Cloud Computing**	**3 0 1**	**4**
21CSA346	**System Security**	**3 0 1**	**4**
21CSA347	**Architecture and Deployment of Secure and Scalable WAN**	**3 0 1**	**4**
21CSA348	**Introduction to Business Analytics and Visualization**	**3 0 1**	**4**

ELECTIVE I, II

Code	Title	L T P	Credit
21CSA331	**Artificial Intelligence**	**3 0 0**	**3**
21CSA332	**Client Server Computing**	**3 0 0**	**3**
21CSA333	**Embedded Systems**	**3 0 0**	**3**
21CSA334	**Enterprise Resource Planning Management**	**3 0 0**	**3**
21CSA335	**Knowledge Management**	**3 0 0**	**3**
21CSA336	**Microprocessor Systems**	**3 0 0**	**3**
21CSA337	**Multimedia and Graphics**	**3 0 0**	**3**
21CSA338	**Social and Professional Issues in Computing**	**3 0 0**	**3**
21CSA339	**Soft Computing**	**3 0 0**	**3**
21CSA340	**Systems and Network Administration**	**3 0 0**	**3**
21CSA341	**Computer Graphics**	**3 0 0**	**3**

SYLLABUS

SEMESTER I

21CUL101	CULTURAL EDUCATION I	L-T-P-C:2-0-0-2

Course Objectives

- To introduce students to the depths and richness of the Indian culture and knowledge traditions, and to enable them to obtain a synoptic view of the grandiose achievements of India in diverse fields.
- To equip students with a knowledge of their country and its eternal values.

Course Outcomes

COs	Description
CO1	Be introduced to the foundational concepts of Indian culture and heritage, the cultural ethos of Amrita Vishwa Vidyapeetham, and Amma's life and vision of holistic education.
CO2	Understand the foundational concepts of Indian civilization like purusharthas, karma-siddhanta, Indian Society and Varna-ashrama-dharma which contributes towards personality growth.
CO3	Gain a positive appreciation of symbols of Indian culture, itihasas, festivals, traditions and the spirit of living in harmony with nature.
CO4	Imbibe the principles and practices of Yoga.
CO5	Get guidelines for healthy and happy living from the great spiritual masters.

CO-PO Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	-	-	-	2	1	1	-	-	-
CO2	-	-	-	3	-	1	-	-	-
CO3	-	-	-	1	1	2	-	-	-
CO4	-	-	-	1	2	2	-	-	-
CO5	-	-	-	2	2	2	-	-	-
CAM	-	-	-	2	1	2	-	-	-

Syllabus

Unit-1

Introduction to Indian culture; Understanding the cultural ethos of Amrita Vishwa Vidyapeetham; Amma's life and vision of holistic education.

Unit-2

Goals of Life – Purusharthas; Introduction to Varnasrama Dharma; Law of Karma; Practices for Happiness.

Unit-3

Symbols of Indian Culture; Festivals of India; Living in Harmony with Nature; Relevance of Epics in Modern Era; Lessons from Ramayana; Life and Work of Great Seers of India.

Text Books / References:

1. Cultural Education Resource Material Semester-1
2. The Eternal Truth (A compilation of Amma's teachings on Indian Culture)
3. Eternal Values for a Changing Society. Swami Ranganathananda. Bharatiya Vidya Bhavan.
4. Awaken Children (Dialogues with Mata Amritanandamayi) Volumes 1 to 9
5. My India, India Eternal. Swami Vivekananda. Ramakrishna Mission.

21ENG101	COMMUNICATIVE ENGLISH	L-T-P-C: 2-0-2-3

Course Objectives

Course Outcomes

COs	Description
CO1	
CO2	
CO3	
CO4	
CO5	

CO-PO Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1									
CO2									
CO3									
CO4									
CO5									
CAM									

Syllabus

Textbooks / References:

21ENV200	ENVIRONMENTAL SCIENCE AND SUSTAINABILITY	L-T-P-C:3-0-0-3

Course Objectives

- To study the nature and facts about environment.
- To appreciate the importance of environment by assessing its impact on the human world

Course Outcomes

COs	Description
CO1	Recognize the physical, chemical & biological components of the Earth's systems and how they function
CO2	Develop an attitude of preserving and conserving bio-diversity.
CO3	Understand how local, regional, state, national and international laws and regulations influence environmental decisions
CO4	Realize the benefits of eco-friendly products and green initiatives

CO-PO Mapping

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	-	2	-	1	1	-	-	-	-
CO2	-	2	-	-	-	-	-	-	-
CO3	-	2	2	1	1	1	-	-	-
CO4	-	3	-	3	-	-	-	-	-
CAM	-	2	2	1	1	1	-	-	-

Syllabus

Unit 1

State of Environment and Unsustainability, Need for Sustainable Development, Traditional conservation systems in India, People in Environment, Need for an attitudinal change and ethics, Need for Environmental Education, Overview of International Treaties and Conventions, Overview of Legal and Regulatory Frameworks.
Environment: Abiotic and biotic factors, Segments of the Environment, Biogeochemical Cycles, Ecosystems (associations, community adaptations, ecological succession, Food webs, Food chain, ecological pyramids), Types of Ecosystems – Terrestrial ecosystems, Ecosystem Services, Economic value of ecosystem services, Threats to ecosystems and conservation strategies.
Biodiversity: Species, Genetic & Ecosystem Diversity, Origin of life and significance of biodiversity, Value of Biodiversity, Biodiversity at Global, National and Local Levels, India as a Mega-Diversity Nation (Hotspots) & Protected Area Network, Community Biodiversity Registers. Threats to Biodiversity, Red Data book, Rare, Endangered and Endemic Species of India. Conservation of Biodiversity. People's action. Impacts, causes, effects, control measures, international, legal and regulatory frameworks of: Climate Change, Ozone depletion, Air pollution, Water pollution, Noise pollution, Soil/ land degradation/ pollution

Unit 2

Linear vs. cyclical resource management systems, need for systems thinking and design of cyclical systems, circular economy, industrial ecology, green technology. Specifically apply these concepts to: Water Resources, Energy Resources, Food Resources, Land & Forests, Waste management.
Discuss the interrelation of environmental issues with social issues such as: Population, Illiteracy,

Poverty, Gender equality, Class discrimination, Social impacts of development on the poor and tribal communities, Conservation movements: people's movements and activism, Indigenous knowledge systems and traditions of conservation.

Unit 3

Common goods and public goods, natural capital/ tragedy of commons, Cost benefit analysis of development projects, Environment Impact Assessment (EIA), Environment Management Plan (EMP), Green business, Eco-labeling, Problems and solutions with case studies.

Global and national state of housing and shelter, Urbanization, Effects of unplanned development case studies, Impacts of the building and road construction industry on the environment, Eco- homes/ Green buildings, Sustainable communities, Sustainable Cities.

Ethical issues related to resource consumption, Intergenerational ethics, Need for investigation and resolution of the root cause of unsustainability, Traditional value systems of India, Significance of holistic value-based education for true sustainability.

Textbooks / References:

1. R. Rajagopalan, Environmental Studies: From Crisis to Cure. Oxford University Press, 2011, 358 pages. ISBN: 9780198072089.
2. Daniel D. Chiras, Environmental Science. Jones & Bartlett Publishers, 01-Feb-2012, 669 pages. ISBN: 9781449645311.
3. Andy Jones, Michel Pimbert and Janice Jiggins, 2011. Virtuous Circles: Values, Systems, Sustainability. IIED and IUCN CEESP, London. URL:http://pubs.iied.org/pdfs/G03177.pdf
4. Annenberg Learner, The Habitable Planet, Annenberg Foundation 2015. URL: http:// www.learner.org/courses/envsci/unit/pdfs/textbook.pdf.

21CSA103	COMPUTER ESSENTIALS	L-T-P-C:3-0-1-4

Course Objectives

- To provide understanding of the various components and functional units of computers, their design and working.
- To provide insight into digital systems and logic circuit design.

Course Outcomes

COs	Description
CO1	Understand the basic components of computer systems and its functionality.
CO2	Understanding of number systems and representations.
CO3	Understanding of boolean algebra, design and implementation of various logic circuits.
CO4	Understanding of various types of combinational and sequential circuits and their functions.

CO-PO Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	2	1	-	-	-	-	1	-
CO2	3	-	-	-	-	-	1	-	-
CO3	2	2	-	-	-	-	-	-	-
CO4	2	3	-	-	-	-	-	-	-
CAM	3	2	1	-	-	-	1	1	-

Syllabus

Computer Fundamentals: Brief history of Computer, Classification of Computers, Functions & Components of a Computer, Central Processing Unit, Storage units, Bus, Input and output Devices. Types of memory, RAM, ROM, Variants of ROM, Secondary storage devices- hard disk-disk components and geometry. Other Secondary Storage devices: CD/DVD Family, Blue ray Disc, Flash Drive, Memory stick, smart cards. Computer Languages-Machine, Assembly Language and Higher Level languages. Operating systems, Bootstrapping. Program execution with illustrative examples.

Number Systems: Decimal, Binary, Octal, Hexadecimal conversion from one to another- Binary arithmetic, representation of signed numbers, 1's and 2's Complement Arithmetic.

Logic Gates and Boolean Algebra. Logic Gate: Basic logic gates- AND, OR, NOT, NAND, NOR, Exclusive OR, Exclusive NOR gates- Logic symbols, truth table and timing diagrams. Boolean algebra - Basic laws and theorems, Boolean functions, truth table, minimization of boolean function using K map method, Realization using logic gates and universal gates.

Logic Circuits: Combinational logic circuits: Half adder, Full adder, Parallel binary adder, Subtracter, Decoders, Encoders, Multiplexers, De-multiplexers. Sequential logic circuits- Flip Flops – RS, JK, T and D Flip Flops, Edge triggered Flip Flops, Master slave Flip Flops.

Registers and Counters: Serial in serial out, Serial in Parallel out, Parallel in serial out, Parallel in Parallel out registers, Bidirectional shift registers. Introduction to counters and applications.

Lab: PC assembling, identification of components, bus subsystems, main chipsets on the motherboard (northbridge, southbridge), Disk formatting, Understanding disk partitions and obtaining partition information

using system tools. Operating system installation, Using package manager or system tools to install/update software. Obtaining essential system resource utilization and information using system tools, Troubleshooting.

Basic Linux commands, Searching the file system using find and grep with simple regular expressions. Basic process control using signals: pausing and resuming process from a Linux terminal, terminating a process. Adding/removing from search path using PATH variable. Compressing/uncompressing using tar/gzip and zip tools. Using man pages to understand tool documentation

Textbooks / References:

1. Floyd & Jain, “Digital Fundamentals”, Eighth Edition, Pearson Education, (2004).
2. Anand Kumar, “Fundamentals of Digital Circuits”, PHI Learning Pvt. Ltd., (2003).
3. Morris Mano, “Digital logic and Computer design”, First Edition, Prentice Hall of India, (2004).
4. Digital principles and Applications- Albert Paul Malvino, Donald P Leach, McGraw Hill
5. The Complete Reference PC Hardware – Craig Zacker, John Rourke, Tata McGraw-Hill, 2004.
6. All about Hard Disk- Manohar Lotia, BPB Publications.
7. P K Sinha & Priti Sinha, “Computer Fundamentals”, Fourth Edition, BPB Publications, (2004).
8. Halsey M. Windows 10 Troubleshooting. Apress; 2016.
9. Soyinka W. Linux Administration: A Beginner’s Guide. Fifth Edition, Mc Graw Hill Professional; 2008

21CSA106	PROBLEM SOLVING AND ALGORITHMIC THINKING	L-T-P-C: 3-0-0-3

Course Objectives

- This course provides the foundations of computational problem solving.
- The course focuses on principles and methods thereby providing transferable skills to any other domain.
- The course also provides foundation for developing computational perspectives of one's own discipline.

Course Outcomes

COs	Description
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.

CO-PO Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-	3	2	-
CO2	2	3	1	-	-	-	3	3	-
CO3	3	2	2	-	-	-	-	-	-
CO4	1	-	2	-	-	-	-	1	-
CAM	3	2	2	-	-	-	3	2	-

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 – decomposing into functions.

Unit II

Representing and manipulating composite data - lists and strings, 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, problem-solving on strings.

Unit III

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

Unit IV

Libraries - Create, export and import packages, commonly used packages - math, random numbers, regular expressions, file handling; Programming semantics - Overflow, underflow, mutability, scope, visibility, exception handling, bitwise operators; Basics of algorithms - time and space complexity, asymptotic notations

Textbooks / References:

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
3. Ferragina P, Luccio F. Computational Thinking: First Algorithms, Then Code. Springer; 2018.
4. Beecher K. Computational Thinking: A beginner's guide to Problem-solving and Programming. BCS Learning & Development Limited; 2017.
5. 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

21CSA182	PROBLEM SOLVING AND ALGORITHMIC THINKINGLAB	L-T-P-C: 0-0-1-1

Course Objectives

- This course provides the foundations of computational problem solving.
- The course focuses on principles and methods thereby providing transferable skills to any other domain.
- The course also provides foundation for developing computational perspectives of one's own discipline.

Course Outcomes

COs	Description
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.

CO-PO Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-	3	2	-
CO2	2	3	1	-	-	-	3	3	-
CO3	3	2	2	-	-	-	-	-	-
CO4	1	-	2	-	-	-	-	1	-
CAM	3	2	2	-	-	-	3	2	-

Syllabus

Reading input/writing output, data representation, choice of data types, formulating solutions to basic problems by applying sequence, selection, and repetition constructs; Modularity – decomposing into functions. lists and strings, problem-solving on lists- performing a search.
Manipulating string data - concatenation, splitting, reversal, comparison, pattern matching on strings, problem-solving on strings.
Using recursion for problem-solving, practical examples of recursion, iteration vs. recursion, simple and binary recursion; sorting and searching.
Data structures - tuples, sets, dictionaries.
Libraries - Create, export and import packages, commonly used packages - math, random numbers, regular expressions, file handling;

Textbooks / References:

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
3. Ferragina P, Luccio F. Computational Thinking: First Algorithms, Then Code. Springer; 2018.
4. Beecher K. Computational Thinking: A beginner's guide to Problem-solving and Programming. BCS Learning & Development Limited; 2017.
5. 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

SEMESTER II

21CUL111	CULTURAL EDUCATION II	L-T-P-C: 2-0-0-2

Course Objectives

- To deepen students' understanding and further their knowledge about the different aspects of Indian culture and heritage.
- To instill into students, a dynamic awareness and understanding of their country's achievements and civilizing influences in various fields and at various epochs.
- To bring a greater ability to deal with life's challenges by helping students towards a balanced and harmonized personality.

Course Outcomes

COs	Description
CO1	To get an overview of India's contribution to the world in the field of art, architecture, and science; to understand the foundational concepts of ancient Indian education system; to glean insights from Mahabharata.
CO2	Learn the important concepts of Vedas, Vedangas, and Yogasutras for the refinement of personality.
CO3	Familiarize themselves with the Bhagavad-Gita and its relevance to daily life; Understand the sagacity of Chanakya; Role of Women in ancient Indian society.
CO4	To understand the principles of Yoga and its applicability through practice.
CO5	Gain a deep understanding of the underlying principles of diverse traditions of worship.

CO-PO Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	-	-	-	2	1	1	-	-	-
CO2	-	-	-	3	-	1	-	-	-
CO3	-	-	-	1	1	2	-	-	-
CO4	-	-	-	1	2	2	-	-	-
CO5	-	-	-	2	2	2	-	-	-
CAM	-	-	-	2	1	2	-	-	-

Syllabus

Unit 1

To the World from India; Education System in India; Insights from Mahabharata; Human Personality. India's Scientific System for Personality Refinement.

Unit 2

The Vedas: An Overview; One God, Many Forms; Bhagavad Gita – The Handbook for Human Life; Examples of Karma Yoga in Modern India.

Unit 3

Chanakya's Guidelines for Successful Life; Role of Women; Conservations with Amma.

Text Books / References

1. Cultural Education Resource Material Semester-2
2. Cultural Heritage of India. R.C.Majumdar. Ramakrishna Mission Institute of Culture.
3. The Vedas. Swami Chandrashekhara Bharati. Bharatiya Vidya Bhavan.
4. Indian Culture and India's Future. Michel Danino. DK Publications.
5. The Beautiful Tree. Dharmapal. DK Publications.
6. India's Rebirth. Sri Aurobindo. Auroville Publications.

21ENG111	PROFESSIONAL COMMUNICATION	L-T-P-C: 1-0-2-2

Course Objectives

Course Outcomes

COs	Description
CO1	
CO2	
CO3	
CO4	

CO-PO Mapping

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1									
CO2									
CO3									
CO4									
CAM									

Syllabus

Textbooks / References:

21CSA112	DATABASE MANAGEMENT SYSTEM	L-T-P-C: 3-1-0-4

Course Objectives

- The objective of the course is to present an introduction to database management systems, with an emphasis on how to organize, maintain and retrieve - efficiently, and effectively - information from a DBMS.

Course Outcomes

COs	Description
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	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.
CO3	Understand Data Normalization and its usage in database design so as to successfully design a complete application
CO4	Learn transaction properties and types in a DBMS including concurrency control and recovery.
CO5	Able to write SQL statements to create tables and indexes, set constraints, insert/update/delete data, and query data in a relational DBMS thereby building a successful application.

CO-PO Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	-	1	-	-	-	-	1	1
CO2	2	3	2	1	1	-	2	2	-
CO3	2	3	2	1	1	-	2	2	-
CO4	3	-	1	-	-	-	-	1	1
CO5	3	2	2	1	1	-	2	2	-
CAM	3	3	2	1	1	-	2	2	1

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: Evaluation of Relational algebra expressions-Query Equivalence-Transaction Processing: ACID properties, states of a transaction-Introduction to

concurrency control-Deadlock-Recovery.

Unit 5

Built in SQL functions- Set operations, Sub Queries-Joins-DCL – TCL- Views – Sequences – Index – Locks PL/SQL Basics – Exceptions – Cursors - Stored Functions – Triggers

Textbooks / References:

1. Silberschatz. Korth. Sudarshan: Database System Concepts - 6thEdition Mcgraw-Hill International Edition.
2. Ivan Bayross: Sql- PL/SQL The Programming Language of Oracle – 4thEdition- Bpb Publications.
3. C.J. Date: An Introduction To Database Systems - Eighth Edition – Pearson Education Asia
4. Kevin Loney - George Koch: Oracle 9i The Complete Reference Mcgraw-Hill International Edition.
5. Fundamentals of Database Systems" by Elmasri and Navathe.

21CSA113	PROGRAMMING IN C	L-T-P-C: 3-1-0-4

Course Objectives

- This course is designed to provide basic concepts of the C-programming and use of language constructs for problem solving using C language.
- This course also covers the usage of pointers, structures & functions for developing applications in C.

Course Outcomes

COs	Description
CO1	Learn fundamental programming concepts needed to develop computer programs.
CO2	Code, debug and execute a well-structured basic computer program using the C language.
CO3	Given a programming problem, design a solution and identify the C programming constructs needed for the solution and implement it in C language.
CO4	Understand and explain different constructs like arrays, pointers and structures and apply it for solving computational problems.
CO5	Develop reusable modules using functions and write programs for file handling.

CO-PO Mapping

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	1	1	-
CO2	2	3	2	-	-	-	3	3	-
CO3	2	3	2	-	-	-	3	3	2
CO4	3	3	1	-	-	-	3	3	1
CO5	3	3	1	-	-	-	3	3	1
CAM	3	3	2	-	-	-	3	3	1

Syllabus

Unit 1

Introduction to C language - structure of 'C' program, Programming elements(tokens) –Classes of data types – Declaration of variables, assigning values to variables, Input and Output operations – printf, scanf, escape sequences (backslash character constants), Specifying Comments, Operators–operator precedence and associativity, Expressions – Evaluation of expressions, type conversions(type casting).

Unit 2

Control Flow - Decision Control and Loop Control, Decision Control Instructions – if-else , nested if-else, Use of logical operators in decision making, Switch control structure, Loop Control Instructions -While, for, do-while, nested loops.

Unit 3

Arrays – single dimensional arrays - declaration –memory representation– initialization and access.
2D arrays and multidimensional arrays.

Strings – defining strings, reading strings from standard input, initializing, accessing, character handling functions, arithmetic operations on characters, character by character input and output, string handling functions,

array of strings and its features.

Pointers –Introduction, declaring and initializing pointer variables, pointer expressions, pointers and arrays, pointers and strings, array of pointers.

Unit 4

Functions – definition-declaration-prototypes and function call- actual and formal arguments-types of functions-call by value-call by reference-nesting of functions-recursive functions-pointers to functions-storage class specifiers.

Enumerated data types, Preprocessor directives – Macros - Defining symbolic constants, File inclusion, Command line arguments.

Unit 5

Structures – definition-declaration-initialization-accessing structures- array of structures, array within structures, structures within structures, self-referential structures, pointers to structures, uses of structures.
Union- definition- union of structures.
Files – Reading and writing files - file handling functions – file opening modes – file operations

Textbooks / References:

1. "Let us C", Yashavant Kanetkar, 13th Edition, BPB Publications.
2. "Programming in ANSI C", E. Balagurusamy, 6thEdition, Tata McGraw-Hill Publishing Company Limited.
3. "C Programming Language" Brian W Kernighan, Dennis M Ritchie Second Edition, Prentice Hall.
4. "Test your C Skills", Yashavant Kanetkar.
5. "Exploring C", Yashavant Kanetkar,

21CSA114	COMPUTER ORGANIZATION	L-T-P-C: 3-1-0-4

Course Objectives

- To understand the basic structure and organization of computer system, basic functions and the operations of functional units.

Course Outcomes

COs	Description
CO1	To understand the basic functional units of computer system, data representation and arithmetic operations.
CO2	To understand the concept of fetch and execution of machine instructions, addressing modes and different instruction types.
CO3	To familiarize the memory organization, types of memory and memory mapping.
CO4	To learn IO Organization and peripheral interfacing.
CO5	To understand parallel processing concepts and embedded systems.

CO-PO Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	2	1	-	-	-	2	-	-
CO2	3	-	-	-	-	-	2	-	-
CO3	3	2	1	-	-	-	2	-	-
CO4	3	1	-	-	-	-	1	-	-
CO5	3	3	-	-	-	-	1	-	-
CAM	3	2	1	-	-	-	2	-	-

Syllabus

Unit 1:BASIC STRUCTURE OF COMPUTERS:

Basic structure of a Computer System: - Functional Units, Multiprocessors and Multicomputers concepts, Basic Arithmetic Operations: Data Representation, Fixed Point Representation. Floating – Point Representation. Integer Addition and Subtraction, Fixed and Floating-point numbers, Floating point representation, Signed numbers, Binary Arithmetic, 1's and 2's Complements Arithmetic, Multiplication of positive numbers , signed operand multiplication - Booth multiplication.

Unit 2: BASIC PROCESSING UNIT AND MACHINE INSTRUCTIONS

Fundamental concepts, Register transfers, Fetching a word from memory, Storing a word in memory, Execution of a complete instruction, Branch instructions, A Complete processor,

Assembly language - Assembly language notation, Basic instruction types, Register Transfer Languages, Addressing modes, subroutines.

Unit 3:MEMORY ORGANIZATION AND ARCHITECTURE

Memory Organization: Basic Concepts, Semiconductor RAM memories, Read-only memories, Performance Analysis of memory, Cache memory: - Types of cache memory, Mapping functions, Replacement algorithms, Virtual memory: - Address Translation, Secondary storage.

Unit 4: INPUT OUTPUT ORGANIZATION

Introduction to I/O Operations, Peripheral devices , Input/Output interfaces, Modes of transfer:- Programmed I/O, Interrupt initiated I/O, Direct Memory access.

Unit 5:PARALLEL PROCESSING AND EMBEDDED SYSTEMS

Parallel Processing – Introduction to pipelining: - Instruction pipelining and Arithmetic pipelining, Hazards: - Data hazards, Instruction hazards, Handling data hazards and instruction hazards.
Embedded Systems: - Examples of embedded systems.

Integer Addition and Subtraction , Fixed and Floating point numbers, Floating point representation., Signed numbers, Binary Arithmetic, 1's and 2's Complements Arithmetic, 2's Complement method for multiplication, Booths Algorithm, Hardware Implementation, Floating Point Arithmetic , The accumulator, Shifts, Carry and Overflow.

Textbooks / References:

1. Carl Hamacher, Zvonks Vranesic, SafeaZaky (2002), Computer Organization, 5thedition,McGraw Hill, New Delhi, India.
2. M Morris Mano, Computer System Architecture (3rd Edition).
3. William Stallings (2010), Computer Organization and Architecture- designing for performance,8th edition, Prentice Hall, New Jersy.
4. Anrew S. Tanenbaum (2006), Structured Computer Organization, 5thedition, PearsonEducation Inc.
5. John P. Hayes (1998), Computer Architecture and Organization, 3rdedition, Tata McGrawHill.

21CSA183	DATABASE MANAGEMENT SYSTEM LAB	L-T-P-C: 0-0-1-1

Course Objectives

- The objective of this lab course is to understand the practical applicability of database management system concepts.
- Working on existing database systems, designing of database, creating relational database, analysis of table design.

Course Outcomes

COs	Description
CO1	Get practical knowledge on designing and creating relational database systems.
CO2	Write queries in SQL to retrieve any type of information from a database.
CO3	Understand various advanced queries execution such as relational constraints, joins, set operations,aggregate function etc.
CO4	Use PL/SQL objects (functions, cursors, triggers etc.) for solving real life database problems.

CO-PO Mapping

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	3	1	2	2	3	3	3	2
CO2	3	1	2	-	-	-	2	1	-
CO3	3	1	2	-	-	-	2	1	-
CO4	3	1	1	-	-	-	2	1	-
CAM	3	1	2	2	2	3	2	1	2

Syllabus

Built in SQL functions- Set operations, Sub Queries-Joins-DCL – TCL- Views – Sequences – Index – Locks

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

21CSA186	PROGRAMMING IN C LAB	L-T-P-C: 0-0-1-1

Course Objectives

- This course aims to give hands-on experience on developing applications using different constructs in C language.

Course Outcomes

COs	Description
CO1	Enhance problem solving skills and use it for solving computational problems.
CO2	Design, implement, test, debug, and document moderately complex programs in C.
CO3	Implement C programs using functions, pointers and structures.
CO4	Use files and file operations to build data handling applications in C.

CO-PO Mapping

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	3	-	-	-	-	3	3	-
CO2	3	3	2	-	-	-	3	3	2
CO3	3	3	2	-	-	-	3	3	2
CO4	3	3	1	-	-	-	3	3	1
CAM	3	3	2	-	-	-	3	3	2

Syllabus

Basic C program and its execution- Installation of a C compiler and familiarisation of its usage, C program to print message on the console, variable declaration and initialisation, reading values from standard input. Usage of format specifiers for printing values.
Operators- Arithmetic, Relational, Ternary, Logical, Bitwise
Control Statements-if, if-else, nested if, if-else if, switch, goto
Looping Control-while, for, do-while
Arrays-one-dimensional- creating, displaying merging, searching, sorting, reversing
Arrays-Two-dimensional- creating, displaying, Operations on 2D arrays
Strings-String functions, manipulation of strings, multi strings
Pointers – Pointer arithmetic, Array of pointers, pointer to array
Functions – passing arguments, returning values, recursive functions, pointers as arguments
Structures-Initializing, members as array, variables as array, passing structures to functions, pointers to structures
Union-Enum types, preprocessors-macros, macro with arguments, nested macro, file inclusion, command line arguments
File Handling

SEMESTER III

21AVP201	AMRITA VALUES PROGRAMME I	L-T-P-C: 1-0-0-1

Course Objectives

Course Outcomes

COs	Description
CO1	
CO2	
CO3	
CO4	
CO5	

CO-PO Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1									
CO2									
CO3									
CO4									
CO5									
CAM									

Syllabus

Textbooks / References:

21SSK201	LIFE SKILLS I	L-T-P-C: 1-0-2-2

Course Objectives

Course Outcomes

COs	Description
CO1	
CO2	
CO3	
CO4	
CO5	

CO-PO Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1									
CO2									
CO3									
CO4									
CO5									
CAM									

Syllabus

Textbooks / References:

21CSA201	DATA STRUCTURES AND ALGORITHMS	L-T-P-C: 3-1-0-4

Course Objectives

- This course aims to provide the basic knowledge of different data structures and its usage. It also covers techniques used for analysing algorithms and notations for expressing time complexity.

Course Outcomes

COs	Description
CO1	Implement basic data structures such as Linked lists, Stack and Queue.
CO2	Analyse an algorithm, determine its time complexity and express it in asymptotic notation.
CO3	Implement different searching and sorting algorithms.
CO4	Use different data structures including tree and graph and solve computational problems using it.
CO5	Choose appropriate data structures and algorithms, understand the ADT/libraries, and use it to design algorithms for a specific problem.

CO-PO Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	3	1	-	-	-	2	3	1
CO2	3	1	1	-	-	-	3	2	-
CO3	3	3	1	-	-	-	1	3	-
CO4	3	3	1	-	-	-	3	3	1
CO5	2	3	2	-	-	-	3	3	1
CAM	3	3	1	-	-	-	3	3	1

Syllabus

Unit 1: Algorithm Analysis

Mathematical preliminaries; Efficiency of algorithms - notion of time and space complexity, Basic Complexity Analysis - Worst case, Average case and Best cases, Asymptotic Analysis- notations, analysing iterative programs – Simple examples; Recurrences, Analysis of Divide and conquer algorithms - Merge sort, Substitution Method, Master method.

Unit 2: Searching and Sorting

Linear Search, Binary Search – Analysis
Bubble Sort, Insertion Sort, Merge sort, Quick Sort - Analysis

Unit 3: Linear Data Structures

Abstract Data Type, List ADT: Singly linked lists, Doubly linked lists, Circular Linked Lists, Stack ADT implementation and applications, Queue ADT: Implementation and Application. Circular Queue, Priority Queue

Unit 4: Non-Linear Data Structures

Properties of a binary tree, Representation of a binary tree, Operations on a Binary Tree, Binary tree – Insertion, Deletion, Traversal, Types of Binary Trees - Expression tree, Binary search tree, AVL tree, Heap

Unit 5: Graphs

Adjacency matrix, Adjacency list, Breadth First Search, Depth First Search, Minimum Spanning Tree- Prim's and Kruskal's Algorithm, Dijkstra's algorithm

Textbooks / References:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, Pearson Education
2. Samanta, Debasis. Classic Data Structures. PHI Learning Pvt. Ltd., 2004.
3. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein. Introduction to Algorithms, 3rdedition, MIT Press, 2009.

21CSA202	OBJECT ORIENTED PROGRAMMING USING JAVA	L-T-P-C: 3-1-0-4

Course Objectives

- 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

COs	Description
CO1	Identify classes, objects, members of a class and relationships among them needed for a specific problem.
CO2	Implement Java application programs using OOP principles and proper program structuring.
CO3	Demonstrate the concepts of polymorphism, inheritance and thread and document a Java Program using Javadoc.
CO4	Use Java AWT and Swing classes to build GUIs and understand how collection interface is implemented.
CO5	Demonstrate the Conceptual model of UML, activity diagram and their modelling techniques.

CO-PO Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	2	1	-
CO2	3	3	3	-	-	-	2	3	-
CO3	3	2	2	-	-	-	2	2	-
CO4	3	3	1	-	-	-	1	2	1
CO5	3	3	3	1	1	1	1	2	1
CAM	3	3	3	1	1	1	2	2	1

Syllabus

Unit 1

Introduction to object oriented software design, Comparison of programming methodologies, Object Basics, Java Environment, Classes and Object, Data Members, Access Specifiers, Arrays within a Class, Array of Objects, Constructors, Default Constructors, Destructors, Static Members, Constant Members.

Unit 2

Overview of Streams, Bytes vs. Characters, File Object, Binary Input and Output, Reading and Writing Objects, Method Overriding, Polymorphism, Super, Interfaces and Abstract Classes, Packages, Exception

Unit 3

Introduction to Threads, Creating Threads, Thread States, Runnable Threads, Coordinating Threads, Interrupting Threads, Runnable Interface, Synchronization.

Unit 4

Collection framework, Collection interfaces and classes, AWT, Swing, Event Handling, Javadoc

Unit 5

Object Oriented Design with UML, Class, object diagrams and sequence diagrams. Use case diagrams and activity diagrams

Textbooks / References:

1. Herbert Scheldt, “Java: The Complete Reference, Eleventh Edition”, Oracle 2018
2. Deitel PJ. Java how to program. Eleventh Edition, Pearson; 2018.
3. Nino J, Hosch FA. Introduction to Programming and Object-oriented Design using Java. Wiley India Private Limited; 2010.
4. Naughton P. and Schildt H. Java 2: The Complete Reference. Eighth Edition, Tata McGraw- Hill; 2011.
5. Bahrami A. Object Oriented Systems Development. Second Edition, McGraw-Hill; 2008.
6. Booch G, Maksimchuk RA. Object-oriented Analysis and Design with Applications. Third Edition, Pearson Education; 2009.

21CSA203	OPERATING SYSTEMS	L-T-P-C: 3-1-0-4

Course Objectives

- A successful student will be able to understand the basic components of a computer operating system, and the interactions among the various components. The course will cover an introduction on the policies for scheduling, deadlocks, memory management, synchronization, system calls, and file systems.

Course Outcome

COs	Description
CO1	Analyze the structure of OS and basic architectural components involved in OS design.
CO2	Understand the process concepts and different operations on processes along with mechanisms for Inter Process Communication.
CO3	To appreciate the role of Process synchronization towards increasing throughput of a system and understand the different mechanisms used for process synchronization and applying these mechanisms for solving some classical synchronization problems.
CO4	Apply various concepts related with deadlock to solve problems related with resources allocation.
CO5	Master concepts of memory management including virtual memory.
CO6	Understand the different I/O management techniques used in Operating Systems. Also familiar with the disk structure and different disk scheduling algorithms.

CO-PO Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	2
CO2	2	2	-	-	-	-	2	-	-
CO3	2	3	-	-	-	-	2	1	-
CO4	3	2	-	-	-	-	2	1	-
CO5	3	1	-	-	-	-	-	-	1
CO6	3	-	-	-	-	-	-	-	1
CAM	3	2	-	-	-	-	2	1	1

Syllabus

Unit 1

Introduction to Operating Systems: Mainframe systems-Desktop systems-Multiprocessor systems-Distributed systems-Clustered systems-Real-time systems-Handheld systems.
Operating System Structures: System components-Operating System services-System calls-System Programs-System Structures-System Design and Implementation-System Generation.

Unit 2

Process Management: Process Concept-Process Scheduling-Operations on processes-Cooperating processes-Inter Process Communication.
CPU Scheduling: Basic concepts-Scheduling criteria-Scheduling Algorithms-First Come Firstserved Scheduling, Shortest job First Scheduling, Round Robin Scheduling, Multilevel Queue Scheduling, Multilevel Feedback Queue Scheduling.
Process synchronisation:Background,critical section problem, semaphores, monitors,producer consumer

problem, dining philosophers problem, readers and writers problem.

Unit 3

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

Unit 4

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.

Unit 5

I/O Systems: Overview, I/O Hardware, Mass storage structure- Disk structure, disk scheduling, disk management.

Textbooks / References:

1. Abraham SilberSchartz- peter B Galvin-Greg Gagne, Operating system Concepts. Eighth Edition, Addison-Wesley(2003).
2. S.Godbole - Operating Systems - Tata McGraw Hill Publications.
3. H.M Deitel - Operating Systems - Second Edition - Pearson Edition Asia.

21CSA204PRINCIPLES OF MANAGEMENT AND ACCOUNTING L-T-P-C: 3-0-0-3

Course Objectives

- The objective of this course to enable the students to have a basic knowledge of principles of management and to provide theoretical and practical aspects of various systems of accounting.

Course Outcomes

COs	Description
CO1	Observe and evaluate the influence of historical forces on the current practice of management.
CO2	Explain how organizations adapt to an uncertain environment and identify techniques managers use to influence and control the internal environment.
CO3	Practice the process of management's four functions: planning, organizing, leading, and controlling.
CO4	Identify and properly use vocabularies within the field of management to articulate one's own position on a specific management issue and communicate effectively with varied audiences.
CO5	Evaluate leadership styles to anticipate the consequences of each

CO-PO Mapping

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	-	-	-	2	2	2	-	-	-
CO2	-	-	-	2	2	2	-	-	-
CO3	-	-	-	2	2	2	-	-	-
CO4	-	-	-	2	2	2	-	-	-
CO5	-	-	-	2	3	3	-	-	-
CAM	-	-	-	2	2	2	-	-	-

Syllabus

Unit 1
Management: meaning and definition, importance of management, administration and management, functional management, functions of management, levels of management

Unit 2
Financial Accounting: Meaning and important terms, accounting concepts, double entry book keeping, types of accounts, journal, ledger, trial balance.

Unit 3
Final Accounts: Preparation of Trading and Profit and Loss Accounts and Balance Sheet, adjustments relating to outstanding expenses, prepaid expenses, accrued income unearned income, depreciation and bad and doubtful debts.

Unit 4
Financial Statement Analysis, Trend Analysis

Unit 5
Cost Accounting: Meaning and Definition, difference between cost accounting and financial accounting, Elements of cost, Cost sheet, Expenses excluded from cost.

Textbooks / References:

1. DinkarPagare – Principles of Management, Sultan Chand and Sons.
2. Vineeth, Shabu – Principles of Management and Accounting, Kalyani Publishers.
3. S.P. Jain, K.L. Narang – Financial Accounting, Kalyani Publishers.
4. S.P. Jain, K.L. Narang – Cost Accounting, Kalyani Publishers.

21CSA282DATA STRUCTURES AND ALGORITHMS LAB **L-T-P-C: 0-0-1-1**

Course Objectives

- This course aims to teach implementation of different linear and non-linear data structures and its usage in development of applications.

Course Outcomes

COs	Description
CO1	Implement different data structures like Stack, Queue, Linked List and their applications.
CO2	Implement different searching and sorting algorithms and select an efficient one for a particular scenario.
CO3	Implement various non-linear data structures.

CO-PO Mapping

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	3	2	1	-	-	3	3	1
CO2	3	3	2	1	-	-	3	3	1
CO3	3	3	2	1	-	-	3	3	1
CAM	3	3	2	1	-	-	3	3	1

Syllabus

Unit 1

Searching – Linear, Binary Search searches
Sorting – Bubble, Insertion, Quick, Merge sort

Unit 2

Stack – Implementation, Applications – Infix to postfix, Evaluation of postfix expression, Check Balance of parenthesised expression etc.
Queues, Linked-Lists – Implementation and applications

Unit 3

Binary Trees -Implementation, Operations.

Unit 4

Graphs – Implementation of graph, BFS, DFS searches

21CSA283OBJECT ORIENTED PROGRAMMING LAB USING JAVA L-T-P-C: 0-0-1-1

Course Objectives

- 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

COs	Description
CO1	Identify classes, objects, members of a class and relationships among them needed for a specific problem.
CO2	Write Java application programs using OOP principles and proper program structuring.
CO3	Demonstrate the concepts of polymorphism, inheritance and thread and document a Java Program using Javadoc.
CO4	Use Java AWT and Swing classes to build GUIs and understand how collection interface is implemented.
CO5	Demonstrate the Conceptual model of UML, activity diagram and their modelling techniques.

CO-PO Mapping

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	2	1	-
CO2	3	3	3	-	-	-	2	3	-
CO3	3	2	2	-	-	-	2	2	-
CO4	3	3	1	-	-	-	1	2	1
CO5	3	3	3	1	1	1	1	2	1
CAM	3	3	3	1	1	1	2	2	1

Syllabus

UML

a. Class Diagram
b. Object Diagram
c. Sequence Diagram

Java

a. Designing classes and demonstrating object oriented concepts
b. Method Overloading and Method Overriding
c. Inheritance
d. Package
e. Multithreading
f. File handling with Java
g. Iterators and Collections- - Case study mode
h. UI Integration of Java concepts with Swing- Case study mode

List of Online tools

1. UML Concepts - ArgoUML
2. Object Oriented Concepts - HPoJ Tool

a. Designing classes and demonstrating object oriented concepts --> Supported by HPOJ
b. Method Overloading and Method Overriding --> Supported by HPOJ
c. Inheritance --> Supported by HPOJ
d. Multithreading --> Supported by HPOJ
e. Iterators and Collections --> Supported by HPOJ

Using Eclipse IDE.

a. Package
b. File Handling with java
c. UI Integration of Java concepts with Swing.

SEMESTER IV

21AVP211	AMRITA VALUES PROGRAMME II	L-T-P-C: 1-0-0-1

Course Objectives

Course Outcomes

COs	Description
CO1	
CO2	
CO3	
CO4	
CO5	

CO-PO Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1									
CO2									
CO3									
CO4									
CO5									
CAM									

Syllabus

Textbooks / References:

21SSK211	LIFE SKILLS II	L-T-P-C: 1-0-2-2

Course Objectives

Course Outcomes

COs	Description
CO1	
CO2	
CO3	
CO4	
CO5	

CO-PO Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1									
CO2									
CO3									
CO4									
CO5									
CAM									

Syllabus

Textbooks / References:

21CSA212	COMPUTER NETWORKS	L-T-P-C: 3-1-0-4

Course Objectives

- 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 Outcome

COs	Description
CO1	Understand the concepts of Data Communication.
CO2	Learn the functions of OSI Layers.
CO3	Familiarise with the Transmission Media, Flow Control and Error Detection & Correction.
CO4	Understand fundamental concepts in Routing, Addressing & working of Transport Protocols.
CO5	Gain familiarity with common networking & Application Protocols.

CO-PO Mapping

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-
CO3	2	-	1	-	-	-	-	-	-
CO4	2	-	2	-	-	-	1	1	-
CO5	2	1	1	-	-	-	1	1	-
CAM	2	1	1	-	-	-	1	1	-

Syllabus

Unit 1

Evolution of Computer Networking - Types of Network - networks topologies - Protocols standards-Network Devices-The OSI reference model- TCP/IP Reference Model.
Physical Layer: transmission media- Analog Transmission- Digital transmission

Unit 2

Data Link Layer Design Issues-Services provided to the Network Layer-Framing-Error Control-Flow Control- Error Detection and Correction- Elementary Data Link Protocols- Sliding Window Protocols- Multiple Access Protocols-An overview of IEEE Standard for LANs, MAC Address.

Unit 3

Introduction to Network Layer – Services - Circuit Switching Vs Packet Switching-Packet Switched Networks-Types of Routing-routing algorithms- congestion control algorithms- Network Protocols-IP- IPV4, IPV6, Subnets, Gateways- Congestion Avoidance in Network Layer.

Unit 4

The Transport Services – Services provided to the upper layers –Elements of transport Protocols –Internet Transport Protocols- Congestion Controls in Transport Layer

Unit 5

Principles of Network Applications-Web and HTTP-Electronic mail-DNS

Textbooks / References:

1. Computer Networks (Fifth Edition) – Andrew S. Tanenbaum (Prentice Hall of India)
2. Computer Networking a Top-Down Approach (Fifth Edition)-James F. Kurose-Keith W. Ross (Pearson)
3. Computer Networks - Protocols, Standards and Interfaces (Second Edition) – Uyless Black (Prentice Hall of India Pvt. Ltd.)
4. Data communication and Networking (Fourth Edition)- Behrouz A Forouzan(Tata Mcgraw Hill)

21CSA213	ADVANCED JAVA AND J2EE	L-T-P-C: 3-1-0-4

Course Objectives

- The main Objective of the course is to enable students to understand the concepts underlying technologies in JAVA Enterprise edition with Swings and multithreading, configuring Apache tomcat server, Java beans and Enterprise Java Beans.

Course Outcome

COs	Description
CO1	Design and develop client-server applications using sockets in Java.
CO2	Develop applications in Java using swings and JDBC.
CO3	Understand the usage of generic classes and collections and write application using the same in Java.
CO4	Understand server-side programming and configure a web server to deploy servlets and JSP programs.
CO5	Create a moderately complex application with MVC architecture.

CO-PO Mapping

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	2	3	-	-	-	3	3	1
CO2	3	2	3	-	-	-	3	3	2
CO3	2	3	3	-	-	-	2	2	1
CO4	2	3	3	-	-	-	2	3	2
CO5	2	2	3	2	1	2	2	2	3
CAM	2	2	3	2	1	2	2	3	2

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 / References:

1. Deitel&Deitel, "Java How to program", Prentice Hall, 2017.
2. Gary Cornell and Cay S. Horstmann, "Core Java Vol 1 and Vol 2", Sun Microsystems Press, Eleventh Edition, 2018.
3. Java EE 8 Development with Eclipse: Develop, Test, and Troubleshoot Java Enterprise Applications Rapidly with Eclipse, 3rd Edition

21CSA214	WEB TECHNOLOGIES	L-T-P-C: 3-1-0-4

Course Objectives

- This course will enable students to understand the concepts and techniques underlying website creation with HTML, CSS and client scripting with JavaScript. It will also equip students with latest web development applications Angular JS, Server scripting with PHP and XML.

Course Outcomes

COs	Description
CO1	Understand basics of web technologies.
CO2	Create interactive web applications using latest web technologies.
CO3	Publish and maintain interactive web applications.
CO4	Use XML standards and tools towards smart web applications.

CO-PO Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	-	2	-	-	-	2	3	2
CO2	3	3	3	-	-	-	3	3	3
CO3	2	3	3	1	1	2	3	3	3
CO4	3	2	3	-	-	-	2	2	2
CAM	3	3	3	1	1	3	3	3	3

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, pseudoclasses,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

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

Case Study: Web Application Framework- Flask- Flask and SQLite- Bootstrap

Textbooks / References:

1. The Complete Reference, HTML and CSS by Thomas A Powell latest edition
2. XML: The Complete Reference Heather Williamson latest edition
3. Web Reference:- w3schools.com

21CSA215	SOFTWARE ENGINEERING	L-T-P-C: 3-0-1-4

Course Objectives

- The course provides a professionally guided education in software engineering that helps students to transition into an amateur software engineer by exposing themselves to 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

COs	Description
CO1	Recognize and apply the principles of software engineering techniques.
CO2	Understand various software process models.
CO3	Apply the right software design methodology for a given scenario.
CO4	Evaluate a system developed for real-world applications.
CO5	Identify and implement various industry standards in software development and maintenance.

CO-PO Mapping

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	2
CO2	3	3	-	-	-	-	-	-	2
CO3	2	3	3	2	1	2	2	-	2
CO4	2	2	1	1	1	2	3	3	3
CO5	1	3	3	2	3	3	-	-	3
CAM	2	3	3	2	1	2	3	3	2

Syllabus

Unit 1

Introduction to Software Engineering: Software Crisis-Changing Nature of Software- Software Myths -Process and Product - A Generic View of Process - Software engineering-A layered technology, a Process framework - Software characteristics- SDLC Introduction – Quality Attributes

Unit 2

Introduction to Software Paradigms - Approaches – Process Models – The Waterfall model, Incremental Process models, Evolutionary Process Models, Specialized Process Models, The Unified Process. – Agile Introduction - - Feasibility Studies - Software Requirements: Functional and non-Functional Requirements, User Requirements, System Requirements, Interface Specification, the Software Requirement Document.

Unit 3

Analysis Modeling - Elements of Analysis Model - System Models: Context Models, Behavioural Models, Data models, Object Models, Structured Method -. Design Engineering: Introduction to Design concepts - Design characteristics - Design Process and Design Quality-Creating an Architectural Design: Software architecture, Data Design - Architectural Styles and Patterns,

Unit 4

Test Engineering - Testing Fundamentals - Objectives - Principles – Testing Strategies: A strategic approach to software testing, Test Strategies for Conventional Software, Black-Box and White-Box testing, Validation testing, System testing, the Art of Debugging - ITG - Software Quality Metrics

Unit 5

Maintenance Engineering – Change Management – Maintenance Side effects - Reverse Engineering and Reengineering

Textbooks / References:

1. Roger S. Pressman, "Software Engineering", Tata McGraw-Hill Publishing Company Pvt. Ltd, Sixth Edition.
2. Rajib Mall, Fundamentals of Software Engineering, Prentice Hall India.
3. Shooman, "Software Engineering", Tata McGraw-Hill Publishing Company, Pvt. Ltd, 1987
4. Pankaj Jalote,, An integrated approach to Software Engineering, Springer/Narosa.
5. Ian Sommerville, Software Engineering, Seventh edition, Pearson education.
6. Waman S Jawadekar, Software Engineering: A primer, Tata McGraw-Hill, 2008. 5. Stephan Schach, Software Engineering, Tata McGraw Hill

21CSA285	ADVANCED JAVA AND J2EE LAB	L-T-P-C: 0-0-1-1

Course Objectives

- The main objective of the course is to enable students to implement the concepts underlying technologies in JAVA Enterprise edition with Swings and multithreading, configuring Apache Tomcat server, Java beans and Enterprise Java Beans.

Course Outcomes

COs	Description
CO1	Design and develop client-server applications using sockets in Java.
CO2	Develop applications in Java using swings and JDBC.
CO3	Implement the usage of generic classes and collections and write application using the same in Java.
CO4	Create server-side programming and configure a web server to deploy servlets and JSP programs.
CO5	Develop enterprise applications using Java EE.

CO-PO Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	2	3	1	-	-	3	3	1
CO2	3	2	3	1	-	-	3	3	2
CO3	2	3	3	1	-	-	2	2	1
CO4	2	3	3	1	-	2	2	3	2
CO5	2	2	3	2	1	3	2	2	2
CAM	2	2	3	1	1	3	2	3	2

Syllabus

1. Program to demonstrate Swing components.
2. Program to implement Address Book using Swing components.
3. Program to demonstrate loading of file in an Swing Component.
4. Multithreading program, one of the threads print a….z and other thread print 1…26.Example: 1a2b3c…. 26z.
5. Multithreading program to schedule two jobs.
6. Client Server Socket Programming.
7. Server Socket which receives data from a java client program using JSON
8. Program to fetch a particular Website tags when an URL is specified.
9. Implement stack, queue, hashmap, hashtable, enumeration, ArrayList.
10. Create a table from a java program.
11. Update a table from a java program.
12. Load a table data in Swing components.
13. Delete a record from a table, drop table from a java file.
14. Program which shows use of Statement, Prepared Statement and Callable Statement.
15. Configure Apache Tomcat and write a hello world jsp page.
16. Configure Apache Tomcat server to deploy Servlets.
17. Exceptional handling in a JSP page.
18. Create a login page and authenticate a user in a JSP page using database.
19. Write a program to implement a simple servlet which writes a Welcome HTML page in the web browser.
20. A servlet should receive a parameter from JSP page and process it.

21. Servlet program to implement parameter handling.
22. Servlet program to handle GET and POST request.
23. A website hit counter data which has to be saved in a cookie.
24. Implement a Java Beans to set and get values.
25. Program to illustrate the procedure of handling session and print a Hello world using Java Bean.
26. Enterprise Session Beans, deploy, and run a simple Java EE application which does add, subtract, multiply and division using stateless session bean.
27. An application named account using stateful session bean. The purpose of account is to perform transaction operations (deposit and withdraw) for the customer.
28. The account application consists of an enterprise bean, which performs the transactions, and two types of clients: an application client and a web client.

21CSA286	WEB TECHNOLOGIES LAB	L-T-P-C: 0-0-1-1

Course Objectives

- This course will enable students to implement the concepts and techniques underlying website creation with HTML, CSS and client scripting with JavaScript. It will also equip students with latest web development applications Angular JS, Server scripting with PHP and XML.

Course Outcomes

COs	Description
CO1	Develop basics of web technologies using HTML and CSS.
CO2	Create interactive web applications using latest web technologies.
CO3	Develop and maintain interactive web applications.
CO4	Use XML standards and tools towards smart web applications.

CO-PO Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	2	3	2	-	-	-	2	3	2
CO2	3	3	3	-	-	-	3	3	3
CO3	2	3	3	1	1	3	3	3	3
CO4	3	2	3	-	-	-	2	2	2
CAM	3	3	3	1	1	3	3	3	3

Syllabus

1. Create a web page with advanced layouts and positioning with CSS and HTML.
2. Design a website with different methods of embedding CSS in a web page.
3. Create a static web page which displays your personal details. (Hint: CSS3 and HTML5)
4. Create a web page through which the user can enter his / her details to become an authenticated user of that page.
5. Create a web site for a Computer Hardware shop. (Hint: CSS3 and HTML5).
6. Create a web site for Amrita School of Arts and Sciences. (Hint: CSS3 and HTML5).
7. Create a web page that shows different methods of embedding JavaScript.
8. Create a web page with rollover menus. Rollover menus should be created using JavaScript.
9. Create a simple calculator, which can perform the basic arithmetic operations.
10. Validate the registration for with the following criteria:
    a. Name and Age should be Mandatory Fields.
    b. Password and Re-enter Password fields should contain same value.
    c. Name field should accept only character values.
11. Write a PHP program to store current date-time in a COOKIE and display the 'Last visited on' date-time on the web page upon reopening of the same page.
12. Write a PHP program to store page views count in SESSION, to increment the count on each refresh, and to show the count on web page.
13. Using PHP and MySQL, develop a program to accept book information viz. Accession number, title, authors, edition and publisher from a web page and store the information in a database and to search for a book with the title specified by the user and to display the search results with proper headings.
14. Create a registration form using Angular JS.
15. Create a simple AngularJS calculator application using Angular Services.
16. Create an application Searching for a character and displaying its position using AngularJS.
17. Create an application using angular JS filters.

18. Create single page web applications using the MVC pattern of AngularJS.
19. Design an XML document to store information about a student in an engineering college affiliated to Amrita. The information must include USN, Name, Name of the College, Branch, Year of Joining, and e-mail id. Make up sample data for 3 students. Create a CSS style sheet and use it to display the document.
20. Create an XML document with the following sample real estate data
    a. Ensure its validity
    b. Then try to break it
21. Create an internal DTD for the previous XML document.
22. Move the previous DTD to an external file and validate the XML document again.
23. Create an application that loads a text string into an XML DOM object, and extracts the info from it with JavaScript.
24. Create an application which reads data from an XML file into XMLDOM object and retrieves the text value of the first element in the xml file.

SEMESTER V

21SSK301	LIFE SKILLS III	L-T-P-C: 1-0-2-2

Course Objectives

Course Outcomes

COs	Description
CO1	
CO2	
CO3	
CO4	

CO-PO Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1									
CO2									
CO3									
CO4									
CAM									

Syllabus

Textbooks / References:

21CSA301	DATA WAREHOUSING AND DATA MINING	L-T-P-C: 3-1-0-4

Course Objectives

- This course will introduce the concepts of data warehouse and data mining, which gives a complete description about the principles, usage, architectures, applications, design and implementation of data mining and data warehousing concepts.

Course Outcomes

COs	Description
CO1	Understand, describe and visualize the different types of data so as to apply data mining techniques.
CO2	Understand the concepts of a data warehouse and its operations.
CO3	Apply the frequent pattern mining algorithms for extracting associations from transaction data.
CO4	Develop skill in selecting the appropriate classification algorithm for solving practical problems.
CO5	Understand the concepts, methods and applications of cluster analysis.

CO-PO Mapping

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	2	1	-	-	-	-	-	2
CO2	3	-	2	-	-	-	1	-	-
CO3	3	2	2	-	-	-	1	1	1
CO4	3	2	2	-	-	-	1	1	1
CO5	3	2	2	-	-	-	1	1	1
CAM	3	2	2	-	-	-	1	1	1

Syllabus

Unit 1

Introduction to Data Mining concepts – Different types of data for mining: database data, transaction data and other kinds of data- Different types of Patterns for mining techniques- Major issues in Data mining- Data objects and attributes types- Statistical description of data- Data visualization technique.

Unit 2

Introduction to Data warehousing concepts- Data warehouse basic concepts- Data warehouse Modeling- Data warehouse design and usage - Data warehouse implementation. Data generalization by attribute-oriented induction.

Unit 3

Frequent Patterns mining basic concepts- Apriori algorithm- Generating Association Rules from Frequent Itemsets - Improving the Efficiency of Apriori.

Unit 4

Classification basic concepts and general approaches- Decision tree induction – Bayes classification methods – Rule Based classification.

Unit 5

Clustering analysis basic concepts- Overview of clustering – major clustering method - partitioning methods: K-means & k-medoids.

Textbooks / References:

1. Jaiwei Han, Micheline Kamber and Jian Pei, ”Data mining concepts and techniques “, Third edition, Elsevier publisher , 2006
2. K P Soman, Shyam Diwakar and V. Ajay.” Insight into data mining theory and practice”, Prentice hall of India , 2006.
3. Yanchang Zhao, “R and Data Mining”, Elsevier, 2013

21CSA302	PYTHON PROGRAMMING	L-T-P-C: 3-0-0-3

Course Objectives

- The main objective of this course is to familiarize the student with Python programming concepts, syntax, semantics, and the runtime environment, as well as with general coding techniques and object oriented programming.

Course Outcomes

COs	Description
CO1	Understandthe structure, syntax, and semantics of the Python language.
CO2	Solve realworld problems by applying the Python Data Structures, Objects, Functions andModules.
CO3	Apply the fundamental principles of ObjectOriented Programming.
CO4	Apply the basics of data science using advanced Python libraries.
CO5	Build practical applications in Python.

CO-PO Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	1	2	-
CO2	2	3	3	-	-	-	3	3	1
CO3	3	1	-	-	-	-	-	2	-
CO4	3	2	3	-	-	-	3	3	1
CO5	2	3	3	-	-	-	3	3	1
CAM	3	2	3	-	-	-	3	3	1

Syllabus

Unit 1

Basic concepts in Python: Python runtime environment, Python variables, Python basic Operators, Understanding python blocks. Python Data Types, Declaring and using Numeric data types and functions. Conditional statements and loop statements in Python.

Unit 2

Python Complex data types: Strings and string functions, List and Tuple manipulation, Dictionary and Set operations.

Unit 3

Functions and modules in Python: defining functions, scope, types of arguments, the anonymous function(lambda), map, filter, reduce and zip functions. Introduction to Python modules and creating own modules.

Unit 4

Exception handling in Python. Python File Operations: Reading files, Writing files in python. Python directories.

Object oriented programming in Python: Defining classes and instantiating objects. Python Constructors and

destructors. Inheritance and polymorphism in Python.

Unit 5

Fundamentals for data science: Introduction to Jupyter notebook, Programming using Numpy, Pandas and matplotlib libraries.

Textbooks / References:

1. Wesley J. Chun, “Core Python Applications Programming”, 3rd Edition , Pearson Education, 2016
2. Charles Dierbach, “Introduction to Computer Science using Python”, Wiley, 2015
3. Jeeva Jose & P. Sojan Lal, “Introduction to Computing and Problem Solving with PYTHON”, Khanna Publishers, New Delhi, 2016.
4. Downey, A. et al., "How to think like a Computer Scientist: Learning with Python", John Wiley, 2015.
5. Wes McKinney, “Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython”, 2nd edition, O’Reilly Publication, ISBN-13: 978-1491957660, ISBN-10: 1491957662
6. Mark Lutz, “Learning Python”, 5th edition, O’Reilly Publication, 2013, ISBN 978- 1449355739
7. John Zelle, “Python Programming: An Introduction to Computer Science”, Second edition, Course Technology Cengage Learning Publications, 2013, ISBN 978- 1590282410
8. Michel Dawson, “Python Programming for Absolute Beginners”, Third Edition, Course Technology Cengage Learning Publications, 2013, ISBN 978-1435455009
9. David Beazley, Brian Jones., “Python Cookbook”, Third Edition, O’Reilly Publication, 2013, ISBN 978-1449340377

21CSA303	MOBILE APPLICATION DEVELOPMENT	L-T-P-C: 0-1-1-2

Course Objectives

- This course is designed to quickly get a student up to speed with writing apps for Android devices. The student will learn the basics of Android platform and get to understand the application lifecycle.

Course Outcomes

COs	Description
CO1	Understand the different API levels and working of Dalvik Virtual Machine.
CO2	Understand the different views, layouts and resource files.
CO3	Understand different UI components.
CO4	Understand Android Notifications and Services.
CO5	Develop SQLite applications.

CO-PO Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	2	3	2	-	-	-	1	1	-
CO2	2	2	2	-	1	1	1	2	-
CO3	2	3	2	-	1	1	2	3	1
CO4	2	3	2	1	1	1	2	3	1
CO5	2	2	3	1	1	1	2	2	2
CAM	2	3	2	1	1	1	2	2	1

Syllabus

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.
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.
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
Introducing SQLite - SQLiteOpenHelper and creating a database - Opening and closing a database, Working with cursors Inserts, updates, and deletes
As a term project students should implement a mobile app with the following: Understand the app idea and design user interface/wireframes of mobile app. Set up the mobile app development environment

Textbooks / References:

1. Head first Android Development.
2. Android Programming: Pushing the Limits, Wiley By Erik Hellman

3. Android Application Development Black Book, Dreamtech Press, Pradeep Kothari, KLSI

Course Objectives

- This course provides the basics of programming using Python programming language.

Course Outcomes

COs	Description
CO1	Design programs to solve problems using the Python language constructs.
CO2	Develop real-time applications using advanced Python libraries.

CO-PO Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	2	3	3	-	-	-	3	3	-
CO2	2	3	3	-	-	-	3	3	1
CAM	2	3	3	-	-	-	3	3	1

Syllabus

Installing Python: basic syntax, interactive shell, editing, saving, and running a script.

Python variables, assignments, expressions, numerical data types and operators, writing comments in the program. Exercise on Control structures and loops in Python: if-else, for, while.

Lists, tuples, set and dictionaries: basic list operators, replacing, inserting, removing an element; searching and sorting lists; tuple creation and manipulation, creating sets and set operations, dictionary literals, adding and removing keys, accessing and replacing values; traversing dictionaries.

Designing functions with various types of arguments. Exercise on the usage of lambda, map, filter, zip.
Working with text files: Programs for manipulating files and directories, os and sys modules; Reading/writing text and numbers from/to a file; creating and reading a formatted file (csv or tab-separated).

Developing Python programs to implement inheritance and overloading and overriding.

Introduction to Jupyter notebook and IPython. Developing programs using Numpy, Panda and Matplotlib libraries in Jupyter notebook.

21CSA391	COMPREHENSIVE TECHNICAL VIVA VOCE	L-T-P-C: 0-2-0-2

Course Objectives

- The objective of comprehensive viva-voce is to assess the overall knowledge of the student in the relevant field of computer science acquired over 3 years of study in the undergraduate program.
- To assess the student's technical and analytical skills in the domain of computer science and also communication skills.

Course Outcomes

COs	Description
CO1	Prepare comprehensively to answer questions from all the courses of five semesters.
CO2	Attain Oral Presentation skills by answering questions in precise and concise manner.
CO3	Gain confidence and interpersonal skills.

CO-PO Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	1	-	-	1	-	-	-	-
CO2	2	1	-	-	2	-	-	-	-
CO3	2	-	-	-	2	1	-	-	-
CAM	2	1	-	-	2	1	-	-	-

Syllabus

The viva may be done based on every course covered till the fifth semester. The objective of this is to enable the students to attend placements and be better performers in their future.

Semester 1: Programming concepts, Syntax, IDE, Logic and programming constructs, Compiler and interpreter problem solving- Logic and algorithms and other topics, C language,COA- Arrays,structure,enum and functions, pointers and other topics

Semester 2: Oops and C++, Object,class,inheritance,polymorphism and abstraction and message passing and other topics, Data structures - Sorting and searching, Tree,list,graph and other topics, OS-Types,Kernel,shell,features. OS core.Linux vs windows, DBMS-DDL,DML and DCL,Normalization,Relationships,Dependancy.

Semester 3: Java, OOPS concepts in java.JDK,JVM,JRE,wrapper classes and other topics, Networking: protocols,layers-model,Devices, Web technologies:HTML,XML,Javascript and other topics

Semester 4: Advanced Java and J2ee- Collections framework,JDBC,Servelets API,JSP and other topics, Software engineering- Software Process, project management, SDLC phases and other topics

Semester 5:C# and .Net- C# fundamentals and core and other topics.Network security/cryptography and cyber security

21CSA398	MINOR PROJECT	4 Credits

Course Objectives

- The main objective of the Project is for the students to learn and experience all the major phases and processes involved in solving real life problems.

Course Outcomes

The major outcome of the minor project must be well-trained students. More specifically students must have acquired the following skills:

COs	Description
CO1	Able to practice acquired knowledge within the chosen area of technology for project development.
CO2	Identify, discuss, and justify the technical aspects of the chosen project with a comprehensive and systematic approach.
CO3	Reproduce, improve, and refine technical aspects for the projects.
CO4	Work as an individual or in a team in development of technical projects.
CO5	Communicate and report effectively project related activities and findings.

CO-PO Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	2	3	2	-	-	1	3	3	3
CO2	1	2	2	-	3	3	2	1	-
CO3	2	2	3	-	-	1	3	3	1
CO4	1	2	2	2	3	3	2	1	1
CO5	-	-	-	3	3	3	-	1	-
CAM	2	2	2	3	3	3	3	1	1

21CSA311	C# AND .NET FRAMEWORK	L-T-P-C: 0-1-1-2

Course Objectives

- To gain a thorough understanding of the philosophy and architecture of .NET and acquire a working knowledge about the .NET programming model along with database connectivity to develop application programs.

Course Outcomes

COs	Description
CO1	Learn to use .NET frame work and basic programming concepts in C#
CO2	Students will be able to develop programs to solve real world problems using OOPS concepts in C#
CO3	Understand the Window Programming and event driven programming
CO4	Learn to use ADO.net to store and retrieve data from database

CO-PO Mapping

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-	3	2	2
CO2	3	3	3	-	-	-	3	3	2
CO3	3	3	3	-	-	1	3	3	2
CO4	3	3	3	-	-	1	3	3	2
CAM	3	3	3	-	-	1	3	3	2

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 , 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.

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, MDI, Mouse and keyboard event handling.

Unit 4

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

Textbooks / References:

1. C# 4.0 the Complete Reference by Herbert Schildt
2. C# by Balaguruswamy
3. Latest version of Andrew Trolsens C# text from Apress(Pro C# 5.0 and the .NET Framework 4.5)
4. Robert Powel, Richard Weeks, C# and the .NET Framework, Techmedia

21CSA312	CRYPTOGRAPHY AND CYBER SECURITY	L-T-P-C: 4-0-0-4

Course Objectives

- The objective of this course is to teach the concepts of securing computer network protocols, based on the application of cryptography techniques.

Course Outcomes

COs	Description
CO1	Provide security of the data over the network.
CO2	Do research in the emerging areas of cryptography and network security.
CO3	Implement various networking protocols.
CO4	Protect any network from the threats in the world.

CO-PO Mapping

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	2	-	-	1	-	1	1	-
CO2	1	2	3	-	-	2	2	3	3
CO3	-	-	3	-	3	2	1	2	-
CO4	-	-	3	2	3	3	2	2	1
CAM	2	2	3	2	3	2	2	2	2

Syllabus

Unit 1

Introduction to Cyber Security - Types of Attacks(Active/passive), Goals for Security, Security threat and vulnerability, Cyber security models (the CIA triad, the star model). Malicious Software: Viruses, Worms, Information Theft, Key loggers, Phishing, Spyware Payload Stealthing, Backdoors, Rootkits, Distributed Denial of Service Attacks.

Unit 2

Classical encryption techniques substitution ciphers and transposition ciphers, cryptanalysis, steganography, Stream and block ciphers - Modern Block Ciphers: Block ciphers principles, Shannon's theory of confusion and diffusion. Data encryption standard (DES), Strength of DES, Differential and Linear cryptanalysis, Block cipher modes of operations.

Unit 3

Public key concepts,Principles of public key crypto systems, RSA algorithm, security of RSA. Key Management and distribution. Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution.

Unit 4

Message Authentication Codes: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions, Case study on attacks. Digital Signatures. Elgamal Digital Signature Techniques, Digital signature standards (DSS).

Unit 5

Introduction to SSL. Introduction to SSL and TLS.Introduction to Cyber Crime and security: Cyber Crimes, types of Cyber Crime, hacking, attack vectors, Cross Site Scripting (XSS), XSS Consequences. Cyber Space and criminal behavior, traditional problems associated with Cyber Crime, Introduction to Incident Response, Digital Forensics.

Textbooks / References:

1. William Stallings-Cryptography and Network security PHI 3rdedition 2003.
2. Dr.T.RPadmanabhan N Harini “Cryptography and Security paper back”, Wiley India.
3. Behrouz A. Forouzan, “Cryptography and Network Security”, Tata McGraw-Hill Publishing.
4. Wenbo Mao, "Modern Cryptography, Theory & Practice", Pearson Education.
5. Manuel Mogollon, “Cryptography and Security Services – Mechanisms and Applications”, Cybertech Publishing.
6. Network Security: Private Communications in a Public World, M. Speciner, R. Perlman, C. Kaufman, Prentice Hall, 2002.

21CSA399	MAJOR PROJECT	8 Credits

Course Objectives

- To allow students to develop their own ideas and get experienced in industrial and research projects.
- It provides an opportunity in solving a real life problem by applying the knowledge gained through various courses of study and an exposure on different phases of software /system development life cycle**.**

Course Outcomes

The major outcome of the major project must be well-trained students. More specifically students must have acquired the following skills:

COs	Description
CO1	Able to practice acquired knowledge within the chosen area of technology for project development.
CO2	Identify, discuss, and justify the technical aspects of the chosen project with a comprehensive and systematic approach.
CO3	Reproduce, improve, and refine technical aspects for the projects.
CO4	Work as an individual or in a team in development of technical projects.
CO5	Communicate and report effectively project related activities and findings.

CO-PO Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	2	3	2	-	-	1	3	3	3
CO2	1	2	2	-	3	3	2	1	-
CO3	2	2	3	-	-	1	3	3	1
CO4	1	2	2	2	3	3	2	1	1
CO5	-	-	-	3	3	3	-	1	-
CAM	2	2	2	3	3	3	3	1	1

ELECTIVE I, II

21CSA331	ARTIFICIAL INTELLIGENCE	L-T-P-C:3-0-0-3

Course Objectives

- The main objective of this course is to familiarize the students with how to represent knowledge, including incomplete and uncertain knowledge of the real world; how to reason logically with that knowledge using probabilities; how to use these reasoning models and methods to decide what to do, particularly by constructing plans; and how to reason and make decisions in the presence of uncertainty about the world. It includes some state-of-the-art topics, such as the logical representation of different types of knowledge, reasoning under uncertainty

Course Outcomes

COs	Description
CO1	Define the basics of artificial intelligence and the deep challenges it presents to the researcher.
CO2	Explain various AI search algorithms (uninformed, informed, heuristic, constraint satisfaction, genetic algorithms).
CO3	Define the fundamentals of knowledge representation (logic-based, frame-based, semantic nets), inference mechanisms, game playing and expert systems
CO4	Demonstrate working knowledge of reasoning in the presence of incomplete and/or uncertain information

CO-PO Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	2	1	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	2	1	-
CO3	2	3	-	-	-	-	2	1	-
CO4	2	2	-	-	-	-	1	1	-
CAM	2	3	-	-	-	-	2	1	-

Syllabus

Unit 1: What is Artificial Intelligence? – The AI Problems – The Underlying Assumption – What is an AI technique – Criteria for Success.Problems, Problem Spaces and Search – Defining Problem as a State Space Search – Production Systems – Problem Characteristics – Production System Characteristics – Issues in the design of Search Programs.

Unit 2: Heuristic Search Techniques - Generate – and – Test – Hill Climbing – Best-First Search – Problem Reduction – Constraint Satisfaction - Means - Ends Analysis. Knowledge Representation issues – Representations and Mapping - Approaches to knowledge Representation – Issues in knowledge Representation – The Frame Problem. Using Predicate Logic – Representing simple facts in Logic – Representing Instance and Isa Relationship – Computable Functions and Predicates – Resolution – Natural Deduction.

Unit 3: Representing Knowledge Using Rules – Procedural versus Declarative knowledge – Logic Programming – Forward versus Backward Reasoning – Matching – Control Knowledge.Symbolic Reasoning under Uncertainty – Introduction to Non-monotonic Reasoning – Augmenting a Problem Solver – Implementation: Depth - First Search.
Statistical Reasoning – Probability and Baye's Theorem – Bayesian Networks – Fuzzy Logic.

Unit 4: Game Playing - The Minimax Search Procedure – Adding Alpha-Beta Cutoffs.Understanding – What is Understanding? What makes Understanding hard?

Unit 5: Common Sense – Qualitative Physics – Common sense ontology – Memory Organization - Expert Systems – Representing and Using Domain knowledge – Expert System Shells – knowledge Acquisition - Components of an AI program.

Textbooks/References:

1. Artificial Intelligence (Second Edition) – Elaine Rich, Kevin knight (Tata McGraw-Hill)
2. A Guide to Expert Systems – Donald A. Waterman (Addison-Wesley)
3. Principles of Artificial Intelligence – Nils J. Nilsson (Narosa Publishing House)
4. Introduction to Artificial Intelligence – Eugene Charnaik, Drew McDermott (Pearson Education Asia)

21CSA332	CLIENT SERVER COMPUTING	L-T-P-C:3-0-0-3

Course Objectives

- The objective of this course is to familiarize with client server computing concepts, to understand the components of client server application, client server system development and the data storage concepts in client server computing.

Course Outcomes

COs	Description
CO1	Understand the concept of client server computing
CO2	Understand the components of client server application.
CO3	Understand the concept of client server network.
CO4	Develop Client Server Systems
CO5	Understand the data Storage concepts in client server computing.

CO-PO Mapping

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	2	1	-	-	-	-	-	-	-
CO2	2	2	2	-	-	-	1	2	-
CO3	2	2	1	-	-	-	-	-	-
CO4	1	2	-	-	-	-	-	-	-
CO5	1	1	-	-	-	--	-	-	-
CAM	2	2	2	-	-	-	1	2	-

Syllabus

Unit1: Client/Server Computing: DBMS concept and architecture, Single system image, Client Server architecture, mainframe-centric client server computing, downsizing and client server computing, preserving mainframe applications investment through porting, client server development tools, advantages of client server computing.
Unit-2: Components of Client/Server application: The client: services, request for services, RPC, windows services, fax, print services, remote boot services, other remote services, Utility Services & Other Services, Dynamic Data Exchange (DDE), Object Linking and Embedding (OLE), Common Object Request Broker Architecture (CORBA). The server: Detailed server functionality, the network operating system, available platforms, the network operating system, available platform, the server operating system.
Unit-3: Client/Server Network: connectivity, communication interface technology, Interposes communication, wide area network technologies, network topologies (Token Ring, Ethernet, FDDI, CDDI) network management, Client-server system development: Software, Client–Server System Hardware: Network Acquisition, PC-level processing unit, Macintosh, notebooks, pen, UNIX workstation, x-terminals, server hardware.
Unit-4: Client Server Systems Development: Services and Support, system administration, Availability, Reliability, Serviceability, Software Distribution, Performance, Network management, Help Disk, Remote Systems Management Security, LAN and Network Management issues. Training, Training advantages of GUI Application, System Administrator training, Database Administrator training, End-user training.
Unit-5: Data Storage: magnetic disk, magnetic tape, CD-ROM, WORM, Optical disk, mirrored disk, fault tolerance, RAID, RAID-Disk network interface cards. Network protection devices, Power Protection Devices, UPS, Surge protectors. The future of client server Computing Enabling Technologies, The transformational system.

`Textbooks/References:

1. Patrick Smith & Steave Guengerich, “Client / Server Computing”, PHI

2. Dawna Travis Dewire, "Client/Server Computing", TMH

Course Objectives

- To acquire knowledge on the basic working of a microcontroller system and its programming.
- To provide experience to integrate hardware and software for microcontroller applications systems.

Course Outcomes

COs	Description
CO1	Understand the basic structure and design of Embedded systems.
CO2	Understand the fundamentals of Embedded processor, Bus Communication in processors, Input/output interfacing.
CO3	Develop programs for Embedded systems.
CO4	Understand different Phases & Modelling of Embedded system.
CO5	Understand the architecture of System-on-Chip and design examples.

CO-PO Mapping

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	3	-	-
CO2	3	1	-	-	-	-	1	-	-
CO3	3	3	-	-	-	-	2	2	-
CO4	3	3	-	-	-	-	2	2	1
CO5	2	3	2	-	-	-	1	2	1
CAM	3	3	2	-	-	-	2	2	1

Syllabus

Unit 1: INTRODUCTION TO EMBEDDED SYSTEMS
Introduction to Embedded Systems, Components of Embedded Systems, Structural units in Embedded processor, DMA, Memory management methods- memory mapping, cache replacement concept, Timer and Counting devices, Real Time Clock- CPU architecture of ARM processor- CPU Bus organization

Unit 2: EMBEDDED NETWORKING AND ISR
Embedded Networking: Introduction, I/O Device Ports & Buses– Serial Bus communication protocols – Serial Communication Standards and Devices- ISR concept-– multiple interrupts – Serial Bus Protocols- RS232 standard – RS485 –USB – Inter Integrated Circuits (I2C)

Unit 3: RTOS BASED EMBEDDED SYSTEM DESIGN
Introduction to basic concepts of RTOS- Task, process & threads, interrupt routines in RTOS, Inter-process Communication – synchronization between processes-semaphores, Mailbox, pipes, priority inversion, priority inheritance

Unit 4: PROGRAMMING CONCEPTS OF EMBEDDED PROGRAMMING
Introduction to Software Development environment-IDE, assembler, compiler, linker, simulator, debugger, In Circuit emulator, Target Hardware Debugging, Features of Embedded C++ and Embedded Java(basic only), Software Implementation, Validation, Testing, system-on-chip

Unit 5: EMBEDDED SYSTEM APPLICATION DEVELOPMENT

Objectives, different Phases & Modeling of the Embedded product Development Life Cycle (EDLC), IPC, Message Queue, Sockets- RPCs.
Case study 1: Study on Smart card- Adaptive Cruise control in a Car -Mobile Phone software for key inputs.
Case study 2: Study of other popular RTOS

Textbooks/References:

1. Rajkamal, 'Embedded system-Architecture, Programming, Design', TMH,2011.
2. Peckol, "Embedded system Design",JohnWiley&Sons,2010
3. Shibu.K.V, "Introduction to Embedded Systems", TataMcgraw Hill,2009
4. Lyla B Das," Embedded Systems-An Integrated Approach",Pearson2013
5. Elicia White,"Making Embedded Systems",O'Reilly Series,SPD,2011
6. Bruce Powel Douglass,"Real-Time UML Workshop for Embedded Systems,Elsevier,2011.

21CSA334	ENTERPRISE RESOURCE PLANNING MANAGEMENT	L-T-P-C:3-0-0-3

Course Objectives

- The objective of this course is to describe the concept of ERP and the ERP model; define key terms; explain the transition from MRP to ERP; identify the levels of ERP maturity. Explain how ERP is used to integrate business processes; define and analyse a process; create a process map and improve and/or simplify the process; apply the result to an ERP implementation.

Course Outcomes

COs	Description
CO1	Understand the structure of ERP.
CO2	Understand ERP and related technologies.
CO3	Understand the different functional modules in ERP.
CO4	Understand ERP implementation life cycle.
CO5	Understand the importance of ERP and E commerce.

CO-PO Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	-	-	-	-
CO2	1	2	1	-	-	-	-	1	-
CO3	1	2	-	-	-	-	-	-	-
CO4	1	2	-	-	-	-	-	-	-
CO5	1	2	-	-	-	-	-	-	-
CAM	1	2	1	-	-	-	-	1	-

Syllabus

Unit 1:ERP Introduction, Benefits, Origin, Evolution and Structure: Conceptual Model of ERP, the Evolution of ERP, the Structure of ERP.

Unit 2: Business Process Reengineering, Data ware Housing, Data Mining, Online Analytic Processing (OLAP), Product Life Cycle Management (PLM), LAP, Supply chain Management.

Unit-3: ERP Marketplace and Marketplace Dynamics: Market Overview, Marketplace Dynamics, the Changing ERP Market. ERP- Functional Modules: Introduction, Functional Modules of ERP Software, Integration of ERP, Supply chain and Customer Relationship Applications.

Unit 4:ERP Implementation Basics, ERP Implementation Life Cycle, Role of SDLC/SSAD, Object Oriented Architecture, Consultants, Vendors and Employees.

Unit 5:ERP & E-Commerce, Future Directives- in ERP, ERP and Internet, Critical success and failure factors, Integrating ERP into organizational culture. Cloud computing in ERP.

Textbooks/References:

1. Alexis Leon, “ERP Demystified”, Tata McGraw Hill
2. Vinod Kumar Garg and Venkitakrishnan N K, “Enterprise Resource Planning Concepts and Practice”, PHI.

21CSA335	KNOWLEDGE MANAGEMENT	L-T-P-C:3-0-0-3

Course Objectives

- To understand knowledge management Systems and the intellectual methods for designing and deploying a Knowledge Management System. Study various tools used in Knowledge Management and its applications.

Course Outcomes

COs	Description
CO1	To get basic idea on knowledge management Systems
CO2	Be familiar with tools for Knowledge management.
CO3	Be exposed to knowledge management Applications.
CO4	Be familiar with some case studies

CO-PO Mapping

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	-	1	-	1
CO2	1	1	2	-	-	-	1	-	1
CO3	1	1	1	-	-	-	1	1	1
CO4	2	1	1	-	-	-	1	1	1
CAM	2	1	1	-	-	-	1	1	1

Syllabus

Introduction: An Introduction to Knowledge Management – The foundations of knowledge management-decision support systems. Business Intelligence, Attributes of Knowledge, Expression of Knowledge- Business benefits of knowledge-Evolution of Knowledge Management – Ethics for Knowledge Management.
Tools for knowledge management-Knowledge Initiatives, KM Process-Life cycle, Knowledge Networking, Principles behind KM success, Thematic Analysis - Knowledge Transformation and Dynamics.
Knowledge Management System and Development, Generic model - Life Cycle- Application Cycle- Challenges in Developing KMS- KM System Architecture, Knowledge Construction Architecture, Implementation of KMS, The learning concept and Knowledge Management System -Establish a knowledge strategy framework, Validation of Knowledge, Validation of knowledge - Knowledge Creation, Acquisition of Knowledge-Knowledge Acquisition Techniques.
Application phase and Organisation Learning, Knowledge Transfer, Knowledge sharing: Knowledge Transferring sharing and tools, Codification of Knowledge, build a knowledge Maps, Designing Knowledge Transfer and Sharing strategy, Network structures for Knowledge Transfer, Knowledge Asset, Organization and Knowledge Management – Building the Learning Organization. Knowledge Markets- Technology Foundations – The Internet and Internet Services – Web Components and Communications.

Textbooks/References:

1. Knowledge Management –Waman S Jawadekar,Tata McGraw Hill Education Private Limited-2011
2. Knowledge Management –E Sudhir Warier, Vikas Publishing House Pvt. Ltd. -2009
3. Measuring and Managing Knowledge: Tom Housel and Arthur Bell 2001, International Edition, Tata McGraw-Hill
4. Knowledge Management: Ganesh Natarajan, President & CEO Aptech

21CSA336	MICROPROCESSOR SYSTEMS	L-T-P-C:3-0-0-3

Course Objectives

- The objective of the course is to make students clear about the architecture and instruction set of typical 8-bit microprocessor. It also deals with Assembly Language Programming using a macro-assembler. Input-output techniques and important programmable support chips used in microprocessor-based systems are discussed in detail.

Course Outcomes

COs	Description
CO1	To understand the general architecture of microprocessor system.
CO2	To understand basic architecture of 8 bit microprocessor- Intel 8085, instruction fetching, decoding and execution.
CO3	To understand the basic programming instructions,addressing modes.
CO4	To understand the different interrupts and interrupts handling in 8085.
CO5	To understand the Programmable Peripheral Interface, ADC,DAC, Programmable interval timer.

CO-PO Mapping

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-
CO3	3	1	2	-	-	-	-	1	-
CO4	3	1	1	-	-	-	-	1	-
CO5	3	1	1	-	-	-	-	1	-
CAM	3	1	1	-	-	-	-	1	-

Syllabus

Unit 1: Introduction of Microcomputer System: CPU, I/O devices, clock, memory, bussed architecture, Tristate logic, address bus, data bus and control bus. Semiconductor Memories: Development of semiconductor memory, internal structure and decoding, memory read and write timing diagrams, MROM, ROM, EPROM, EEPROM, DRAM

Unit 2: Architecture of 8-bit Microprocessor: Intel 8085A microprocessor,Pin description and internal architecture. Operation and Control of Microprocessor: Timing and control unit, op-code fetch machine cycle, memory read/write machine cycles, I/O read/write machine cycles, interrupt acknowledge machine cycle, state transition diagram.

Unit 3: Instruction Set: Addressing modes; Data transfer, arithmetic, logical, branch, stack and machine control groups of instruction set, macro RTLand micro RTL flow chart of few typical instructions; Unspecified flags and instructions. Assembly Language Programming: Assembler directives, simple examples;Subroutines, parameter

Unit 4: Interrupts: Interrupt structure of 8085A microprocessor, processing of vectored and nonvectored interrupts, latency time and response time; Handling multiple interrupts

Unit 5: Programmable Peripheral Interface: Intel 8255, pin configuration, internal structure of a port bit, modes of operation, bit SET/RESET feature, programming; ADC and DAC chips and their interfacing.Programmable Interval Timer: Intel 8253, pin configuration, internal block diagram of counter and modes of operation, counter

read methods, programming, READ-BACK command of Intel 8254.

Textbooks/References:

1. Hall D.V.,"Microprocessor and Interfacing-Programming and Hardware", 2nd Ed., Tata McGraw-Hill Publishing Company Limited, 2008.
2. Gaonkar R.S.,"Microprocessor Architecture,Programming and Applications", 5th Ed., Penram International, 2007.
3. Stewart J,"Microprocessor Systems- Hardware,Software and Programming", Prentice Hall International Edition,1990
4. Short K. L.,"Microprocessors and Programmed Logic", 2nd Ed.,Pearson Education, 2008.

21CSA337	MULTIMEDIA AND GRAPHICS	L-T-P-C:3-0-0-3

Course Objectives

- The course enables the student to learn the concepts of multimedia like text, speech, image and video processing in today's international standards. Further, it also adds an essence of multimedia systems design, multimedia networks, multimedia search engines and emerging multimedia value-added services.

Course Outcomes

COs	Description
CO1	Describe the types of media and define multimedia system
CO2	Describe the process of digitizing (quantization) of different analog signals
CO3	Use and apply tools for image processing, video, sound and animation.
CO4	Apply methodology to develop a multimedia system.
CO5	Apply acquired knowledge in the field of multimedia in practice and independently continue to expand knowledge in this field.

CO-PO Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	2	1	3	1	-	-	-	2	-
CO2	2	-	-	1	-	-	1	1	2
CO3	2	1	3	2	-	-	1	2	-
CO4	2	2	3	1	-	-	3	3	1
CO5	3	3	3	3	-	1	2	2	2
CAM	2	2	3	1		1	1	2	2

Syllabus

Unit 1: Introduction: Graphics Systems – Raster Scan & Random Scan systems. Output Primitives,What is Multimedia? – Introduction to making Multimedia - Media Skills – Macintosh and Windows Platforms – Basic software tools.
Unit 2: Making instant Multimedia – Multimedia Authoring tools.
Unit 3: Multimedia Building Blocks: Text – Sound – Images.
Unit 4: Multimedia Building Blocks: Animation: types, techniques, key frame animation, utility, morphing. Virtual Reality concepts.– Video.
Unit 5: Multimedia and the Internet: The Internet and how it works – Tools for World Wide Web – Designing for the World Wide Web.

Textbooks/References:

1. Nigel Chapman – Digital Multimedia – Wiley – ISBN – 81-265-0489-7
2. John F. Koegel Buford – Multimedia Systems – PEARSON – ISBN – 81-78-08-162-8
3. Donald Hearn, Pauline Baker, " Computer Graphics – C Version", Pearson Education.
4. Steinmetz R. & Nahrstedt K., "Multimedia: Computing, Communications and Applications", Pearson Education.
5. David F. Rogers, "Procedural Elements for Computer Graphics", Tata McGraw-Hill
6. Foley, van Dam, Feiner & Hughes, "Computer Graphics Principles & Practice", Pearson Education.
7. William M. Newman, Robert F. Sproull, "Principles of Interactive Computer Graphics" , Tata McGraw-Hill.
8. David F. Rogers, J. Alan Adams, "Mathematical Elements for Computer Graphics", Tata McGraw-Hill.
9. Tay Vaughan, "Multimedia: Making it Work", Tata McGraw-Hill.

21CSA338	SOCIAL AND PROFESSIONAL ISSUES IN COMPUTING	L-T-P-C:3-0-0-3

Course Objectives

- This course is designed to explore the nature and principles of ethics—including personal, professional, and corporate ethics - in a computing context. Address the interplay between ethics on the one hand; and law, society, politics, economy, justice, responsibility, honesty on the other. Explore specific ethical issues raised by the ubiquity of computer and information technology in today's society.

Course Outcomes

COs	Description
CO1	Able to identify social and ethical issues that arise in the development and application of computing technology in modern society
CO2	Understand the responsibilities of computer professionals as defined by the Software Engineering Code of Ethics and Professional Practice
CO3	Understand risks and security operations in an organization.
CO4	Able to formulate viewpoints concerning the current legal and ethical status of intellectual property rights – specifically trade secrets, trademarks, copyrights, patents, and licensing – as they relate to computer software
CO5	Able to handle some legal issues related to computer crime and hacking

CO-PO Mapping

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	-	-	2	-	-	-	-	1
CO2	3	-	-	2	-	-	-	-	1
CO3	3	1	1	-	-	-	1	-	1
CO4	2	1	-	2	-	-	1	-	1
CO5	2	2	2	-	-	-	1	2	-
CAM	3	1	2	2	-	-	1	2	1

Syllabus

Unit 1: Social Context: Introduction to the social implications of computing, Social implications of networked communication, Growth of, Control of, and access to the Internet, Gender – Related issues, Cultural issues, International Issues, Accessibility Issues (e.g. underrepresentation of minorities, Women and disabled in the computing profession), Public policy issues (e.g. electronic voting).

Unit 2: Analytical Tools: Making and evaluating ethical arguments, Identifying and evaluating ethical choices, Understanding the social context of design, Identifying assumptions and values. Professional Ethics: Community values and the laws by which we live, The nature of professionalism (Including care, attention and discipline, fiduciary responsibility, and mentoring).Keeping up-to-date as a professional (in terms of knowledge, tools, skills, legal and professional framework as well as the ability to self-assess and computer fluency), Various forms of professional credentialing and the advantages and disadvantages, The role of the professional in public policy, Maintaining awareness of consequences, Ethical dissent and whistle-blowing. Codes of ethics, conduct, and practice(IEEE, ACM, SE, AITP, and so forth), Dealing with harassment and discrimination, “Acceptable use” policies for computing in the work place. Healthy Computing environment (ergonomics)

Unit 3: Risks: Historical examples of software risks (such as the Therac-25 case), Implications of software complexity, Risk assessment and Risk Management; Risk removal, risk reduction and risk control.
Security Operations: Physical security, Physical access controls, Personnel access controls, Operational security,

Security polices for systems/networks, Recovery and Response, Dealing with problems (both technical and human)

Unit 4: Intellectual Property: Foundations of Intellectual Property, Copyrights, patents, and trade secrets, Software Piracy, Software Patents, Transactional issues concerning Intellectual Property. Privacy and Civil Liberties: Ethical and legal basis for privacy protection, Ethical and legal framework for freedom of information, Privacy implications of database systems (e.g. Data gathering, storage and sharing, massive data collecting, computer surveillance systems) Technological strategies for privacy protection, Freedom of expression in cyberspace, International and intercultural implications.

Unit 5: Computer Crime: History and examples of computer crime, "Cracking" ("Hacking") and its effects, Viruses, Worms, and Trojan Horses, Identity Theft, Crime Prevention strategies.

Textbooks/References:

1. Ethics for Information Age, 3rd Edition, Michael J. Quinn, Pearson/Addison Wesley, 2009

21CSA339	SOFT COMPUTING	L-T-P-C:3-0-0-3

Course Objectives

- The objective of this course is to familiarize with soft computing concepts, introduce and use the idea of Neural networks, fuzzy logic and use of heuristics based on human experience, introduce and use the concepts of Genetic algorithm and its applications to soft computing using some applications.

Course Outcomes

COs	Description
CO1	Understand the concept of soft computing and its applications
CO2	Understand the design of neural network architectures
CO3	Understand the concept of fuzzy systems.
CO4	Understand neuro-fuzzy hybrid systems and its applications
CO5	Understand the genetic algorithm concepts.

CO-PO Mapping

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	2	1	1	-	-	-	-	2	3
CO2	3	3	2	-	-	-	1	2	2
CO3	3	3	2	-	-	-	1	2	2
CO4	2	3	2	-	-	-	1	3	1
CO5	3	1	-	-	-	-	3	1	1
CAM	3	3	2	-	-	-	1	2	2

Syllabus

Unit 1: Introduction to Soft Computing-Concept of computing systems-"Soft" computing versus "Hard" computing-Characteristics of Soft computing-Some applications of soft computing techniques.

Unit 2: What is Neural Network, Learning rules and various activation functions, Single layer Perceptron, Back Propagation networks, Architecture of Back propagation (BP)Networks, Backpropagation Learning, to Associative Memory, Adaptive Resonance theory and Self Organizing Map, Recent Applications.

Unit 3: Fuzzy Set theory, Fuzzy versus Crisp set, Fuzzy Relation, Fuzzification, Minmax Composition, Defuzzification Method, Fuzzy Logic, Fuzzy Rule based systems, Predicate logic, Fuzzy Decision Making, Fuzzy Control Systems, Fuzzy Classification.

Unit 4: Hybrid Soft Computing Techniques and Applications-Neuro-fuzzy hybrid systems – genetic neuro hybrid systems – genetic fuzzy hybrid and fuzzy genetic hybrid systems – simplified fuzzy ARTMAP – Applications: A fusion approach of multispectral images with SAR, optimization of traveling salesman problem using genetic algorithm approach, soft computing-based hybrid fuzzy controllers.

Unit 5: Genetic Algorithm: -History of Genetic Algorithms (GA), Working Principle, Various Encoding methods, Fitness function, GA Operators- Reproduction, Crossover, Mutation, Convergence of GA, Bit wise operation in GA, Multi-level Optimization

Textbooks/References:

1. Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications, S.Rajasekaran, G. A. Vijayalakshami, PHI

2. S.N.Sivanandam and S.N.Deepa, "Principles of Soft Computing", Wiley India Pvt Ltd, 2011.

Course Objectives

- The main aim of this course is to provide basic ideas to manage and administer computer systems as well as networks. Students are trained with practical sessions

Course Outcomes

COs	Description
CO1	Understand the role of a System/Network administrator
CO2	Understand the basic software commands for managing and administering the systems/networks.
CO3	Develop skills in doing subnetting, routing, and VPN installation.
CO4	Develop the skill to test the security vulnerabilities and their countermeasures.

CO-PO Mapping

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	-	1	2	2	2	-	-	-
CO2	2	1	1	1	1	-	-	-	-
CO3	2	1	2	-	-	-	-	2	-
CO4	2	1	2	-	-	-	-	1	-
CAM	2	1	2	2	2	2	-	2	-

Syllabus

Unit 1: Understanding System Administration – Network Operating System - Network File System – Admin User - Administration Tools – Commands - Configuration Files – Log Files - Backup and Restore Files.
Unit 2: User Management - Issues - Registration – Account Policy – Login environment – Setting up and Supporting Users – Disk Quotas.
Unit 3: Network Administration – Topologies – Network Devices - Understanding TCP/IP – Administering TCP/IP - Network Configuration – Static and Dynamic -Routing, Switching, VPN and other security protocols- Firewall administration
Unit 4: Introduction to File Server – Setting Up a File Server – Network File Systems - SAMBA – Web Server.
Unit 5: Understanding Directory Services – Active Directory/LDAP – Network Security – Importance of Port Number – Tracking Services – Monitoring your System – Network Security Tools Implement and monitor security measures for the protection of computer systems, networks, and information.

Textbooks/References:

1. Red Hat Linux - System Administration
2. Windows Server 2016 Administration Fundamentals by Bekim Dauti
3. UNIX and Linux System Administration Handbook, 4thEd., by Nemeth, Snyder, Hein and Whaley (Prentice Hall, 2010)
4. The Practice of System and Network Administration, 2nd Ed., by Limoncelli, Hogan and Chalup (Addison Wesley, 2007)
5. Mark Burgess – Principles of Network and System Administration –2ndEdition - John Wiley & Sons
6. Essential System Administration: Tools and Techniques for Linux and Unix Administration, 3rd Edition 3rd Edition by Æleen Frisch
7. LDAP System Administration: Putting Directories to Work 1st Edition by Gerald Carter
8. TCP/IP Network Administration (3rd Edition; O'Reilly Networking) Third Edition by Craig Hunt
9. Network Troubleshooting Tools (O'Reilly System Administration) 1st Edition by Joseph D Sloan
10. Linux Cookbook: Essential Skills for Linux Users and System & Network Administrators 2nd Edition by Carla Schroder

21CSA341	COMPUTER GRAPHICS	L-T-P-C:3-0-0-3

Course Objectives

- The primary objective of this course is to give the basic principles of 2D and 3D computer graphics, to study the elementary mathematical techniques that allow us to position objects in three dimensional spaces and techniques necessary to produce basic 2D/3D dimensional illustrations.

Course Outcomes

COs	Description
CO1	Understand various Graphics applications, different video display devices, and describe Raster-Scan Systems and Random-Scan Systems.
CO2	Construct lines and circles by applying Bresenham's Line Algorithm and Midpoint Circle Algorithm and apply appropriate filling algorithms to fill objects.
CO3	Describe two-dimensional and three-dimensional transformations.
CO4	Describe line clipping and projections.
CO5	Implement basic graphics programming using OpenGL.

CO-PO Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-
CO2	3	2	1	-	-	-	-	2	-
CO3	3	2	1	-	-	-	-	2	-
CO4	3	2	1	-	-	-	-	2	-
CO5	3	3	3	2	2	1	1	1	1
CAM	3	2	1	2	2	1	1	2	1

Syllabus

Unit 1: Applications of Graphics, Display devices, Random and Raster Graphics systems, Output Primitives: Bresenham's Line Algorithm, Midpoint Circle Algorithm; Filled Area Primitives: Boundary-Fill Algorithm, Flood-Fill Algorithm; Bitmap Character Generation.

Unit 2: Two-Dimensional Geometric Transformations: Translation, Rotation, Scaling, Homogeneous coordinates. Reflection, Shear. Three-Dimensional Geometric Transformations: Translation, Rotation, Scaling, Reflection, Shear.

Unit 3: Two-Dimensional Viewing: Window-to-viewport transformation, Clipping - Cohen Sutherland Line Clipping algorithm.

Unit 4: Three-Dimensional Viewing: Projections, Parallel Projections, Perspective Projections, View Volumes**.**

Unit 5: Graphics Programming: OpenGL Introduction: Command Syntax, Drawing and filling images, patterns, filling regular and irregular shapes, Outputting Text, Justifying Text, Animation. Drawing with mouse, building mouse cursors, freehand drawing using mouse, menus using mouse.

Textbooks/References:

1. Computer Graphics, C Version, D. Hearn, M.P. Baker, 2nd Edition, Pearson Education
2. OpenGL Programming Guide, M. Woo, J. Neider, T. Davis, D. Shreiner, 3rd edition, Pearson Education

PROFESSIONAL ELECTIVES

21CSA342	IOT ARCHITECTURES AND PROGRAMMING	L-T-P-C: 3-0-1-4

Course Objectives

- 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

COs	Description
CO1	Understand theoretical foundation of IoT architectures.
CO2	Systematic professional knowledge and strong practical skills in the IoT Platform and System Design.
CO3	Understand the vision of IoT from a global perspective and its applications
CO4	Determine its market perspective, using gateways, devices and data management
CO5	Building a state of art architecture in IoT and its applications in commercial building automation and real-world design constraints.

CO-PO Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	3	2	-	-	-	1	1	1	-
CO2	2	2	2	-	1	1	2	1	2	-
CO3	2	3	2	-	1	1	3	2	3	1
CO4	2	3	2	1	1	1	1	2	3	1
CO5	2	2	3	1	1	1	2	2	2	2
CAM	2	3	2	1	1	1	2	2	2	1

Syllabus

Unit 1: IoT Networking Core Technologies involved in IoT development, Internet web and Networking technologies, Infrastructure, Overview of IoT supported Hardware platforms such as: Raspberry pi, ARM Cortex Processors, Arduino and Intel Galileo boards, Wireless networking equipment and configurations, accessing hardware and device file interactions.

Unit 2: M2M to IoT Role of M2M in IoT, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. Building architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations

Unit 3: IoT Architecture -State of the Art IoT reference Model and Architecture- Functional View, Information View, Deployment and Operational View, Other Relevant architectural views, Middleware Introduction-FiWare etc., Remote monitoring and sensing, remote controlling and performance analysis, layering concepts, communication pattern, 6LoWPAN, Sensors and sensor Node and interfacing using any Embedded target boards (Raspberry Pi / Intel Galileo/ARM Cortex/ Arduino)

Unit 4: IoT Application Development Application protocols: MQTT, REST/HTTP, CoAP, MySQL, Back-end Application Designing Apache for handling HTTP Requests, MongoDB Object type Database, HTML, CSS &

jQuery for UI Designing, JSON lib for data processing, Security & Privacy during development

Unit 5: IoT Security and case studies Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps towards a Secure Platform, Smarty Approach. Data Aggregation for the IoT in Smart Cities

Textbooks/References:

1. Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)", 1 st Edition, VPT, 2014
2. Adrian McEwen, Hakim Cassimally, "Designing the Internet of Things", November 2013, John Wiley and Sons.
3. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1 st Edition, Apress Publications, 2013
4. CunoPfister, Getting Started with the Internet of Things, O"Reilly Media, 2011, ISBN: 978-1- 4493-9357-1
5. Zach Shelby, Carsten Bormann, "6LoWPAN: The Wireless Embedded Internet", John Wiley and Sons.
6. Dr. OvidiuVermesan, Dr. Peter Friess "Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems", River Publishers

21CSA343 ADVANCED SOFTWARE ENGINEERING AND DESIGN PATTERNS L-T-P-C: 3-0-1-4

Course Objectives

- Advanced Software Engineering presents a broad perspective on software systems engineering, concentrating on widely used techniques for developing large-scale software systems covering a wide spectrum of software processes from initial requirements elicitation through design and development to system evolution. The course also covers a wide range of software development abilities and skills from analyzing a problem to implement a solution, by discussing the design patterns in Smalltalk MVC architecture, Express representation invariants, understand their impact on efficiency and ease of implementation, and implement them as runtime assertions by differentiating between structural patterns and behavioral patterns involved in a software development process.

Course Outcomes

COs	Description
CO1	Illustrate the idea of the software myths, basics of software engineering, SRS and its phases with different Process Models.
CO2	Describe the design and working of ERD, DFD, Design Methods and architectural views.
CO3	Understand Testing strategies, different methods, design transformation to understand the structure of application development. Design a module structure to solve a problem, and evaluate alternatives in software applications.
CO4	Analyze and Design a model by exploiting the well-known design patterns (such as Iterator, Observer, Factory and Visitor)
CO5	Understand and apply common design patterns to incremental/iterative development.
CO6	Identify appropriate patterns for designing solution to the given problem by applying the software development concepts for implementing a solution.

CO-PO Mapping

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	1	-	-
CO2	3	2	2	-	-	-	-	1	-	-
CO3	3	2	2	-	-	-	-	1	1	-
CO4	3	3	-	1	1	-	-	1	1	-
CO5	2	3	2	1	1	-	-	1	1	-
CO6	2	3	2	1	1	-	-	1	1	-
CAM	3	3	2	1	1	-	-	1	1	-

Syllabus

Introductions to Software Engineering: Software Myths and Types, Process and Products, Software Characteristics, SDLC process, Software requirements specification, approaches and paradigms. Prototyping, RAD, SCRUM, Incremental and Agile process models.

Design process consideration: Design Concepts, Design Architecture, Description and Principles, UML Modeling: Use case and Class Diagrams, State Transition Diagrams and Interaction Diagrams. Analysis to Design Modeling: Transformations. Testing fundamentals: Testing Principles, Processes and Methods used for evaluating a software.

Introductions to Design Pattern, Catalog of Design Patterns, The Catalog of Design Patterns, Organizing the Catalog, How Design Patterns Solve Design Problems, How to Select a Design Pattern, How to Use a Design

Pattern.

A Case Study: Designing a Document Editor: Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems. Creational Patterns: Abstract Factory, Builder, Factory Method and Prototype Patterns.

Categories of Patterns: Structural Patterns: Adapter, Bridge, Composite and Decorator. Behavioral Patterns: Observer, Mediator, Interpreter and Iterator. Differences between Structural and Behavioral Patterns. Discussion of real-time examples

Textbooks/References:

1. Roger S Pressman, "Software Engineering", Tata McGraw-Hill Publishing Company Pvt. Ltd., Sixth Edition
2. Design Patterns by Erich Gamma, Pearson Education.
3. Shooman, "Software Engineering", Tata McGraw-Hill Publishing Company Pvt. Ltd., 1987
4. Design Patterns Explained by Alan Shalloway, Pearson Education.
5. Pattern Oriented Software Architecture, F. Buschmann & Others, John Wiley & Sons.

21CSA344	ADVANCED DATA MINING AND APPLICATIONS	L-T-P-C: 3-0-1-4

Course Objectives

- This course focuses on advanced data mining concepts and techniques for discovering interesting patterns from data in various applications It emphasizes techniques for developing effective,efficient, and scalable data mining tools.

Course Outcomes

COs	Description
CO1	To remember the difference between database and data mining and it applications, classification and issues.
CO2	Understand the various data pre-processing methods like cleaning, integration, transformation, reduction.
CO3	Apply the frequent pattern mining algorithms to find the frequent pattern and understand the various patterns and its rules.
CO4	Understand the various classification and prediction algorithms and evaluate the performance of classifiers.
CO5	To analyse the nature of data, based on the nature apply various clustering algorithm and detect the outliers and process the outlier using various methods.

CO-PO Mapping

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	1	-	-	1
CO2	3	2	2	-	-	-	1	1	1	1
CO3	3	3	3	-	-	1	1	1	1	1
CO4	3	3	3	-	-	1	1	1	1	1
CO5	3	3	3	-	-	1	1	1	1	1
CAM	3	3	3	-	-	1	1	1	1	1

Syllabus

Introduction to data mining; Data preprocessing; Data cleaning; Data integration; Data reduction techniques; Data Transformation and Discretization.

Mining Frequent Patterns: Basic Concept –Apriori algorithm-Pattern-growth approach for mining Frequent Item Set Mining Methods – Mining Association Rules – Association to Correlation Analysis-pattern mining-road map, pattern mining in multilevel, multidimensional space, constraint-based frequent pattern mining-mining, high-dimensional and colossal patterns-pattern exploration and applications.

Classification and Prediction: Basic Concept - Decision Tree Induction - Bayesian Classification – k-Nearest-Neighbour ,Classification by back propagation-- Linear SVM - Regression – Linear, Logistic – Model evaluation and selection-metric for evaluating classifier performance-holdout method and random subsampling, cross validation-bootstrap, ROC, Technique for improve classification accuracy–Introduction to Ensemble methods-Bagging-boosting and AdaBoost, Random forest-Multiclass classification-Semi-supervised classification-Active learning-Transfer learning.

Clustering: What is cluster analysis, requirements for cluster analysis, Overview of basic clustering methods-Partitioning Methods, k-Means, k-Medoids. Hierarchical Methods- Agglomerative and Divisive hierarchical clustering, Single, Average and Complete linkage, BIRCH, CHAMELEON. Density-Based Methods-DBSCAN-OPTICS, DENCLUE, Grid-Based Methods-STING,CLIQUE , Evaluation in Clustering, Advanced clustering-Probabilistic Model-Based Cluster-EM algorithm, Outlier Detection- Outlier and Outlier analysis-what are outliers, type of outliers, Outlier detection methods-, Statistical approaches-parametric methods, nonparametric methods, Proximity-based approaches-a grid-based method, density-based outlier detection,

clustering-based approach, classification based approaches, clustering based approaches.

LAB-Tools :Implementation of Data mining algorithms using Latest Open Source Data mining Tool-Python, Jupyter notebook, Spider, R-programming.

Textbooks / References:

1. Jiawei Han, Micheline Kamber and Jian Pei, “Data mining concepts and Techniques”, Third Edition, Elsevier Publisher, 2006.
2. K.P.Soman, Shyam Diwakar and V.Ajay, “Insight into data mining Theory and Practice”, Prentice Hall of India, 2006.

21CSA345	CLOUD COMPUTING	L-T-P-C: 3-0-1-4

Course Objectives

- To Familiarize the Cloud computing environment, services and delivery models and also analyze the cloud deployment models, QoS parameters, Accounting and Security.

Course Outcomes

COs	Description
CO1	Familiarize the various Computing platforms and features
CO2	Analyze the features of virtualization
CO3	Understand the architecture, cloud services and cloud platforms
CO4	Analyze Cloud delivery models and deployment models
CO5	Understand the concepts of cloud Accounting and Security
CO6	Develop a Cloud platform, VM containers and analyze services, and QoS performance

CO-PO Mapping

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	3	2	-	-	-	1	1	1	-
CO2	2	2	2	-	1	1	1	1	2	-
CO3	2	3	2	-	1	1	3	2	3	1
CO4	2	3	2	1	1	1	2	2	3	1
CO5	2	2	3	1	1	1	2	2	2	2
CO6	2	1	2	1	1	1	2	1	2	2
CAM	2	3	2	1	1	1	2	1	2	2

Syllabus

Cloud Computing Overview: Cloud and Grid and Web2.0 and Other Computing- Cloud Computing Environments- Platforms. Parallel and Distributed Computing- Virtualization: Characteristics-Taxonomy- Pros and Cons – Xen- VMware- Hyper V. Cloud Computing Architecture-Service Models Deployment Models-Infrastructure as a Service Resource Virtualization-Server-Storage-Network-Platform as a Service-Cloud Platform and Management-Software as a Service-Case Study on Open Nebula. Service Management in Cloud Computing Service Level Agreement-Billing and Accounting-Managing Data. Cloud Security: Infrastructure, Data and Storage Security.

Lab

Cloud Computing:- Familiarize various public and private cloud platforms, Create configure VMs, Working with Containers and docker, to implement IAAS and PAAS model services.
Application development and deployment in cloud with a scenario application, Containerizing and orchestrating apps, Different storage options, Monitoring and load-balancing, build a private Cloud

Textbooks / References:

1. Rajkumar Buyya,Christian Vecchiola and S.ThamaraiSelvi,"Mastering Cloud Computing: Foundations and Applications Programming" , First Edition, McGrawHill Education,2013.
2. Rajkumar Buyya, James Broberg and Andrzej M. Goscinski,"Cloud Computing: Principles and Paradigms", First Edition, Wiley, 2011.
3. Barrie Sisisky, "Cloud Computing Bible", First Edition , Wiley-India, 2010.

4. Nikos Antonpoulos, Lee Gillam,“Cloud Computing: Principles, Systems and Applications”,First Edition , Springer, 2012.
5. Ronald L. Krutz, Russell Dean Vines“Cloud Security: A Comprehensive Guide to Secure Cloud Computing”, First Edition, Wiley-India, 2010
6. https://www.qwiklabs.com/
7. https://sites.google.com/google.com/gcp-teachingresources/home?pli=1&authuser=1
8. https://opennebula.io/docs/

21CSA346	SYSTEM SECURITY	L-T-P-C: 3-0-1-4

Course Objectives

- This course provides basic knowledge and skills in the fundamental theories and practices of cyber security.
- It provides an overview of the field of security and assurance emphasizing the need to protect informationbeing transmitted electronically.

Course Outcomes

COs	Description
CO1	Understand various attacks on the system and the need for security.
CO2	Understand various malicious and non-malicious program errors and learn to develop secure programs.
CO3	Learn various protection mechanisms provided by operating system and to manage it.
CO4	Review the security services provided by the database systems.
CO5	Understand the threats in computer networks, ethical issues, privacy and copyright laws.

CO-PO Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	3	2	-	-	-	1	1	1	-
CO2	2	2	2	-	1	1	2	1	2	-
CO3	2	3	2	-	1	1	2	2	3	1
CO4	2	3	2	1	1	1	2	2	3	1
CO5	2	2	3	1	1	1	2	2	2	2
CAM	2	3	2	1	1	1	2	2	2	1

Syllabus

Unit 1: Basics of Computer Security: Overview – Definition of terms – Security goals – Shortcomings – Attack and defense – Malicious code – Worms – Intruders – Error detection and correction Encryption and Cryptography: Ciphers andcodes – Public key algorithms – Key distribution – Digital signatures.

Unit 2: Security Services: Authentication and Key Exchange Protocols - Access control matrix – User authentication –Directory authentication service – Diffie-Hellman key exchange – Kerberos.

Unit 3: System security and Security models: Disaster recovery - Protection policies. E-mail Security: Pretty good privacy -Database Security: Integrity constraints - Multi-phase commit protocols - Networks Security: Threats in networks -DS authentication -Web and Electronic Commerce: Secure socket layer - Client-side certificates - Trusted Systems :Memory protection.

Textbooks / References:

1. Stallings William, Cryptography and Network Security: Principles and Practice, 7th Edition, Pearson/Prentice- Hall, 2018.
2. Forouzan B A, Cryptography and Network Security, Special Indian Edition, Tata McGraw Hill, 2007.
3. Padmanabhan TR, Shyamala C K, and Harini N, Cryptography and Security, First Edition, Wiley India Publications, 2011.

21CSA347ARCHITECTURE AND DEPLOYMENT OF SECURE AND SCALABLE WAN L-T-P-C: 3-0-1-4

Course Objectives

- This Course provides an introduction about secure and scalable WAN,configuration of WLAN and WAN technologies.It also introduces various protocols and troubleshooting of networks using various tools.

Course Outcomes

COs	Description
CO1	Understand the design considerations for the enterprise network.
CO2	Learn to configure and troubleshoot WLAN.
CO3	Understand the operation and configuration of WAN technologies.
CO4	Learn datalink protocol like PPP, HDLC and NAT concepts.
CO5	Understand VPNs and IPsec; troubleshoot and monitor the network using various tools.

CO-PO Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	1	-	-	-
CO2	3	2	3	-	-	-	-	-	1	-
CO3	3	2	3	-	-	-	1	-	1	-
CO4	3	2	3	-	-	-	1	-	1	-
CO5	3	1	3	-	-	-	2	-	-	-
CAM	3	2	3	-	-	-	1	-	1	-

Syllabus

Unit 1: Introduction to Scaling Networks, implementing a Network Design, LAN Redundancy, Spanning Tree Concepts and protocols.

Unit 2: Link Aggregation Concepts and Configuration, Wireless LAN Concepts, operations and Security, Wireless LAN Configuration, Troubleshoot Single-Area OSPF, Multiarea OSPF

Unit 3: Operation and configuration. Hierarchical Network Design, WAN Technologies, Spanning Tree Configuration, First-Hop Redundancy Protocols, Point-to-Point Connections.

Unit 4:PPP Operation and Configuration, HDLC protocol, Troubleshoot WAN Connectivity, Frame Relay concepts and Configurations, NAT Operation & Configuration, Troubleshooting NAT

Unit 5: Tele working, Broadband Solutions, Configuring xDSL Connectivity, Securing Site-to-Site Connectivity, VPNs, Site-to-Site GRE Tunnels, IPsec, Monitoring the Network – Syslog, SNMP, Netflow, Network Troubleshooting with a Systematic Approach.

Textbooks/References:

1. Youlu Zheng and ShakilAkhtar,"Networks for Computer Scientists and Engineers".
2. Peterson & Davie, "Computer Networks, A Systems Approach", 5th Edition, Morgan Kaufmann, 2011.
3. "Scaling Networks - Course Booklet ", Cisco Press.
4. "Switched Networks - Course Booklet", Cisco Press.

21CSA348 INTRODUCTION TO BUSINESS ANALYTICS AND VISUALIZATION L-T-P-C: 3-0-1-4

Course Objectives

- To promote the ability to critically analyze and solve data-oriented real-world decision problems.
- To utilize the theories of statistics and probabilities in business analytics.
- Familiarisethe modeling techniques and best practices in visualization.

Course Outcomes

COs	Description
CO1	Apply best practices of data visualization in different stages of the data mining process.
CO2	Analyze and explore data to get useful insights for business.
CO3	Ability to choose an appropriate data analysis methodology suitable for a given business problem.
CO4	Achieve familiarity with using data analysis tools.
CO5	Apply time series analysis to real world problems.

CO-PO Mapping

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	1	2	-	-	-	1	-	1	-
CO2	2	3	1	-	-	-	-	1	-	-
CO3	2	3	1	-	-	-	-	1	-	-
CO4	1	2	3	-	-	-	1	-	2	-
CO5	2	3	1	-	-	-	-	1	2	-
CAM	2	3	1	-	-	-	1	1	2	-

Syllabus

Unit 1: Introduction to Business Analytics , Descriptive Statistics - Types of Data and its Measures, Data cleansing. Data Visualization-Design Techniques, Tables, Charts, Advanced data Visualization, Dashboards, Case Studies.

Unit 2: Inferential Analysis - Statistical Inference, Descriptive Data Mining - Clustering and Association Rules. Performance Evaluation, Overview of key Classification and prediction techniques, Case studies.

Unit 3: Introduction to Forecasting, Time Series – Level, Trend, and Seasonality, Smoothing Techniques – Moving Average and Exponential Smoothing, Determining the best forecasting model to use. Case Study.

Textbooks / References:

1. Jeffrey D. Camm, James J. Cochran, Michael J. Fry, Jeffrey W. Ohlmann, David R. Anderson, Dennis J. Sweeney, Thomas A. Williams 'Business Analytics',3/e, Cengage Learning,2019.
2. GalitShmueli, Kenneth C. Lichtendahl Jr., 'Practical Time Series Forecasting with R: A Hands-On Guide', 2/e, Axelrod Schnall Publishers, 2016.
3. Joel Grus, 'Data Science from Scratch: First Principles with Python', 2/e, O'Reilly Media, 2019.
4. Cole Nussbaumer Knaflic, 'Storytelling with Data: A Data Visualization Guide for Business Professionals', John Wiley& Sons, 2015.
5. Claus O. Wilke, "Fundamentals of Data Visualization: A primer for making informative and compelling

figures", O'Reilly, 2019.

MATHEMATICS CORES

21MAT231MATHEMATICAL FOUNDATION FOR COMPUTER SCIENCE L-T-P-C: 3-0-1-4

Course Objectives

- The primary objective of this course is to provide mathematical background and adequate experience on various topics of basic mathematics like Set Theory,Matrix,Differential calculus etc. This course will extend student's Logical ability.

Course Outcomes

COs	Description
CO1	Study and solve problems related to connectives,predicates and quantifiers under different situations.
CO2	Develop basic knowledge of matrices and to solve equations using Cramer's rule.
CO3	Understand the concept of eigen values.
CO4	Develop the knowledge about derivatives and know various applications of differentiation.
CO5	Understand the basic concepts of Mathematical reasoning, set and functions

CO-PO Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	3	-	-	-	-	3	-	-
CO2	3	2	-	-	-	-	1	-	-
CO3	3	3	-	-	-	-	2	2	-
CO4	3	3	-	-	-	-	2	2	1
CO5	3	2	-	-	-	-	1	2	1
CAM	3	3	-	-	-	-	2	2	1

Syllabus

Unit 1: Basic concepts of set theory - Mathematical logic-introduction-statements-connectives-negation, conjunction, disjunction- statement formulas and truth tables- conditional and bi-conditional statements-tautology-contradiction-equivalence of formulas-duality law-Predicates and Quantifiers, Arguments.

Unit 2: Operations on sets - power set- venn diagram Cartesian product-relations -functions- types of functions -composition of functions.

Unit 3: Matrix algebra-Introduction-Types of matrices-matrix operations- transpose of a matrix -determinant of matrix - inverse of a matrix- Cramer's rule

Unit 4: Matrix: finding rank of a matrix - normal form-echelon form-Cayley Hamilton theorem-Eigen values

Unit 5: Differential calculus - Functions and limits - Simple Differentiation of Algebraic Functions — Evaluation of First and Second Order Derivatives – Maxima and Minima

Textbooks/References:

1. P.R.Vittal-Business Mathematics and Statistics,Margham Publications,Chennai.
2. B.S.Vatsa-Discrete Mathematics –New Age International Limited Publishers,New Delhi

21MAT232	DISCRETE MATHEMATICS	L-T-P-C: 3-0-1-4

Course Objectives

- To give an insight to develop logical thinking and its application to computer science by learning Boolean algebra, number theory, counting techniques and graph theory.

Course Outcomes

COs	Description
CO1	To understand the basic concepts of Mathematical reasoning, set and functions.
CO2	To understand various counting techniques and principle of inclusion and exclusions.
CO3	Understand the concepts of various types of relations, partial ordering and equivalence relations.
CO4	Apply the concepts of generating functions to solve the recurrence relations.
CO5	Familiarise the fundamental concepts of graph theory and shortest path algorithm.

CO-PO Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	1	2	1
CO2	1	3	2	-	-	-	1	1	-
CO3	1	3	2	-	-	-	1	1	-
CO4	3	3	-	-	-	-	1	1	-
CO5	1	1	1	-	-	-	1	2	3
CAM	1	3	2	-	-	-	1	1	2

Syllabus

Unit 1: Binary operations, group, semi group,monoid, abelian group, subgroup(simple theorems without proof) Boolean algebra-definition-principle of duality-theorems.

Unit 2: Basic Counting Principles, Generating Functions, Euler's phi-function and its Application to Cryptography.

Unit 3: Relations and their properties - relation matrix, graph of a relation - types of relations -equivalence relation - n-ary relations

Unit 4: Advanced Counting Techniques: Recurrence Relations, Solving Linear Recurrence relations, Divide and Conquer Algorithms and Recurrence relations, Generating Functions, Inclusion Exclusionprinciples and their Applications.

Unit 5: Introduction to Graph Theory: Graphs, Bipartite Graphs, Eulerian and Hamiltonian Graphs, Graph Connectivity.

Textbooks/References:

1. Kenneth H. Rosen, Discrete Mathematics and its Applications, McGraw Hill.
2. R. P. Grimaldi, "Discrete and Combinatorial Mathematics", Pearson Education, Fifth Edition, 2007.
3. Thomas Koshy, "Discrete Mathematics with Applications", Academic Press, 2005.

21MAT233STATISTICAL AND NUMERICAL METHODS L-T-P-C: 3-1-0-4

Course Objectives

- The main objective of this course is to understand and implement various concepts of numerical analysis and statistics to solve real life problems.

Course Outcomes

COs	Description
CO1	Study the relationship of a dependent variable on an independent variable.
CO2	Understand the various types of probability distributions and its applications
CO3	To understand the meaning and process of differentiation
CO4	Provide numerical answers to complex problems of scientific and engineering nature.
CO5	Develop an idea of numbers, its divisibility and properties

CO-PO Mapping

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	1	2	-	-	-	-	2	-	-
CO2	2	3	-	-	-	-	2	1	-
CO3	2	2	-	-	-	-	2	-	-
CO4	2	2	-	-	-	1	1	1	-
CO5	2	2	2	-	-	-	2	2	1
CAM	2	2	2	-	-	1	2	1	1

Syllabus

Unit 1: Statistics-Introduction -Measures of average-AM-Median-Mode, Measures of dispersion and its coefficients – Range – QD – SD-MD

Unit 2 : Correlation- Karl Pearson's and Spearman's rank correlation, Regression- regression equations, regression coefficients

Unit 3: Permutations – combinations – Probability-addition theorem, multiplication theorem, independent events,conditional probability,Baye's theorem,Probability distribution-Binomial,Poisson, Normal.

Unit 4: Interpolation- Newton's forward &backward method- Lagrange's Method,Curve fitting-fitting a straight line

Unit 5: Solutions of Numerical, Algebraic and transcendental methods- bisection method, Newton Raphson method,Simultaneous linear equations -Gauss elimination

Textbooks/References:

1. P.R.Vittal-Business Mathematics and Statistics,Margham Publications,Chennai,
2. H.S.Hall and S.R.Knight: Higher Algebra –AITBS Publishers India.
3. M.K.Venkataraman: Numerical methods in Science and Engineering-National Publishing Company,Chennai

21MAT234	ALGEBRA AND NUMBER THEORY	L-T-P-C: 3-0-1-4

Course Objectives

- This course aims to introduce students the basic concept of algebra and number theory.

Course Outcomes

COs	Description
CO1	To understand inner products and compute the angle/length of a vector. To construct the orthonormal basis.
CO2	To understand the process of diagonalizing and identify Conic Sections using diagonalization.
CO3	Understand the axioms in the definition of a group through examples; to understand Subgroups/ Cyclic Groups / Factor Groups and identify them.
CO4	Apply division algorithm in Cryptography.

CO-PO Mapping

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	2	1	-
CO2	1	1	2	-	-	-	-	1	1	1
CO3	1	1	-	-	-	1	1	1	1	1
CO4	1	2	-	1	-	-	1	2	1	-
CAM	1	2	2	1	-	1	1	2	1	1

Syllabus

Unit 1: Vector Spaces, Inner Products, Angle and Orthogonality in Inner Product Spaces, Length of a Vector, Schwarz Inequality, Orthogonal Vectors, Orthogonal Complement, Orthogonal Bases: Gram-Schmidt Process. (Sec. 4.4 ,T-1)

Unit 2: Problems in Eigen Values and Eigen Vectors, Diagonalization, Orthogonal Diagonalization, Quadratic Forms, Diagonalizing Quadratic Forms, Conic Sections. (Sec. 7.1 to 7.3 and 9.5 to 9.6 ,T-3)

Unit 3: Decomposition-LU-Decompositions-The Power Method- QR method- SVD- Data Compression Using Singular Value Decomposition (Sec. 6.3 and 7.3 T2 & 9.1- 9.5 T3)

Unit 4: Definition of Groups, Basic Examples - Symmetric Groups, Matrix Groups, Groups of Rigid Motions of a Plane, Finite Groups of Motions, Subgroups, Cyclic Group and Factor Groups, Lagrange's Theorem, Normal Subgroups. Quotients of Groups, Homomorphisms, Kernal of a homomorphism, Automorphisms , Cayley's Theorem (without proof)and, Permutation Groups. (Sec. 2.1 to 2.10, T1)

Definition of Rings, Examples including Polynomial Rings, Formal Power Series Rings, Matrix Rings and Group Rings. Commutative Rings, Integral Domain, Division Ring, Characteristics of an Integral domain, Fields. (Sec. 3.1 to 3.2, T1)

Unit 5: Divisibility theory and congruences: Division algorithm, Greatest Common Divisor Euclidean algorithm, Basic properties of congruences, Binary and decimal representation of integers, Linear congruences and Chinese Remainder Theorem. (Sec 2.2- 2.5,4.2-4.4 , T4)

Fermat's Theorem and its Generalization, Fermat's Little theorem, Wilson's theorem, Euler's phi function, Euler's theorem, Properties of phi function.(Sec 5.2-5.3,7.2-7.4 ,T4).

Textbooks / References:

1. I N. Herstein, ‘Topics in Algebra’, Second Edition, John Wiley and Sons, 2000.
2. Gilbert Strang,’ Linear Algebra and its Applications, Fourth Edition, Cengage Learning, 2014 (chapter 3)
3. Howard Anton and Chris Rorres, ‘Elementary Linear Algebra’, 9th Edition, Wiley, 2005. (ch 9)
4. David M. Burton,Elementary Number Theory(7th edition),McGraw Hill Education(India)
5. John B. Fraleigh, ‘A First Course in Abstract Algebra’, Narosa Publishing House, 2003.
6. Joseph A. Gallian, ‘Contemporary Abstract Algebra’, Cengage Learning, 2013.
7. M.Artin, ‘Algebra’, Prentice Hall inc., 1994.
8. David C. Lay, Linear Algebra and its Applications, Pearson

21MAT235	FOUNDATIONS OF APPLIED MATHEMATICS - PART I	L-T-P-C: 3-0-1-4

Course Objectives

- The objective of this course is to understand and implement various mathematical principles techniques and tools to modelto solve real life problems.

Course Outcomes

COs	Description
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.

CO-PO Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-	2	1	-
CO2	3	2	3	-	-	-	2	1	-
CO3	3	2	2	-	-	-	2	2	-
CO4	3	-	-	-	-	-	2	-	-
CAM	3	2	2	-	-	-	2	1	-

Syllabus

Unit 1: Mathematical Modelling
Roadmap of the mathematics curriculum - Problem solving -Real life applications- Mathematical modeling.

Unit 2: 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 3: Algebra and Trigonometry
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 4: 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 5: Probability & 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
2. Bird, Basic Engineering Mathematics, 7th Edition, Newnes, India
3. Stewart 2015, CALCULUS: Early Transcendentals, 8th Edition, Cengage learning, India
4. Amit Saha 2015, Doing Math with python, 1st edition, No Starch Press
5. Morley 2020, Applying Math with Python, Packt Publishing

6. Gowers 2002, Mathematics: A Very Short Introduction, 1st edition, Oxford University press

Course Objectives

- The objective of this course is to understand and implement various mathematical principles techniques and tools to modelto solve real life problems in an advanced manner.

Course Outcomes

COs	Description
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

CO-PO Mapping

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-	2	1	-
CO2	3	2	3	-	-	-	2	1	-
CO3	3	2	2	-	-	-	2	2	-
CO4	3	-	-	-	-	-	2	-	-
CAM	3	2	2	-	-	-	2	1	-

Syllabus

Unit 1: 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 2: 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 3: 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 4: 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 5: 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 / References:

1. Vadakkeppatt, Ajay. Course Notes- Foundations of Applied Mathematics, 2021
2. Stewart 2015, CALCULUS: Early Transcendentals, 8thEdition, Cengage learning, India.

3. Strang 2005, Linear Algebra and its Applications, 4th Edition, Cengage Learning (RS).