SYLLABUS

SEMESTER 1

CULTURAL EDUCATION I 2002

Objectives: Love is the substratum of life and spirituality. If love is absent life becomes meaningless. In the present world if love is used as the string to connect the beads of values, life becomes precious, rare and beautiful like a fragrant blossom. Values are not to be learned alone. They have to be imbibed into the inner spirit and put into practice. This should happen at the right time when you have vitality and strength, when your hearts are open.

The present course in value education is a humble experience based effort to lead and metamorphosis the students through the process of transformation of their inner self towards achieving the best. Amma’s nectarous words of wisdom and acts of love are our guiding principles. Amma’s philosophy provides an insight into the vision of our optimistic future.

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<tr>
<th>CO1</th>
<th>Helps the students to imbibe values into their inner spirit and put it into real life practice.</th>
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<td>CO2</td>
<td>Help the students towards achieving the best through the process of transformation of their inner self</td>
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<tr>
<td>CO3</td>
<td>Provides the students an insight into the vision of optimistic future.</td>
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Syllabus:

Introduction to Indian Culture
Introduction to Amma’s life and Teachings
Symbols of Indian Culture
Science and Technology in Ancient India
Education in Ancient India
Goals of Life – Purusharthas
Introduction to Vedanta and Bhagavad Gita

Introduction to Yoga

Nature and Indian Culture

Values from Indian History

Life and work of Great Seers of India (1)

TEXTBOOKS:

1. The Glory of India (in-house publication)
2. The Mother of Sweet Bliss. (Amma’s Life & Teachings)

CO – PO Affinity Map

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COMMUNICATIVE ENGLISH  2-0-2-3

Objectives:

To help students obtain an ability to communicate fluently in English; to enable and enhance the students skills in reading, writing, listening and speaking; to impart an aesthetic sense and enhance creativity
Course Outcomes

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<th>CO1</th>
<th>Students will heighten their awareness of correct usage of English grammar in writing and speaking</th>
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<td>CO2</td>
<td>Students will attain and enhance competence in the four modes of literacy: writing, speaking, reading and listening</td>
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<td>CO3</td>
<td>Students will improve their reading fluency skills through extensive reading</td>
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Unit- I
Kinds of sentences, usage of preposition, use of adjectives, adverbs for description, Tenses, Determiners- Agreement (Subject – Verb, Pronoun- Antecedent) collocation, Phrasal Verbs, Modifiers, Linkers/ Discourse Markers, Question Tags

Unit- II
Paragraph writing – Cohesion - Development: definition, comparison, classification, contrast, cause and effect - Essay writing: Descriptive and Narrative

Unit- III
Letter Writing - Personal (congratulation, invitation, felicitation, gratitude, condolence etc.) Official (Principal / Head of the department/ College authorities, Bank Manager, Editors of newspapers and magazines)

Unit- IV
Reading Comprehension – Skimming and scanning- inference and deduction – Reading different kinds of material –Speaking: Narration of incidents / stories/ anecdotes- Current News Awareness

Unit-V
Prose: John Halt’s ‘Three Kinds of Discipline’ [Detailed]
Max Beerbohm’s ‘The Golden Drugget’ [Detailed]
Poems: Ogden Nash- ‘This is Going to Hurt Just a Little Bit’ [Detailed]


Wole Soyinka- ‘Telephone Conversation’ [Non-Detailed]

Kamala Das- ‘The Dance of the Eunuchs’[Non-Detailed]

Short Stories: Edgar Allan Poe’s ‘The Black Cat’, Ruskin Bond’s ‘The Time Stops at Shamili’ [Non-Detailed]

CORE READING:

1. Ruskin Bond, Time Stops at Shamli and Other Stories, Penguin Books India Pvt Ltd, 1989
2. Syamala, V. Speak English in Four Easy Steps, Improve English Foundation Trivandrum: 2006
5. Online sources

References:

8. Murphy, Raymond, Murphy’s English Grammar, CUP, 2004
9. Online sources

CO – PO Affinity Map

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ENVIRONMENTAL SCIENCE AND SUSTAINABILITY 3 0 0 3
Objectives: *EVS is a multidisciplinary scholastic field which efficiently considers human cooperation with the earth in light of a legitimate concern for taking care of complex issues. Ecological examinations unite the standards of the physical sciences, business/financial aspects and sociologies to take care of contemporary natural issues.*

**Course Outcomes**

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<tr>
<th>CO1</th>
<th>Understanding sustainable developments, need for environmental education, Contribution of famous personalities in Environment.</th>
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<td>Make out the abiotic and boiotic factors of environment, Understanding the importance of different types of ecosystems</td>
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<td>CO3</td>
<td>Study of bio diversity, different types of diversity in nature giving importance to India as a mega diversity nation.</td>
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<td>CO4</td>
<td>Understanding linear and cyclic resource management with more emphasis to air, water, soil resources.</td>
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<td>CO5</td>
<td>Be familiar with Environment Impact Assessment &amp; Environment Management Plan</td>
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**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


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:


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Course Objectives: *The Computer Essentials module sets out basic ideas and abilities identifying with the utilization of use of devices, computer organization, data representations, databases and data science.*

*Provide abilities to oversee PCs, gadgets, and information safely and viably.*

**COURSE OUTCOMES**

CO1: Understand the fundamental concepts of electronic communication and their use in computer applications, the basic structure and operation of a digital computer, identify the logic gates and their functionality, perform Number Conversions from one System to another System, Design basic electronic Circuits (combinational circuits), and understand the Construction of Memory.

CO2: Understand the internal organization of computers, CPU, memory unit and Input/Outputs and the relations between its main components and understand contemporary microprocessor designs and identify various design techniques employed

CO3: Understand the role of a database management system in an organization, use of Structured Query Language (SQL) and learn SQL syntax, needs of database processing and learn techniques for controlling the consequences of concurrent data access.

CO4: Understand the concept of a database transaction and related database facilities, including concurrency control, backup and recovery, locking and related protocols. Importance of modeling in the software development life, the UML notation and symbols. Identify classes/entities of data, their attributes, and relationships. Design the logical and physical structure of a relational database for efficient data storage

CO5: Understanding the flow of a data science process, and the skill sets needed to be a data scientist, significance of exploratory data analysis in data science

**SYLLABUS**

**Unit I**
Digital Fundamentals: Number Systems-Binary, Hexadecimal, Octal, Conversion, Data encoding, Operations on Binary number system, representation of positive and negative integer, compliment operations, real number system, Boolean Algebra, Logic Gates, SOP and POS – K map Simple arithmetic circuits, Combinational circuits- Sequential circuits (10 hrs)

**Unit II**

Basic Computer Organization: Registers, Instruction Formats, Types of instructions, Execution of a Complete Instruction, Bus Organization, Control Unit Organizations-Hard-wired Control, Micro programmed Control. – Input Out organizations Central processing units and different CPU organizations – Subroutines -Memory – Memory Hierarchy- Types (10 hrs)

**Unit-3**

Introduction to Database Management Systems-Database, DBMS, Why Database -File system vs DBMS, Database applications, Database users, Introduction to SQL, Data types, Classification of SQL-DDL with constraints, DML, DCL, TCL

**Unit-4**

Data representation, Data organization, Data models using UML, Types of Data, structured, unstructured, semi structured, examples of real world data, data collection techniques, data interpretation mechanisms. Data storage mechanisms, Hierarchy of storage, Characteristics of storage, Storage media, storage related technologies, online and offline storage mechanisms

**Unit 5**

Introduction to Data Science - Steps – Skills – Data – Datasets – Existing data sources – data models, Applications

**TextBook**


Objectives: This course is designed to provide complete knowledge of C language. Students learns programming constructs develop logic and create programs and applications in C.

Course Outcomes

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PROBLEM SOLVING AND PROGRAMMING IN C 3104
Syllabus

Unit 1
Problem Solving, Problem definition, Problem decomposition, Abstraction, Greedy Method, Divide and Conquer. Algorithm and Flowcharting, Name binding, Selection, Repetition.

Unit 2
Introduction to C language - structure of ‘C’ program, Programming elements(tokens) –Classes of data types –Declaration of variables, assigning values to variables, defining symbolic constants, escape sequences (backslash character constants), Operators–operator precedence and associativity, Expressions – Evaluation of expressions, type conversions(type casting). Input and Output operations – formatted and unformatted input and output–Conversion specifiers- Conditional and Control structures

Unit 3
Arrays – single dimensional arrays - declaration –memory representation– initialization and access. 2D arrays and multidimensional arrays and its applications.
Strings – defining strings, initializing, accessing, character handling functions, arithmetic operations on characters, character by character input and output, string handling functions, array of strings and its features. Structures-Definition, initializations, structures and arrays, accessing structures ,Union- declaration and initializations.

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.

Unit 5
Pointers, Definition, pointers and arrays, pointers and structures, Pre-processor directives, Files – Reading and writing files.

TEXT BOOKS:

REFERENCES:
1. “Test your C skills”, Yashavant Kanetkar,
2. “Exploring C”, Yashavant Kanetkar,

Evaluation Pattern:

Internal Assessment: 50
End Semester Examination: 50

**Internal Assessment:**

Periodical1-15 marks

Periodical2-15 marks

Continuous Assessment-20 marks (Quizzes, assignments, tutorials, viva-voce)

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**PROBLEM SOLVING AND PROGRAMMING IN C LAB**  

**Objectives:**

The purpose of this course is to introduce to students to the field of programming using C language. The students will be able to enhance their analysing and problem solving skills and use the same for writing programs in C.

**Course Outcomes**

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<td>Develop C programs that uses conditional and iterative statements, arrays, strings, functions, pointers and files</td>
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**Unit 1: Flowgorithm and Linux commands**

Operators- Arithmetic, Relational, assignment, logical, increment and decrement  
Control Statements-if, if-else, nested if  
Looping Control-while, for, do-while
Unit 2: C Programming

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
Functions – passing arguments, returning values, recursive functions, pointers as arguments
Structures & pointers

Evaluation Pattern:

Internal Assessment: 80
End Semester Examination: 20

Internal Assessment:

Periodical1-30 marks
Periodical2-30 marks
Continuous Assessment-20 marks (Quizzes, assignments, tutorials, viva-voce)

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COURSE OUTCOMES

CO1: Provide hands-on use of Microsoft Office applications Word, Excel, Access and PowerPoint. Completion of the assignments will result in MS Office applications knowledge and skills.

CO2: Understand the functional components of a computer system (processor, storage and input/output) in terms of assembly language commands. Understand the relationship between high level programming languages and machine level implementation. Understand computer architecture and its relationship to higher level machine abstractions. Also able to how to represent integers, real numbers, and character data, representation of negative numbers, storage capacity and its effect on numeric magnitude. Perform arithmetic operations on binary and hexadecimal notations. Convert numbers between decimal, binary and hexadecimal notations.

CO3: Must be able to construct simple and advanced database queries using Structured Query Language (SQL)

CO4: Understand the concept Identify Business Requirements. Entity Relationship Data Modeling, Normalization, Advanced Data Modeling Concepts, Transform a Data Model into a Functional Database. Create conceptual models of relational databases based on requirement specification documents

CO5: Understand the data storage concepts, data storage equipment's that are used to store the user / computer generated data.

SYLLABUS

Usage of Word, excel and PowerPoint

PC Assembly Data representation and operations on Binary data

SQL-Create: Table and column level constraints- Primary key, Foreign key, Null/ Not null, Unique, Default. Check, Alter, Drop, Insert, Update, Delete, Truncate, Select: using WHERE, AND, OR, IN, NOT IN

Data collection and interpretation

Data storage mechanism and tools
Objective:
Love is the substratum of life and spirituality. If love is absent life becomes meaningless. In the present world if love is used as the string to connect the beads of values, life becomes precious, rare and beautiful like a fragrant blossom. Values are not to be learned alone. They have to be imbibed into the inner spirit and put into practice. This should happen at the right time when you have vitality and strength, when your hearts are open.

The present course in value education is a humble experience based effort to lead and metamorphosis the students through the process of transformation of their inner self towards achieving the best. Amma’s nectarous words of wisdom and acts of love are our guiding principles. Amma’s philosophy provides an insight into the vision of our optimistic future.

Course Outcomes
Syllabus:

Bhagavad Gita and Life Management
Historicity of Ramayana and Mahabharata
Overview of Patanjali’s Yoga Sutras
Highlights of Indian Mythology
Indian Society: Its Strengths and Weaknesses
Role & Position of Women in Indian Society
Indian Models of Economy, Business and Management
Health and Lifestyle related issues
Conservation of cultural heritage
Life and work of Great Seers of India (2)

TEXTBOOKS:

1. The Glory of India (in- house publication)
2. Sanatana Dharma (A Compilation of Amma’s teachings on Indian Culture)

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CO2: Help the students towards achieving the best through the process of transformation of their inner self.

CO3: Provides the students an insight into the vision of optimistic future.
Objectives:

To convey and document information in a formal environment; to acquire the skill of self projection in professional circles; to inculcate critical and analytical thinking.

Course outcomes:

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<tr>
<th>CO1</th>
<th>Understand the role of communication in personal &amp; professional success.</th>
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<td>Develop awareness of appropriate communication strategies.</td>
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<td>CO3</td>
<td>Build and maintain healthy and effective relationships.</td>
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<td>CO4</td>
<td>Identify and apply strategies to improve communication especially in meetings</td>
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<td>CO5</td>
<td>Enables students to build up language and specialized abilities such as meeting, management and documentation, argumentation, conflict resolution, interpersonal and intercultural skills, professional presentations and employment starters.</td>
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Syllabus

Unit I

Vocabulary Building: Prefixes and Suffixes; One word substitutes, Modal auxiliaries, Error Analysis: Position of Adverbs, Redundancy, misplaced modifiers, Dangling modifiers – Reported Speech

Unit II

Instruction, Suggestion & Recommendation - Sounds of English: Stress, Intonation- Essay writing: Analytical and Argumentative

Unit III

Circulars, Memos – Business Letters - e-mails

Unit IV

Reports: Trip report, incident report, event report - Situational Dialogue - Group Discussion

Unit V
Listening and Reading Practice - Book Review

References

1. FelixaEskey. Tech Talk, University of Michigan. 2005

References

10. FelixaEskey. Tech Talk, University of Michigan. 2005

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STATISTICS AND PROBABILITY 3 1 0 4

Unit I
Measures of Central Tendency (Mean, Median, Mode), Measures of Dispersion (Range, Inter quartile range, Standard deviation,), skewness and kurtosis.

Unit II

Unit III
Random variables, Probability Distributions and Probability mass functions, Cumulative Distribution functions, mathematical expectation, variance, moments and moment generating function.

Unit IV

Unit-V
Two dimensional random variables-Joint, marginal and conditional probability distributions for discrete case only. Conditional mean, conditional variance, covariance and correlation. Correlation Analysis, Regression analysis, Method of least squares - Fitting a straight line.

Textbooks:

Reference books:

**Database Management System** 3003

**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. Particular course also proposed to provide the competent way of designing and maintaining database systems and optimized retrieval of data at the right time.

**Course Outcomes**

<table>
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<tr>
<th>CO1</th>
<th>Master the basic concepts of DBMS and its types. Understand the concepts of data independence and three schema architecture.</th>
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<td>CO2</td>
<td>Be familiar with the CODD's rules and E-R Model and also have clear picture about the structure of the relational databases.</td>
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<td>CO3</td>
<td>Master the concept of normalization and different types of normalization. Design normalised database objects and process the data in an optimized way.</td>
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<td>CO4</td>
<td>Be familiar with the basics of query evaluation techniques and query optimization and also to get a clear picture about transaction processing.</td>
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<td>CO5</td>
<td>Comprehend the conversion of queries into relational algebra and to construct query transactions having atomic, consistent, isolated and durable properties.</td>
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**UNIT 1**

Introduction to Data and Database. Significance of Database Management System, Various Types of DBMS. Data Independence - The Three Levels Of Architecture - The External Level - Conceptual Level - Internal Level - Client/Server Architecture- System Structure, Instance and schema.

**UNIT 2**


**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


TEXTBOOKS:


REFERENCE:

1. C.J. Date: An Introduction To Database Systems - Eighth Edition - PearsonEducation Asia


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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

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.

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.

TEXTBOOK:


REFERENCES:


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OPERATING SYSTEMS

Objectives: Fundamental concepts and designs will be covered along with the practical aspects that pertain to the most popular operating systems such as Unix/Linux and Windows, and some instructional operating systems will be studied as well.

CO1: Understand the basic concepts of operating system with different types of OS, services and system calls
CO2: Get knowledge of process management, Inter process communication and various CPU scheduling algorithms

CO3: Learn about deadlocks, methods of handling deadlocks and preventing deadlocks.

CO4: Understand the concept of memory management - paging and segmentation.

CO5: Learn about various I/O systems and mass storage structures

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.

UNIT 2

UNIT 3

UNIT 4

UNIT 5
I/O Systems: Overview, I/O Hardware
Mass storage structure- Disk structure, disk scheduling, disk management.
Case study on desktop and mobile operating system

TEXT BOOK:

REFERENCES:

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OBJECT ORIENTED PROGRAMMING USING JAVA LAB 0031

COURSE OUTCOMES

CO1: The skills to apply OOP in Java programming in problem solving.

CO2: Write a complete class definition and with in the class definition, write constructor and overloaded methods.

CO3: Conceptualize, Analyze and write programs to solve more complicated problems using the concepts of multi-threading and Exception handling.

CO4: Use Java AWT and Swing classes to build GUIs and understand how collection interface is implemented.

CO5: Demonstrate event handling in GUIs.

SYLLABUS

Input / Output statements, Manipulators, Structures, Classes, Objects, Static members and functions, Constructors and destructors, Constructor overloading, Function overloading, Forms of inheritance, Exception handling, Interfaces, Multithreading, Thread Synchronization, Collection Framework, AWT, Swing, Event Handling.
Objectives: The course is aimed at providing the skills for developing database and its various objects. Students will be able to create structured query language to manipulate data in the database. They will also be able to construct application using PL/SQL.

Course Outcomes

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<tr>
<td>CO1</td>
<td>Master the basic commands of SQL and its usage</td>
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<td>CO2</td>
<td>Design tables and insert relevant data for query manipulation</td>
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<td>CO3</td>
<td>Understand the application of SQL functions, sub queries and joins</td>
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<tr>
<td>CO4</td>
<td>Construct interactive PL/SQL programs for database applications</td>
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</table>

Syllabus

Basic SQL Commands DML- Select, insert, Delete

DDL Commands-Create, Drop, Alter

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

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

Programming with PL/SQL
TEXTBOOKS:


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SEMESTER 3

AMRITA VALUES PROGRAMME  I  1 0 0 1

Objectives: Amrita University's Amrita Values Programme (AVP) is a new initiative to give exposure to students about richness and beauty of Indian way of life. India is a country where history, culture, art, aesthetics, cuisine and nature exhibit more diversity than nearly anywhere else in the world.

Amrita Values Programmes emphasize on making students familiar with the rich tapestry of Indian life, culture, arts, science and heritage which has historically drawn people from all over the world.

Students shall have to register for any two of the following courses, one each in the third and the fourth semesters, which may be offered by the respective school during the concerned semester.

Course Outcomes:

| CO1 | To make students familiar with the rich tapestry of Indian life, culture, arts, science and heritage. |
**Syllabus: Courses offered under the framework of Amrita Values Programmes I and II**

**Insights into Indian Classical Music**
The course introduces the students into the various terminologies used in Indian musicology and their explanations, like Nadam, Sruti, Svaram – svara nomenclature, Stayi, Graha, Nyasa, Amsa, Thala, Sapta talas and their angas, Shadangas, Vadi, Samavadi, Anuvadi. The course takes the students through Carnatic as well as Hindustani classical styles.

**Insights into Traditional Indian Painting**
The course introduces traditional Indian paintings in the light of ancient Indian wisdom in the fields of aesthetics, the Shadanga (Six limbs of Indian paintings) and the contextual stories from ancient texts from where the paintings originated. The course introduces the painting styles such as Madhubani, Kerala Mural, Pahari, Cheriyal, Rajput, Tanjore etc.

**Insights into Indian Classical Dance**
The course takes the students through the ancient Indian text on aesthetics the Natyasastra and its commentary the Abhinava Bharati. The course introduces various styles of Indian classical dance such as Bharatanatyam, Mohiniyatton, Kuchipudi, Odissy, Katak etc. The course takes the students through both contextual theory as well as practice time.

**Indian Martial Arts and Self Defense**
The course introduces the students to the ancient Indian system of self-defense and the combat through various martial art forms and focuses more on traditional Kerala’s traditional Kalari Payattu. The course introduces the various exercise technique to make the body supple and flexible before going into the steps and techniques of the martial art. The advanced level of this course introduces the technique of weaponry.

**Social Awareness Campaign**
The course introduces the students into the concept of public social awareness and how to transmit the messages of social awareness through various media, both traditional and modern. The course goes through the theoretical aspects of campaign planning and execution.

**Temple Mural Arts in Kerala**
The traditional percussion ensembles in the Temples of Kerala have enthralled millions over the years. The splendor of our temples makes art enthusiast spellbound, warmth and grandeur of color combination sumptuousness of the outline, crowding of space by divine or heroic figures often with in vigorous movement are the characteristics of murals.

The mural painting specially area visual counterpart of myth, legend, gods, dirties, and demons of the theatrical world, Identical myths are popular the birth of Rama, the story of Bhīma and Hanuman, Shiva, as Kirata, and the Jealousy of Uma and ganga the mural painting in Kerala appear to be closely related to, and influenced by this theatrical activity the art historians on temple planes, wood carving and painting the architectural plane of the Kerala temples are built largely on the pan-Indians almost universal model of the vasthupurusha.

**Organic Farming in Practice**
Organic agriculture is the application of a set of cultural, biological, and mechanical practices that support the cycling of farm resources, promote ecological balance, and conserve biodiversity. These include maintaining and enhancing soil and water quality; conserving wetlands, woodlands, and wildlife; and avoiding use of synthetic fertilizers, sewage sludge, irradiation, and genetic engineering. This factsheet provides an overview of some common farming practices that ensure organic integrity and operation sustainability.

**Ayurveda for Lifestyle Modification:**
Ayurveda aims to integrate and balance the body, mind, and spirit which will ultimately leads to human happiness and health. Ayurveda offers methods for finding out early stages of diseases that are still undetectable by modern medical investigation. Ayurveda understands that health is a reflection of when a person is living in harmony with nature and disease arises when a person is out of harmony with the cycles of nature. All things in the universe (both living and non-living) are joined together in Ayurveda. This leaflet endow with some practical knowledge to rediscover our pre-industrial herbal heritage.

**Life Style and Therapy using Yoga**
Yoga therapy is the adaptation of yogic principles, methods, and techniques to specific human ailments. In its ideal application, Yoga therapy is preventive in nature, as is Yoga itself, but it is also restorative in many instances, palliative in others, and curative in many others. The therapeutic effect comes to force when we practice daily and the body starts removing toxins and the rest is done by nature.

**CO – PO Affinity Map**

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</table>
**Objectives:** Bridge the gap between a student and a student becoming an employee or an entrepreneur. Aims to provide students with the knowledge and skills to understand and participate in the modern business scenario and the world of economics so as to prepare them to achieve success in their career.

**Course outcomes**

<table>
<thead>
<tr>
<th>Course Outcome (CO)</th>
<th>Soft Skills:</th>
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<tbody>
<tr>
<td>CO1</td>
<td>At the end of the course, the students would have developed self-confidence</td>
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<td>and positive attitude necessary to compete and challenge themselves. They</td>
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<td>would also be able to analyse and manage their emotions to face real life</td>
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<td>situations.</td>
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<td>CO2</td>
<td>At the end of the course, the students shall learn to examine the context</td>
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<td>of a Group Discussion topic and develop new perspectives and ideas through</td>
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<td>brainstorming and arrive at a consensus.</td>
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<td>CO3</td>
<td>At the end of the course, the students will have the ability to prepare a</td>
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<td>suitable resume. They would also have acquired the necessary skills,</td>
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<td>abilities and knowledge to present themselves confidently. They would be</td>
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<td>sure-footed in introducing themselves and facing interviews.</td>
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<td>CO4</td>
<td>At the end of the course the students will have the ability to analyse</td>
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<td>every question asked by the interviewer, compose correct responses and</td>
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<td>respond in the right manner to justify and convince the interviewer of one’s</td>
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<td>right candidature through displaying etiquette, positive attitude and</td>
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<td>courteous communication.</td>
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</table>

**Aptitude:**
CO5 | At the end of the course, the student will have acquired the ability to analyse, understand and classify questions under arithmetic, algebra and logical reasoning and solve them employing the most suitable methods. They will be able to analyse, compare and arrive at conclusions for data analysis questions.

CO6 | At the end of the course, students will be able to interpret, critically analyse and solve logical reasoning questions. They will have acquired the skills to manage time while applying methods to solve questions on arithmetic, algebra, logical reasoning, statistics and data analysis and arrive at appropriate conclusions.

Verbal:

CO7 | At the end of the course, the students will have the ability to understand the nuances of English grammar and apply them effectively.

CO8 | At the end of the course, the students will have the ability to relate, choose, conclude and determine the usage of right vocabulary.

CO9 | At the end of the course, the students will have the ability to decide, conclude, identify and choose the right grammatical construction.

Soft skills and its importance: Pleasure and pains of transition from an academic environment to work-environment. Need for change. Fears, stress and competition in the professional world. Importance of positive attitude, self-motivation and continuous knowledge upgradation.

Self Confidence: Characteristics of the person perceived, characteristics of the situation, Characteristics of the Perceiver. Attitude, Values, Motivation, Emotion Management, Steps to like yourself, Positive Mental Attitude, Assertiveness.
Presentations: Preparations, Outlining, Hints for efficient practice, Last minute tasks, means of effective presentation, language, Gestures, Posture, Facial expressions, Professional attire.

Vocabulary building: A brief introduction into the methods and practices of learning vocabulary. Learning how to face questions on antonyms, synonyms, spelling error, analogy etc. Faulty comparison, wrong form of words and confused words like understanding the nuances of spelling changes and wrong use of words.

Listening Skills: The importance of listening in communication and how to listen actively.

Prepositions and Articles: A experiential method of learning the uses of articles and prepositions in sentences is provided.

Problem solving; Number System; LCM & HCF; Divisibility Test; Surds and Indices; Logarithms; Ratio, Proportions and Variations; Partnership; Time speed and distance; work time problems;

Data Interpretation: Numerical Data Tables; Line Graphs; Bar Charts and Pie charts; Caselet Forms; Mix Diagrams; Geometrical Diagrams and other forms of Data Representation.

Logical Reasoning: Family Tree; Linear Arrangements; Circular and Complex Arrangement; Conditionalities and Grouping; Sequencing and Scheduling; Selections; Networks; Codes; Cubes; Venn Diagram in Logical Reasoning.

**TEXTBOOKS:**

REFERENCES:

1. Quantitative Aptitude, by R S Aggarwal, S Chand Publ.
3. Data Interpretation, R S Aggarwal, S Chand Publ.
4. Nova GRE, KAPAL GRE, Barrons GRE books;
5. Quantitative Aptitude, The Institute of Chartered Accountants of India.
7. The BBC and British Council online resources
8. Owl Purdue University online teaching resources
9. www.thegrammarbook.com online teaching resources
10. www.englishpage.com online teaching resources and other useful websites.

CO – PO Affinity Map

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Objective: The course aims to make the student acquainted with general computer programming concepts like conditional execution, loops, Python programming language syntax, semantics, and the runtime environment, as well as with general coding technique. The course also helps to understand about how to handle data and to visualize data using various Python packages and tools.

Course Outcomes

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<thead>
<tr>
<th>CO1</th>
<th>Give basic knowledge about python variables, operators and data types</th>
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<tr>
<td>CO2</td>
<td>Helps to get an idea about python control structures</td>
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<td>CO3</td>
<td>To be aware of python complex data types</td>
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<td>CO4</td>
<td>Familiarize with Python files, databases and advanced python objects.</td>
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<tr>
<td>CO5</td>
<td>Get an overall idea about various python packages and GUI programming along with thorough understanding of data and its formatting.</td>
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Unit 1
Introduction to Python: Python variables, Python basic Operators, Understanding python blocks. Python Data Types, Declaring and using Numeric data types: int, float etc.

Unit 2
Python Program Flow Control Conditional blocks: if, else and else if, Simple for loops in python, For loop using ranges, string, list and dictionaries. Use of while loops in python, Loop manipulation using pass, continue, break and else. Programming using Python conditional and loop blocks.

Unit 3
Python Complex data types: Using string data type and string operations, Defining list and list slicing, Use of Tuple data type. String, List and Dictionary, Manipulations Building blocks of python programs, string manipulation methods, List manipulation. Dictionary manipulation, Programming using string, list and dictionary in-buit functions. Python Functions, Organizing python codes using functions.

Unit 4
Advanced Python Objects, map(),Advanced Python Lambda and List Comprehensions, Advanced Python Demonstration: The Numerical Python Library (NumPy), The Series Data Structure, Querying a Series, The DataFrame Data Structure, DataFrame Indexing and Loading, Querying a DataFrame, Indexing Dataframes, Missing Values.
Unit 5

Understanding the Python Packages for Data Science- SciKit Learn, MatPlotLib, Importing and Exporting Data in Python, Getting Started Analyzing Data in Python, Understanding the Data, Dealing with Missing Values in Python, Data Formatting in Python

Text Book/References

CO – PO Affinity Map

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OBJECTIVES: This course is intended to introduce abstract concepts and shows how those concepts are useful in problem solving, and then shows how the abstractions can be made concrete by using a programming language. The course aims to provide an understanding about different data structures and relevant standard algorithms for them. Equal emphasis is placed on both the abstract and the concrete versions of a concept. The only prerequisite for students is an understanding in programming.

Course Outcomes

<table>
<thead>
<tr>
<th>CO1</th>
<th>Student will be able to understand the basic pseudocode conventions and methods of analysing algorithms</th>
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<tbody>
<tr>
<td>CO2</td>
<td>Learn the working of various searching and sorting algorithms</td>
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<tr>
<td>CO3</td>
<td>Able to develop applications using suitable data structures</td>
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<tr>
<td>CO4</td>
<td>Understand the tree and tree traversal concepts</td>
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<tr>
<td>CO5</td>
<td>Gives an idea about graphs and finding shortest path</td>
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</tbody>
</table>

Unit 1. Algorithm Analysis

Basic mathematical review, RAM model of computation, Pseudocode conventions, Worst case, Average case and Best case analysis, Asymptotic Analysis, Back Substitution Method, masters method, Euclid's algorithm, Exponentiation.

Unit 2: Searching and Sorting

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

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

Basic concepts of trees, Implementation of trees, Traversal, Binary tree, Expression tree, Binary search tree, AVL tree, Heaps.
Unit 5. Graphs

Adjacency matrix, Adjacency list, BFS, DFS, MST, PRIMS and KRUSKAL’S, DIJKSTRA’S algorithm


DATA STRUCTURES AND ALGORITHMS LAB-I  0 0 3 1

Objectives: The course is designed to develop skills to design and analyse simple linear and non-linear data structures and compare the performance of different algorithms for same problem. It strengthen the ability to the students to identify and apply the suitable data structure for the given real world problem.

Course Outcomes

<table>
<thead>
<tr>
<th>CO1</th>
<th>Student will be able to implement various sorting algorithms</th>
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<tbody>
<tr>
<td>CO2</td>
<td>Learn to apply array, Linked list, stack and queue concepts to solve real world problems</td>
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<tr>
<td>CO3</td>
<td>Learn to implement binary search trees, traversal algorithms and various operations</td>
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<tr>
<td>CO4</td>
<td>Understand graph and traversal algorithms</td>
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Syllabus

Topic 1: Sorting – Searching
1. Write a program to implement Bubble Sort.
2. Write a program to implement selection sort.
3. Write a program to implement Quick Sort.
4. Write a program to implement Insertion Sort.
5. Write a program to implement Merge Sort.
6. Write a program to implement Binary Search.
**Topic 2: Arrays – Stacks - Recursion**

7. Write and test a function that transposes a square matrix.
8. Write and test a recursive function that prints all the permutations of the first n characters of a string.
9. Write and test a recursive function that returns the power $x^n$.
10. Write a program to implement a stack of strings (illustrate the operations push(), pop(), size(), empty() and top()).
11. Write a program to show the linked implementation of the Stack class.
12. Write a program to covert infix to postfix.
13. Write a program to implement Towers of Hanoi using Stack.

**Queues - Linked-Lists**

14. Write a program to implement a linear list and perform the operation such as insert(), search() and delete().
15. Write a program to implement a queue by adding the functions such as
   (i) Determine the size
   (ii) input queue
   (iii) output a queue
   (iv) split a queue into two queues
16. Write a program to search a circular linked list with a header node.

**Topic 3: Binary Trees - Binary Tree Traversal**

17. Write a program to implement Binary Search Tree.
18. Priority queue implementation.
19. Write a program to create a binary tree and find the height of a binary tree.
20. Write a program to perform the binary tree traversals.
21. Write a program to perform a deletion from a Binary Tree (using a delete() function).

**Topic 4: Graphs**

20. Matrix representation of graphs
21. DFS traversal
22. BFS traversal
COURSE OBJECTIVES:

This course studies the standard models for the layered approach to communication between autonomous machines in a network, and the main characteristics of data transmission across various physical link types. It considers how to design networks and protocols for diverse situations, analyses several protocols, and identifies significant problem areas in networked communications.

COURSE OUTCOMES

CO1: Understand the basic network concepts, including the structure and operation of the different types of networks

CO2: Must be able to understand the design of different networks and related reference models used.

CO3: Comprehend the basic working principles behind switching techniques used in communication channels.

CO4: Familiarize the routing techniques and congestion control mechanisms used in Routers. Must be able to understand and successfully apply routing algorithms for optimization.

CO5: Must be able to understand, how is the end-to-end connection mechanism works at the transport layer.

SYLLABUS

Unit 1:- Introduction to Computer Networks

Introduction To Computer Networks: Introduction: Definition of a Computer Network; Components of a computer network; Classification of networks; Transmission Medium; Wireless transmission; Local area networks, Metropolitan area networks, Wide area networks, Wireless networks ; Data transmission modes;

Unit 2:- Layered architecture

Unit 3: Physical layer

Physical Layer: Network topologies; Switching; Circuit switching, Message switching, Packet switching, Relationship between Packet Size and Transmission time, Comparison of switching techniques: Multiplexing; FDM, WDM, TDM

Unit 4: Network Layer

Network Layer: Design issues of Network layer; Nature of the service provided, Routing, Congestion control, Types of routing algorithms, Classes of routing algorithms, Properties of routing algorithms, Optimality principle: Routing algorithms; Shortest path algorithm, Flooding, Distance vector routing, Hierarchical routing, Link state routing, Factors of congestion, Comparison of flow control and congestion control, General principles of congestion control

Unit 5: Transport Layer

Transport Layer: Services of Transport layer; Service primitives: Connection establishment: Connection Release: Transport Protocols;

Text Books:


Reference text books:

2. Computer Networks top down approach by Mc graw hill: Forouzan
3. Computer Networks top down approach by pearson: James F Kurose

CO – PO Affinity Map

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Objectives: To familiarize students with the spreadsheet data presentation and analysis features using graphs and charts. Also performing qualitative data analysis using functions like IF, data sort and filter. This course also aims in performing conditional formatting and using pivot tables for qualitative data analysis. Finally it covers how to develop macros and perform inferential statistics of data using Chi-square, z-test and ANOVA.

Course Outcomes

<table>
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<th>CO1</th>
<th>Presentation and Analysis of quantitative data using graphs and charts.</th>
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<td>Presentation of Qualitative data using IF, data sort and filter.</td>
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<td>CO3</td>
<td>Perform conditional formatting using autosum, vlookup, hlookup, math functions.</td>
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<td>Analysis of qualitative data using pivot table and charts.</td>
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<tr>
<td>CO5</td>
<td>Develop macros and perform inferential statistics of data using Chi-square, z-test and ANOVA.</td>
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Syllabus:

Presentation of quantitative data: Data Visualization – types of graphs and charts

Analysis of quantitative data – Descriptive Statistics

Presentation of qualitative data: Preparation, Data Conversion using IF, Data conversion from non-excel sources, Data Queries with sort, filter and advanced filter

Conditional formatting, format as table, autosum, fill, Vlookup, Hlookup, Math functions, Name manager, Group and Ungroup data

Analysis of qualitative data – Dealing with errors - Trace, Pivot reports – Pivot table and charts

Data Validation, Macros

Inferential statistics of data – Chi-square test, z-test, t-test, confidence intervals for sample statistics, ANOVA
Amrita University’s Amrita Values Programme (AVP) is a new initiative to give exposure to students about richness and beauty of Indian way of life. India is a country where history, culture, art, aesthetics, cuisine and nature exhibit more diversity than nearly anywhere else in the world.

Amrita Values Programmes emphasize on making students familiar with the rich tapestry of Indian life, culture, arts, science and heritage which has historically drawn people from all over the world.

Students shall have to register for any two of the following courses, one each in the third and the fourth semesters, which may be offered by the respective school during the concerned semester.

**Courses offered under the framework of Amrita Values Programmes I and II**

**Insights into Indian Classical Music**

The course introduces the students into the various terminologies used in Indian musicology and their explanations, like Nadam, Sruti, Svaram – svara nomenclature, Stayi, Graha, Nyasa, Amsa, Thala,- Sapta talas and their angas, Shadangas, Vadi, Samavadi, Anuvadi. The course takes the students through Carnatic as well as Hindustani classical styles.

**Insights into Traditional Indian Painting**
The course introduces traditional Indian paintings in the light of ancient Indian wisdom in the fields of aesthetics, the Shadanga (Sixs limbs of Indian paintings) and the contextual stories from ancient texts from where the paintings originated. The course introduces the painting styles such as Madhubani, Kerala Mural, Pahari, Cheriyal, Rajput, Tanjore etc.

**Insights into Indian Classical Dance**

The course takes the students through the ancient Indian text on aesthetics the Natyasastra and its commentary the Abhinava Bharati. The course introduces various styles of Indian classical dance such as Bharatanatyam, Mohiniyattam, Kuchipudi, Odissi, Katak etc. The course takes the students through both contextual theory as well as practice time.

**Indian Martial Arts and Self Defense**

The course introduces the students to the ancient Indian system of self-defense and the combat through various martial art forms and focuses more on traditional Kerala’s traditional Kalari Payattu. The course introduces the various exercise technique to make the body supple and flexible before going into the steps and techniques of the martial art. The advanced level of this course introduces the technique of weaponry.

**Social Awareness Campaign**

The course introduces the students into the concept of public social awareness and how to transmit the messages of social awareness through various media, both traditional and modern. The course goes through the theoretical aspects of campaign planning and execution.

**Temple Mural Arts in Kerala**

The traditional percussion ensembles in the Temples of Kerala have enthralled millions over the years. The splendor of our temples makes art enthusiast spellbound, warmth and grandeur of color combination sumptuousness of the outline, crowding of space by divine or heroic figures often with in vigorous movement are the characteristics of murals.

The mural painting specially area visual counterpart of myth, legend, gods, diries, and demons of the theatrical world, Identical myths are popular the birth of Rama, the story of Bhima and Hanuman, Shiva, as Kirata, and the Jealousy of Uma and ganga the mural painting in Kerala appear to be closely related to, and influenced by this theatrical activity the art historians on temple planes, wood carving and painting the architectural plane of the Kerala temples are built largely on the pan-Indians almost universal model of the vasthupurusha.

**Organic Farming in Practice**

Organic agriculture is the application of a set of cultural, biological, and mechanical practices that support the cycling of farm resources, promote ecological balance, and conserve biodiversity. These include maintaining and enhancing soil and water quality; conserving wetlands, woodlands, and wildlife; and avoiding use of synthetic fertilizers, sewage sludge, irradiation, and genetic engineering. This factsheet provides an overview of some common farming practices that ensure organic integrity and operation sustainability.
Ayurveda for Lifestyle Modification:

Ayurveda aims to integrate and balance the body, mind, and spirit which will ultimately leads to human happiness and health. Ayurveda offers methods for finding out early stages of diseases that are still undetectable by modern medical investigation. Ayurveda understands that health is a reflection of when a person is living in harmony with nature and disease arises when a person is out of harmony with the cycles of nature. All things in the universe (both living and non-living) are joined together in Ayurveda. This leaflet endow with some practical knowledge to rediscover our pre-industrial herbal heritage.

Life Style and Therapy using Yoga

Yoga therapy is the adaptation of yogic principles, methods, and techniques to specific human ailments. In its ideal application, Yoga therapy is preventive in nature, as is Yoga itself, but it is also restorative in many instances, palliative in others, and curative in many others. The therapeutic effect comes to force when we practice daily and the body starts removing toxins and the rest is done by nature.

Group Discussions: Advantages of Group Discussions, Structured GD – Roles, Negative roles to be avoided, Personality traits to do well in a GD, Initiation techniques, How to perform in a group discussion, Summarization techniques.

**Listening Comprehension advanced:** Exercise on improving listening skills, Grammar basics: Topics like clauses, punctuation, capitalization, number agreement, pronouns, tenses etc.

Reading Comprehension advanced: A course on how to approach middle level reading comprehension passages.

Problem solving – Money Related problems; Mixtures; Symbol Based problems; Clocks and Calendars; Simple, Linear, Quadratic and Polynomial Equations; Special Equations; Inequalities; Functions and Graphs; Sequence and Series; Set Theory; Permutations and Combinations; Probability; Statistics.

Data Sufficiency: Concepts and Problem Solving.

Non-Verbal Reasoning and Simple Engineering Aptitude: Mirror Image; Water Image; Paper Folding; Paper Cutting; Grouping Of Figures; Figure Formation and Analysis; Completion of Incomplete Pattern; Figure Matrix; Miscellaneous.

Special Aptitude: Cloth, Leather, 2D and 3D Objects, Coin, Match Sticks, Stubs, Chalk, Chess Board, Land and geodesic problems etc., Related Problems

**TEXTBOOKS:**

**REFERENCES:**
1. Quantitative Aptitude, by R S Aggarwal, S Chand Publ.
5. The BBC and British Council online resources
6. Owl Purdue University online teaching resources
7. www.thesgrammarbook.com online teaching resources
8. www.englishpage.com online teaching resources and other useful websites.
COURSE OBJECTIVE

CO1: To understand data mining process and the resulting patterns, types of data, attributes and knowledge discovery process

CO2: To study the different data preprocessing techniques before applying the data mining process

CO3: To characterize the kinds of patterns that can be discovered by association rule mining

CO4: To learn the different prediction, classification and clustering algorithms

CO5: To categorize and carefully differentiate between situations for applying different data-mining techniques for different applications

Unit 1

Introduction: Introduction to Data Mining-Types of Data and Patterns Mined- Technologies-Applications-Major Issues in Data Mining. Introduction to Data Warehousing: Basic Concepts and Techniques

Unit 2

Knowing about Data-Data Preprocessing: Cleaning– Integration–Reduction–Data Transformation and Discretization

Unit 3

Mining Frequent Patterns: Basic Concept – Frequent Item Set Mining Methods -Apriori and FP Growth algorithms -Mining Association Rules

Unit 4

Classification and Predication: Issues – Algorithms- Decision Tree Induction - Bayesian Classification –k Nearest Neighbor - Prediction - Accuracy- Precision and Recall

Unit 5

Clustering: Overview of Clustering – Types of Data in Cluster Analysis – K Means and K Medoid, Hierarchical Clustering Algorithms

TEXTBOOKS / REFERENCES:
1. Jiawei Han, Micheline Kamber and Jian Pei, “Data Mining Concepts and Techniques”, Third Edition, Elsevier Publisher, 2006.

CO – PO Affinity Map

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R Programming for Data Sciences  

Preamble

Data Science with R gives a student necessary skill to apply the R programming language through practical examples in order to extract valuable knowledge from data. The goal of this course is to help the student learn the most important tools in R programming language that will allow him/her to practice data science.

Course Outcomes

CO-01: Learn the basic syntax of R programming language
CO-02: Pre-process raw data in R for further analysis.
CO-03: Conduct exploratory data analysis using R
CO-04: Create insightful visualizations to identify patterns from data.
CO-05: Use statistical estimates to make meaningful predictions from data.

Syllabus

Unit 1
Introduction to data science, Knowledge discovery in databases, The Data Science Process - data collection, pre-processing, transformation and modeling, data mining, interpretation and evaluation.

The R Programming Language- Basic concepts, definitions and notations, R as a calculator, Identifiers, constants, R data types, R- Objects: Vectors, Lists, Matrices, Arrays, Factors, Data Frames; Atomic and Recursive Variables, R-Operators.

Unit 2

Conditional statements and Control structures, Looping constructs and Loop control statements.

Function in R Programming- Components of a Function, Built in and user defined Functions, Vector and Matrix manipulation functions, R-strings and string manipulation functions.

Unit 3

Scoping rules in R, Package in R- Installing and Loading Packages in R, using help, access functions from packages.

Getting Data In and Out of R - Importing data from excel, Working with data from files, importing larger Data Sets, loading data from databases, Working with structured and unstructured data, Reading from URL, Storing data using R functions.

Unit 4


R for managing data-Data cleansing, Treating missing values, data transformations, sampling data for modeling- test and training splits, creating sample groups, Data reduction.

Unit 5

R for Basic Statistics- Descriptive Statistics: arithmetic mean, median, Measure of dispersion - Minimum and Maximum values, quantiles, percentiles, IQR, standard deviation, variance.

Linear regression – using linear and logistic regression and making predictions. Characterizing prediction quality. Using correlation to find relations between variables –Pearson, Kendall and Spearman tests.

Lab:
1. Basic Programming assignments to understand the R Syntax, R – objects conditional and loops.
2. Use R functions and packages to extend the R programming environment.
3. Data analysis case study: loading and processing data, visually inspecting and analyzing using statistical estimates.

**Text Books:**
2. Practical Data Science with R, Nina Zumel and John Mount, Dreamtech/Manning, 2014

**References:**
1. “R for Data Science”, Hadley Wickham and Garett Grolemund, , O’Reilly, 2017

**CO – PO Affinity Map**

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**SOFTWARE ENGINEERING** 2103

**Objectives**  To provide foundation in software engineering principles and techniques required for development of best applications with varied domains. To impart required software development skills for the students to adapt to readily changing environments using the appropriate theory, principles and processes
**Course Outcomes:**

CO1: Learn to apply the knowledge of software engineering methodologies to identify, formulate, and solve software engineering problems.

CO2: Understand the ability to analyse the complex system by applying analytical, engineering and knowledge-based techniques to clearly understand the requirements.

CO3: an ability to design a system, component, or process to meet desired needs within realistic constraints relevant to the system

CO4: an ability to implement, verify, validate, test and maintain software systems developed using modern techniques, skills and engineering tools.

CO5: an ability to function on multi-disciplinary teams with an understanding of professional and ethical responsibility to create solutions for significant application domains.

**Unit 1**


**Unit 2**


**Unit 3**


**Text books:**


Reference book:


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WEB TECHNOLOGIES 3034

Course Outcomes

CO-01: Learn the basic web programming technologies
CO-02: Equip with latest web development tools
CO-03: Understand the industrial standards with frameworks
CO-04: Create a full fledged CRUD web application on their own.
CO-05: Learn scripting skills with PHP

Unit -1 : Web Development Basics
Web History; Client-Server ; Browser-Web Server; W3 Consortium;
HTML5 and CSS3
HTML5- Basic Tags, Tables, Forms, Input tag, 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 : Client side scripting : JavaScript
Introduction to JavaScript, internal and external Java script files, variables, control statements, loops, Arrays, string handling, functions in JavaScript, Form Handling, Input Validation, Regular Expression, Event Handling
DOM concept, creating html elements using java script. Drawing 2D shapes. Introduction to AJAX

Unit-3 : JavaScript Framework
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 - PHP
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 : XML & JSON
Introduction to XML, usage of XML, XML tags, elements and attributes, attribute type, XML validation: DTD and XSD, XML DOM ; XML & PHP; JSON.
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Textbook/Reference:
The Complete Reference, HTML and CSS by Thomas A Powell latest edition
XML Bible by Horold, Ellotte Rusty
Web Reference: W3Schools.com

DATA MINING AND APPLICATIONS Lab 0-0-3-

(In Python) and Use Kaggle
Using Pandas Data frames
Visualization and plots - seaborn
Data Preparation – Cleaning – Missing data, Data Reduction – PCA, Data Transformation – Normalization, Binning, distance measures, similarity
Association mining
Regression – Linear
Naïve Bayes Classifier, Decision tree, KNN
KMeans, Hierarchical clustering

Case study based seminar 1 0 0- 1

Preamble:
The case-study based seminar course constitute a form of experiential learning which promotes critical thinking, learning, and participation among students, especially in terms of the ability to view an issue from multiple perspectives and to grasp the practical application of core course concepts. Through guided discussions, each student will be able to expand his/her understanding of how different kinds of problems are approached and solved in the field of data science.
Course Objectives:

CO-01: Understand current applications, practices and challenges in the field of data science.

CO-02: Form connections between specific academic topics and real-world problems and applications.

CO-03: Help the student to conduct thorough literature review on the problem domain which facilitate interdisciplinary learning.

CO-04: Refine analytical, presentation and leadership skills as demonstrated by written and oral communications.

CO-05: Reinforce active listening skills, as demonstrated by response to and further development of ideas presented by classmates.

Course Syllabus

Unit 1
Research Process, Quantitative vs. Qualitative Approaches to Research, Exploratory vs. Confirmatory Research, Experimental vs Theoretical Research. Introduction to Case study research. Designing CSR.

Unit 2
Conducting Literature Review, Referencing, Information Sources, Information Retrieval, Role of libraries in Information Retrieval, Tools for identifying literatures, Indexing and abstracting services, Citation indexes

Unit 3
Experimental Research: Cause effect relationship, Development of Hypothesis, Data collection, Numerical and Graphical Data Analysis: Sampling, Observation, Surveys, Inferential Statistics, and Interpretation of Results.

Unit 4
Preparation of Dissertation and Research Papers, Guidelines for writing the abstract, introduction, methodology, results and discussion, conclusion. References, Citation and listing
system of documents, Intellectual property rights (IPR), Ethics of Research- Scientific Misconduct- Plagiarism

Unit 5

Selection of a case study research work for critical analysis. (The case study work may be a book, 3 – 5 articles, a dissertation, or technical report on a topic of interest.)

Case study proposal: A description of the case study and reasons/rationale for the choice. Briefly summarize the case study research and explain why it was selected for analysis.

Critical Review: Identify the conceptual, methodological, and other relevant criteria used in the study research; and identify the “lessons learned,” through the analysis of this case study research, for own research design.

Presentation: Talk on the case study to the class that addresses key learnings or findings, significant dilemmas or issues of interest, and/or other points. The purpose of the talk/presentation is to share one’s work with others and deepen our understanding of case study research methods.

Paper submission: to propose a case study research project of their own. The paper should describe the phenomenon under investigation, the theoretical background in which this study will be grounded, and the key questions to be investigated.

Text Books:


References


CO – PO Affinity Map
Semester 5

LIFE SKILLS III  1 0 2 2


Facing an Interview: Foundation in core subject, Industry Orientation/ Knowledge about the company, Professional Personality, Communication Skills, activities before interview, upon entering interview room, during the interview and at the end. Mock interviews.

Advanced Grammar: Topics like parallel construction, dangling modifiers, active and passive voices, etc.

Syllogisms, Critical reasoning: A course on verbal reasoning. Listening Comprehension advanced: An exercise on improving listening skills.

Reading Comprehension advanced: A course on how to approach advanced level of reading, comprehension passages. Exercises on competitive exam questions.

Specific Training: Solving campus recruitment papers, National level and state level competitive examination papers; Speed mathematics; Tackling aptitude problems asked in interview; Techniques to remember (In Mathematics). Lateral Thinking problems. Quick checking of answers techniques; Techniques on elimination of options, Estimating and predicting correct answer; Time management in aptitude tests; Test taking strategies.

TEXTBOOKS:
4. The Hard Truth about Soft Skills, by Amazon Publication.

REFERENCES:
1. Speed Mathematics, Secrets of Lightning Mental Calculations, by Bill Handley, Master Mind books;
2. The Trachtenberg Speed System of Basic Mathematics, Rupa & Co., Publishers;
5. Quick Arithmetics, by Ashish Agarwal, S Chand Publ.;
8. The BBC and British Council online resources
9. Owl Purdue University online teaching resources
10. www.grammarbook.com online teaching resources
11. www.englishpage.com online teaching resources and other useful websites.

ARTIFICIAL INTELLIGENCE
3003

CO1: Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations.

CO2: Understand basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning

CO3: Demonstrate awareness and a fundamental understanding of various applications of AI techniques in intelligent systems

CO4: Explore the current scope, potential, limitations, and implications of intelligent systems.

CO5: Understand the various searching techniques, constraint satisfaction problem and example problems- game playing techniques.

CO6: Experiment with an AI model for simulation and analysis.

Unit 1

Unit 2


Unit 3


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


TEXTBOOKS:

REFERENCES:
4. Introduction to Artificial Intelligence – Eugene Charnaik, Drew McDermott (Pearson Education Asia)

CO – PO Affinity Map
MACHINE LEARNING 3-0-0-3

CO1: Have a good understanding of the fundamental ideas of machine learning: data, model selection, model complexity, etc.

CO2: Understand the strengths and weaknesses of many popular machine learning approaches.

CO3: Appreciate the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and un-supervised learning.

CO4: Be able to design and implement various machine learning algorithms in a range of real-world applications.

CO5: Develop the ability to evaluate and interpret the results of the algorithms

CO6: Ability to recognize and implement various ways of selecting suitable model parameters for different machine learning techniques.

Unit 1

Introduction to Machine learning: Supervised learning, Unsupervised learning, some basic concepts in machine learning, Review of probability,

The log-sum-exp trick, Feature selection using mutual information, Linear Regression

Unit 2

Computational Learning theory- Sample complexity, ε- exhausted version space, PAC learning, agnostic learner, VC dimensions, Sample complexity.

Bayesian Learning, curse of dimensionality, over fitting.

Parametric Estimators - estimator bias and variance, active learning

Unit 3
Dimensionality reduction, Clustering – choosing the number of clusters, Spectral clustering, Evaluating cluster quality. Margin and generalization (EM) algorithm, EM, regularization

Unit 4

Non-parametric methods – KNN

Linear discrimination - Support vector machine (SVM) and kernels,

Classification errors, regularization, logistic regression,

Unit 5


TEXTBOOKS:


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CLOUD COMPUTING 3-0-0-3

COURSE OUTCOMES
CO1: Understand the fundamental ideas behind cloud computing and different types of cloud services – Delivery models, Deployment models
CO2: Learn the virtualization and its role in cloud computing
CO3: Learn different features of containers and their orchestration in cloud
CO4: Learn storage technologies, networking, application development and deployment in the cloud
CO5: Understand the role of cloud computing in IoT, Bigdata and machine learning domains

SYLLABUS

UNIT 1

UNIT 2

UNIT 3
Containers, Docker Architecture, Docker Engine, Docker Images, Docker Hub, Kubernetes,

UNIT 4
Storage options in cloud, Cloud SQL, Application development and deployment in cloud, Cloud API,

UNIT 5
Monitoring and load balancing, Cloud Networking, Cloud in machine learning, bigdata analytics and IoT

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CLOUD COMPUTING LAB 0 0 3 1

COURSE OUTCOMES
CO1: Familiarize widely used cloud platforms
CO2: Create and configure virtual machines
CO3: Learn how to create containers and its orchestration
CO4: Development, deployment and monitoring of cloud applications
CO5: Understand the storage and networking options in cloud

SYLLABUS
Create accounts in AWS and Google cloud, Explore the various services offered by Amazon and Google, Virtualization concept in Virtualbox, Create and configure Virtual machine, Host a web server in the virtual machine, Create containers using docker, Kubernetes and orcherstation of containers, Structured and unstructured storage in the cloud, CloudSQL, Application development and deployment in cloud. Load balancing and monitoring of cloud applications. Various networking options in cloud, Case study - private cloud setup using openstack

REFERENCES:
2. https://sites.google.com/google.com/gcp-teachingresources/home?pli=1&authuser=1

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MACHINE LEARNING LAB

Logistic regression, Estimation, Dimensionality reduction
Evaluation measures
- Supervised Learning
  - Find-s algorithm
  - Candidate elimination algorithm- algorithm implementation
  - Naïve Bayes algorithm- algorithm implementation
  - Decision tree algorithm
Nearest Neighbor algorithm - algorithm implementation
SVM algorithm - using simulation tool

- Unsupervised Learning
  - K means algorithm - algorithm implementation
  - EM algorithm
  - HMM
- Instance based learning
  - Locally weighted regression algorithm

MIOR PROJECT 4 Credits

Preamble:
Data Scientists, employ techniques and theories drawn from many fields within the broad areas of mathematics, statistics, information science, and computer science, in particular from the subdomains of machine learning, classification, cluster analysis, data mining, databases, and visualization to derive actionable insights and help meet specific business needs and goals. The goal of this Minor Project course is to help the student apply the theories and important tools they studied in this program to practice data science and mobilize the students for the next semester Major Project course.

Course Objectives:

CO-01: Provide opportunities to identify real world problems.

CO-02: Conduct thorough literature review on the problem domain.

CO-03: Specialize data science methods, applications and tools.

CO-04: Demonstrate independence and originality in thought and application.

CO-05: Provide opportunity to work as a team and evaluate the developed product/algorithm both from individuals’ and teams’ perspective.
CO – PO Affinity Map

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Semester 6

BIG DATA ANALYTICS AND VISUALIZATION 3-0-0-3

COURSE OUTCOMES

CO1: Understand the basic concepts in Big Data Analytics and gain the ability to choose the right solution for a task involving big data, including databases, architectures and cloud services.

CO2: Understand the different methods to analyze and visualize the big data.

CO3: Develop the skillset to build effective solutions for Big Data issues using Hadoop and its Eco-System.

CO4: Get insights into different data visualization techniques and standard tools.

CO5: Understanding of real life issues faced by different organizations and its effective solutions through case studies.

UNIT 1

Introduction to Big Data, Types of Digital Data, Characteristics of Big Data, Evolution of Big Data, Definition of Big Data, Data Appliance, Challenges with Big Data, Big data sources, Best practices in Big Data Analytics, Introduction to Data Modelling

UNIT 2

Introduction to elementary data analysis: Measures of center: Mean, Median, Mode, Variance, Standard deviation, Range, Normal Distribution : Center, Spread, Skewed Left, Skewed Right, Outlier, Correlation Patterns, Magnitude and Direction in relationship, Introduction to Bayesian Model

UNIT 3
History of Visualization, Goals of Visualization, Types of Data Visualization: Scientific Visualization, Information Visualization, Visual Analytics, Impact of visualization, Big Data Visualization Tools: Tableau, Google Chart

UNIT 4

Introduction to Big Data Processing and Apache Hadoop, Installation and Configuration of Hadoop in Ubuntu, HDFS Concepts, MapReduce Framework, Anatomy of a Map Reduce Job Run, Job Scheduling, Shuffle and Sort, Task Execution

UNIT 5

Introduction to Hadoop Eco System, Apache Hive, Apache Mahout, Apache Pig, Case studies: Analyzing big data with twitter, Big data for Ecommerce, Big data for blogs.

TEXTBOOKS:


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BIG DATA ANALYTICS AND VISUALIZATION LAB

0-0-3-1

COURSE OUTCOMES

CO1: Get familiar with standard tools and frameworks used in the analysis and visualization of Big Data

CO2: Acquire a clear understanding of the architectural concepts of Hadoop and MapReduce paradigm

CO3: Learn the Java concepts required for developing MapReduce programs

CO4: Get familiar with the usage and applications of programming tools PIG&HIVE in Hadoop echo system

CO5:  Learn how to effectively use the data visualization tools Tableau/Google Chart

SYLLABUS

Installation and Configuration of Hadoop in two operating modes (Pseudo distributed & Fully distributed), Use web based tools to monitor the Hadoop setup, Perform the different file management tasks in HDFS, Run a basic WordCount program to understand MapReduce paradigm, Stop word elimination using MapReduce, Mining of large dataset to find the average, max and min values using MapReduce, TeraSort benchmark comparison for YARN, Setting up Hadoop cluster in AWS, Install PIG on Hadoop and write Pig Latin scripts to sort, group, join, project and filter your data, Install Hive on Hadoop and use it to create, alter and drop databases, tables, views, functions and indexes, Use Tableau/Google chart to visualize a dataset of your choice.

REFERENCES:


5. https://www.tableau.com/

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BIG DATA ANALYTICS LAB 0 0 2 1

Hadoop Installation, Single entry mode, configuration, setting up Name Node and Data Node, executing sample Program
Map Reduce introduction, Word Count, Number sum and Tera Sort program execution and performance analysis
Real time data handling in Hadoop, with cluster performance monitoring with Ganglia.
Hadoop configuration with Hive and data processing, Integrating R with Hadoop and visualizing Large data sets.

Major Project (Optionally leading to Paper Publication) 10 credits

Preamble:

Data Scientists, employ techniques and theories drawn from many fields within the broad areas of mathematics, statistics, information science, and computer science, in particular from the subdomains of machine learning, classification, cluster analysis, data mining, databases, and visualization to derive actionable insights and help meet specific business needs and goals. The goal of this Major Project course is to help the student experienced in industrial/research projects by applying the skills they acquired by the different courses in this program, to solve real world problems.

Course Objectives:

CO-01: Apply the skills a student acquired through the different courses in this program to design software solutions for real world problems.

CO-02: To expose the student to the industry-standard project practices, under time and deliverable constraints.

CO-03: Provide opportunity to work as a team and evaluate the developed product/algorithm both from individual’s and team’s perspective.
CO-04: Train the student to write and publish research papers.

CO-05: Demonstrate independence and originality in thought and application and communicate among software professionals to demonstrate the knowledge and principles.

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**Electives**

**TIME SERIES ANALYSIS 3 0 0 3**

**COURSE OUTCOMES**

CO1  To get introduced to the overview of time series analysis and importance of its properties.

CO2  Describe the regression, type and importance of regression and role of model selection in time serious analysis.

CO3  Explain about the covariance and prediction about time serious data and its models.

CO4  Classify different types of spectral representation and estimation of time serious analysis.

CO5  Overview about multivariate and spatial time serious and its higher applications.

Unit: 1
Overview - signal vs noise, graphics; Stationary processes-ensemble, random walk vs trend, periodicity, linear process; Estimators-mean, ACF, PACF, variogram; Properties-covariance of covariance, normality.

Unit: 2

Regression-models for trend, differencing, backshift operator B; Harmonic regression-periodogram, signal processing, novel asymp; Nonparametric regression-smoothing, periodic functions; Model selection-AIC, BIC, SIC, bias-variance trade-of; ARMA models-polynomial approximation, causality, notation.

Unit: 3

Covariances-identification; Prediction-recursion; Estimation-MLE, LS, forward-backward; State-space models-Kalman filter; Properties-equivalence with ARMA, nonlinear models; Switching models-hidden Markov models (HMM).

Unit: 4

Hilbert spaces-infinite dimension, L2, martingale; Spectral representation-integral representation, Wolddecomposition; Periodogram-discrete Fourier transform (DFT); Spectral estimation-linear filters.

Unit: 5

Multivariate time series-VAR, cross-correlation, trans function, spectral regr; Cointegration-principal components; Seasonality-X-11, regression models, seasonal differencing; Wavelets-multiresolution analysis; Spatial time series-kriging, spatial AR models.

TEXTBOOK:


REFERENCES:


5. “Forecasting: Principles and Practice” by Rob J. Hyndman and George Athanasopoulos.

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INTRODUCTION TO IOT  3 0 0 3

Course Objective: Students will be able understand and explore the interconnection and integration of the physical world and the cyber space. They will also be able to design & develop IOT Devices.

Course Outcome:

- Able to understand the application areas of IoT
- Able to understand data analytics in IoT
- Able to understand building blocks of IoT and their protocols

Unit 1: Introduction  10 Hours


Unit 2: Fundamental devices in IoT  7 Hours


Unit 3: Protocols for IoT  8 Hours


Unit 4: Data and Network Analytics in IoT  10 Hours


Unit 5: Implementing IoT  10 Hours


Text Books:


Reference Books:


CO – PO Affinity Map

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EMBEDDED SYSTEMS  3 0 0 3

COURSE OUTCOMES

CO1: Comprehend the specifications of embedded systems for hardware and software architecture.

CO2: Analyze and develop software programs for the embedded systems.

CO3: Assess the design specifications Embedded Systems, related frameworks and Embedded Systems resource chains.

CO4: Design the breadboard test circuit including microcontroller design and device control.

CO5: Construct embedded devices utilizing RTOS concepts in real-time.

Unit 1

Unit 2

Unit 3

Unit 4

Unit 5
**TEXTBOOKS:**

2. David E. Simon – An Embedded Software Primer- Pearson Education Asia – 1999

**REFERENCES:**

1. Caroline Yao & Quing Li – Real Time Concepts for Embedded Systems
2. Kirk Zureli - C Programming for Embedded Systems
NON-RELATIONAL DATABASE 3 0 0 3

Objective: To study basic concepts of database systems, relational and non-relational databases and graph databases.

COURSE OUTCOMES

CO1: To understand the concept of how NoSQL databases differ from relational databases from a practical perspective.

CO2: Master the basic concepts of designing NoSQL database management system.

CO3: Be familiar with selecting a particular NoSQL database for specific use cases.

CO4: Must be able to Identify what type of NoSQL database to implement based on business requirements

Unit 1:

Database Management System – introduction, history of database, management systems-characteristics of dbms, definition, objectives, merits and demerits, entity relationship model, concurrency control.

Environment systems – definition, designing databases, hierarchical data model, network data model

Unit 2:

RDBMS – relational data model, techniques & components of relational data model, definition of relational terms, features, 12 rules for a fully RDBMS.

Unit 3:

NOSQL Systems-Introduction to NoSQL, Disadvantages of NoSQL technology, NOSQL Systems, weakness of RDBMS, Key-value database-Key values database, More elements of key values database, Properties of Key-value store

Unit 4:

Columnar Databases - Characteristics of a columnar database, Concepts of columnar databases

Document databases with MongoDB - Implement a document database with Mongo DB, MongoDB.

Unit 5:
Graph Databases - Graph databases, graph traversal and graph problems, graph data structures
edge list, adjacency matrix, properties of graph model.

Implementation and systems - Reliable, maintainable and scalable, Different information systems

Text:

1. Advanced Data Management: For SQL, NoSQL, Cloud and Distributed Databases By Lena
Wiese

Reference:

1. Getting Started with Nosql by Gaurav Vaish.
NoSQL for Dummies by Adam Fowler.

**CO – PO Affinity Map**

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OBJECTIVE
The objective of this course is to equip students with mathematical and statistical techniques used in pattern recognition and enable students to develop machine learning algorithms for real life problems.

COURSE OUTCOMES
CO1: Understand the concept of a pattern and the basic approach to the development of pattern recognition and machine intelligence algorithms and applications of PR system
CO2: Understand the basic methods of feature extraction, feature evaluation, analyse and relate research in the pattern recognition area.
CO3: Understand and apply both supervised and unsupervised classification methods to develop PR system in real-world data
CO4: Apply pattern recognition techniques to real-world problems such as object detection and recognition
CO5: Implement simple pattern classifiers, classifier combinations, and structural pattern recognizers
CO6: Summarize, analyze, and relate research in the pattern recognition area verbally and in writing


Text Books


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COURSE OUTCOMES

CO1: To enable students to learn the fundamental concepts of a digital image processing and its working protocols.

CO2: To understand image enhancement techniques in spatial and frequency domain so as to devise algorithms or mathematical models for real time image enhancement problems.

CO3: To enable students implement algorithms for handling intensive image restoration problems.

CO4: Development of segmentation algorithms used to detect and extract the region of interest from images.

CO5: Interpretation and use of feature extraction and image representation techniques to carry out image labeling and automatic image understanding.

UNIT-1


UNIT-2


UNIT-3


UNIT-4


UNIT-5

TEXTBOOKS:


REFERENCES


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CO1: Understand the working of a wireless systems, basics of wireless communication, including the features and operation of protocols, antennas, and various propagation modes in wireless communication.

CO2: Explain the basic physical and technical settings of modulation techniques and features of analog and digital data including transmission methods.

CO3: To lay a basic foundation on IEEE wireless communication standards such as WLAN-802.11, Bluetooth, WiMax and satellite communication.

CO4: Understand the concept of Adhoc network and types of routing protocols supporting wireless communications and simulate protocols such as AODV, TORA, DSDV in NS2 or NS3.

CO5: Must be able to simulate or implement a real word wireless communication system.


TEXTBOOK / REFERENCES:


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MULTIMEDIA AND GRAPHICS

CO1: Understand the concept of multimedia terms such as multimedia, integration, interactive, HTML, and authoring and qualify the characteristics of multimedia: nonlinear versus linear content.

CO2: Describe several different environments in which multimedia might be used, and several different aspects of multimedia building blocks that provide a benefit over other forms of information presentation.

CO3: Utilization of different multimedia building blocks with all the features such as creation of text, image, digital audio and video with different types of format of each.

CO4: Describe the primary multimedia delivery methods—the Internet, wireless, CD-ROM, and DVD—as well as cite the history of multimedia and note important projected changes in the future of multimedia.

Unit 1

Unit 2
Making instant Multimedia – Multimedia Authoring tools.

Unit 3

Unit 4
Multimedia Building Blocks: Animation – Video.

Unit 5

TEXTBOOK:

REFERENCES:

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COURSE OUTCOMES

CO1 To get introduced to the basic concepts of Bioinformatics and its importance in Biological data analysis.

CO2 Describe the history, scope and importance of nucleic acids and role of molecular biology in Bioinformatics.

CO3 Explain about the methods to characterize and manage the different types of Biological data and its applications.

CO4 Classify different types of Bioinformatics software’s.

CO5 Overview about biological macromolecular structures and structure prediction methods in Biocomputing, introduction to sequence alignments.

UNIT-1

UNIT-2

UNIT-3

UNIT-4

UNIT-5

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Course Outcome

CO1: Describe and identify the strategies and functions of the soft computing in smart machines.

CO2: Acknowledge the usefulness of a soft computing mechanism for a significant problem.

CO3: Address the advantages of various neural network architectures and their limitations.

CO4: Use fuzzy logic and thinking in order to address insecurity and to resolve problems of engineering and genetic algorithms to substitute issues of optimization.

CO5: Find out numerous methods for solving technical and real-world problems with these models.

Unit 1


Unit 2

FUZZY sets, properties, Membership functions Fuzzy operations, Applications.

Unit 3

Classification and Regression Trees - Data Clustering Algorithms - Rule based Structure identification.

Unit 4

Neuro-Fuzzy Systems.

Unit 5


TEXTBOOK/REFERENCES:


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Objective: The aim of this course is to study, learn, and understand the main concepts of advanced operating systems. To introduce concepts related to distributed computing systems and Virtualization concepts.

Course Outcomes

CO1: Understanding the broad problem areas in Advanced Operating Systems.

CO2: Exposure to Virtualizing techniques.

CO3: Demonstrate understanding of different architectures used in Distributed OS and analyze their design issues.

CO4: To introduce fundamental principles of distributed systems, technical challenges and key design issues.

CO5: To impart knowledge of the distributed computing models and algorithms.

Unit 1

Overview of operating System, OS Structures - SPIN, Exokernel, L3 microkernel approach, Process and Threads, File and memory management, Disks, Microkernels.

Unit 2

Virtualization - Requirements For Virtualization, Type 1 and Type 2 Hypervisors, Techniques For Efficient Virtualization, Memory Virtualization, I/O Virtualization, Virtual Appliances, Virtual Machines on Multicore Cpus, Licensing Issues. Load Balancing.

Unit 3

Distributed Operating System – fundamentals, Distributed Objects and Middleware, Naming, Java RMI, Remote Procedure calls. Parallel Systems - Shared memory machines, Synchronization, Communication, Lightweight RPC, Scheduling, Shared memory multiprocessor OS, Mobile OS.

Unit 4


Unit 5
Distributed mutual exchange algorithms, Deadlock detection in distributed systems, checkpoint and rollback recovery, Distributed file servers; Distributed programming environments: Communication primitives.

Text books/Reference Books


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NATURAL LANGUAGE PROCESSING 3003

COURSE OUTCOMES

CO1: Understand approaches to syntax and semantics, fundamental mathematical models and algorithms in the field of NLP including hidden Markov models, Ngram Models and probabilistic models.

CO2: Devise solutions for a range of natural language components using existing algorithms, techniques and frameworks, including part-of-speech tagging, language modelling, parsing, context modelling and semantic role labelling.

CO3: To give an overview of the major technologies in speech recognition and synthesis including tools for acoustic analysis.

CO4: To evaluate the outcomes of various language processing and representation models.

CO5: To get exposed to hands-on experience of using NLP tools and apply existing statistical and deep learning techniques to language applications such as machine translation.

Unit 1

Unit 2

Unit 3

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REFERENCES:

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COURSE OUTCOMES

CO1: Be familiar with the basic methods for information extraction and retrieval of textual data

CO2: Understand the concept of apply text processing techniques to prepare documents for statistical modelling

CO3: Must be able to evaluate the performance of machine learning models for textual data

CO4: Master the concept of machine learning models for analyzing textual data and correctly interpreting the results

Unit-1


Unit-2


Unit-3

Extracting Relations from Text: From Word Sequences to Dependency Paths: Introduction, Subsequence Kernels for Relation Extraction, A Dependency-Path Kernel for Relation Extraction and Experimental Evaluation

Mining Diagnostic Text Reports by Learning to Annotate Knowledge Roles: Introduction, Domain Knowledge and Knowledge Roles, Frame Semantics and Semantic Role Labeling, Learning to Annotate Cases with Knowledge Roles and Evaluations.

Unit-4


Textual Signatures: Identifying Text-Types Using Latent Semantic Analysis to Measure the Cohesion of Text Structures:
Introduction, Cohesion, CohMetrix, Approaches to Analyzing Texts, Latent Semantic Analysis, Predictions, Results of Experiments.

Automatic Document Separation: A Combination of Probabilistic Classification and Finite-State Sequence Modeling:
Introduction, Related Work, Data Preparation, Document Separation as a Sequence Mapping Problem, Results.

Evolving Explanatory Novel Patterns for Semantically-Based Text Mining:
Related Work, A Semantically Guided Model for Effective Text Mining.

Text Books:

Reference Books:

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COURSE OUTCOMES

CO1: Understand the concepts of Business Intelligence & Data Warehouses and apply the principles of data warehouse modelling.

CO2: Must be able to construct frameworks of computerized decision support by using the concepts of data analytics and business intelligence (BI).

CO3: Understand the technologies and use tools that make up BI concepts like Data warehousing, Data reporting and use of Online analytical processing (OLAP)

CO4: Must be able to Identify the major ethical and legal issues of analytics.


TEXT BOOKS/ REFERENCES:


2. Jiawei Han, MichelineKamber and Jian Pei, “Data mining concepts and Techniques”,Third Edition, Elsevier Publisher, 2006.


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QUANTUM COMPUTING

COURSE OUTCOMES:

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<th>To gain a clear understanding of the fundamental concepts of quantum computing</th>
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<td>To grasp the various mathematical and calculation based concepts of quantum computing</td>
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<td>Development of a solid foundation on the security venues of quantum computing.</td>
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<td>Understanding the algorithmic foundations and searching mechanisms</td>
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<td>Acquainting the student with the error correction and fault tolerance related mechanisms of quantum computing</td>
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**Introduction to Quantum Computation:** Quantum bits, Bloch sphere representation of a qubit, multiple qubits.

**Background Mathematics and Physics:** Hilber space, Probabilities and measurements, entanglement, density operators and correlation, basics of quantum mechanics, Measurements in bases other than computational basis.

**Quantum Circuits:** single qubit gates, multiple qubit gates, design of quantum circuits.

**Quantum Information and Cryptography:** Comparison between classical and quantum information theory. Bell states. Quantum teleportation. Quantum Cryptography, no cloning theorem.


**Noise and error correction:** Graph states and codes, Quantum error correction, fault-tolerant computation

**References**

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CO2: Must be able to program in C# and work on basic console applications.

CO3: Must be able to build Window applications with event handling and MDI features.

CO4: Understand the working ADO.Net model and design and implement a database application

CO5: Understand the working of file systems, file types, directories and building an interactive windows application.


String class: methods and properties of string class, enumerations, boxing and unboxing, OOPS concepts: Encapsulation, data hiding, inheritance, interfaces, polymorphism, operator overloading, overriding Methods, Static Class members, Delegates and events. Exception Handling, garbage collector, generics and collection

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


Files: System.IO, directory and file types, Stream readers and stream writers, working with binary data.

CO – PO Affinity Map

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**Objectives:** Students will be able to develop design patterns to solve object oriented design problems.

**Course Outcomes**

CO1  Understand the appropriate roles of subtyping and inheritance, and use them effectively.

CO2  Identify the appropriate design patterns to solve object oriented design problems.

CO3  Develop design solutions using creational patterns.

CO4  Apply structural patterns to solve design problems.

CO5  Construct design solutions by using behavioral patterns.

**Unit 1**
Introduction to Design Patterns: Significance – Software Design and patterns – Model – View - Controller.

**Unit 2**
Observer Pattern - Decorator Pattern - Factory Pattern - Singleton Pattern - Command Pattern - Adapter and Facade Patterns - Template


**Unit 3**

**TEXTBOOK:**

**REFERENCES:**
3. Mark Grand, “Patterns in Java – A Catalog of Reusable Patterns Illustrated with UML”, Wiley – Dream tech India, 2002

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