BSc (Physics, Mathematics and Computer Science) Syllabus

Semester I

21ENG101 Communicative English 2023

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

<table>
<thead>
<tr>
<th>COs</th>
<th>Course Outcomes</th>
<th>Justification</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO 1</td>
<td>Demonstrate competency in all the four linguistic skills, viz. listening, speaking, reading and writing</td>
<td>Assignments, Reading Comprehension, Speaking and Listening Activities</td>
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<tr>
<td>CO 2</td>
<td>Apply different styles of communication in professional context</td>
<td>Group Discussion, debates</td>
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<td>CO 3</td>
<td>Participate in different planned &amp; extempore communicative activities</td>
<td>Extempore speeches, presentations</td>
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<tr>
<td>CO 4</td>
<td>Interpret and discuss facts and information in a given context</td>
<td>Reading Comprehension, writing tasks involving critical analysis</td>
</tr>
</tbody>
</table>
Unit I
Kinds of sentences, Word Order, usage of preposition, use of adjectives, adverbs for description, Determiners- Agreement (Subject – Verb, Pronoun- Antecedent) collocation

Unit II
Tenses
Reported speech
Active and passive Voice
Phrasal Verbs, Linkers/ Discourse Markers, Question Tags

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

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
Nirad C Chaudhuri “Indian Crowds” [Non-Detailed]
Dr S Radhakrishnan “The Shaping of my Character” [Detailed]
Charles Lamb” Dream Children” [Detailed]
Ruskin Bond “Night Train at Deoli” [Non-Detailed]
Rabindranath Tagore “Subha” [Non-Detailed]
Agra Gra “ And you call me coloured” [Detailed]
Alfred Lord Tennyson “Ulysses” [Detailed]

CORE READING:
2. Syamala, V. *Speak English in Four Easy Steps*, Improve English Foundation Trivandrum: 2006
3. Online sources

**References:**

7. Murphy, Raymond, *Murphy’s English Grammar*, CUP, 2004

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**21CUL101 CULTURAL EDUCATION I 2-0-0 2**

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)

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**PHYSICS PAPER - I**
Course Objectives: To enable students to understand Newtonian mechanics and apply Newton’s laws to explain natural physical phenomena.

Course Outcomes (CO):

<table>
<thead>
<tr>
<th>CO</th>
<th>Description</th>
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<tbody>
<tr>
<td>CO1</td>
<td>Acquire basic knowledge of vector analysis and particle dynamics and its application.</td>
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<tr>
<td>CO2</td>
<td>To understand the basic knowledge of work power and energy and collision process.</td>
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<tr>
<td>CO3</td>
<td>Ability to understand the gravitation and laws of planetary motion, centre of mass.</td>
</tr>
<tr>
<td>CO4</td>
<td>To gain knowledge about the rotational kinematics and rigid body dynamics.</td>
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<tr>
<td>CO5</td>
<td>To gain basic understanding of the fluid dynamics.</td>
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<tr>
<td>CO6</td>
<td>Ability to do experiment on mechanics and analysis of results.</td>
</tr>
</tbody>
</table>

Unit - I

Vector Analysis: Integrals (line, surface and volume), Physical significance of Gradient, Divergence and curl, statement of Gauss’s and Stroke’s theorems.

Particle dynamics: Review of the equations of motion, projectile motion, Newton’s First, Second and Third Law of Motion, Newton’s I Law as a basic kinematical law defining a frame of reference, Newton’s II Law as a basic dynamical law of mechanics and Newton’s III law as an interaction law, Frames of reference, inertial and non-inertial, pseudo forces, Force laws, weight and mass, Application of Newton’s law, importance of free body diagrams representing forces on the body in a free body diagram and frictional forces. Discussion of importance of friction in daily life.

Unit - II

Conservation Laws: Introduction, conservative forces, potential energy, complete solution for one, two and three dimensional systems, non-conservative forces, conservation of energy, conservation of energy to be seen as a spreading out and appearing in different forms, mass and energy.
Conservation of Linear Momentum: Centre of mass, motion of the center of mass, linear momentum of a particle, linear momentum of a system of particles, conservation of linear momentum, some applications of momentum principle, systems of variable mass – Rocket equation.

Collisions: Elastic and Inelastic, Collision in one and two dimensions.

Unit - III

Gravitation: Historical Introduction, Newton’s law of Universal Gravitation, Universal Gravitation constant ‘G’, inertial and gravitational mass, variation in acceleration due to gravity with altitude and depth, motion of planets and satellites, gravitational field and potential, gravitational potential energy, potential energy for many particle systems, calculations of field and potential for (a) a spherical shell, (b) a sphere, energy consideration in the motion of planets and satellites.

Central Force: Kepler’s laws of planetary motion, the inverse square law, Rutherford’s problem, derivation of Kepler’s Law from Universal law of Gravitation.

Unit - IV

Rotational Kinematics
Rotational variables, angular velocity, angular acceleration. Rotation with constant angular acceleration, Linear and angular variables, kinetic energy of rotation, rotational inertia, calculation of rotational inertia – of a rod, sphere and cylinder, torque, Newton’s laws of rotation, work, power and work – kinetic energy theorem.

Dynamics of Rigid bodies
Angular momentum and moment of inertia, Theorem on moment of inertia, moment of inertia for (i) solid cylinder, (ii) rectangular slab, (iii) solid sphere and (iv) circular hoop.

Unit - V

Fluid Mechanism
PRACTICALS

(A minimum of ten experiments to be done from the list given below)

1. To Determine the Momentum of Inertia and Mass of a Flywheel.
2. Study of the motion of an air bubble.
3. Study of the motion of a freely falling body.
4. Study of the acceleration of a body subjected to different unbalanced forces.
5. Study of accelerations of different masses under a constant unbalanced force.
6. Study of conservation of energy and momentum in head-on-collision between two spheres of equal mass.
8. Determination of Surface tension of liquid by capillary rise method.
9. To study the relation between length and time period of a simple pendulum.
10. Study of the rate of flow of water through a capillary tube under different pressure heads.
11. Momentum of inertia of a rod by torsional oscillation.
12. Determination of Acceleration due to Gravity and radius of gyration by Bar Pendulum.

Mapping of CO’s and PO’s:

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TEXTBOOKS:


REFERENCES:


MATHEMATICS PAPER - I

21MAT106CALCULUS 3-1-0 4

OBJECTIVES:

- To understand parameterisation of curves and to find arc lengths.
- To familiarise with calculus of multiple variables.
- To use important theorems in vector calculus in practical problems.

Course Outcomes (CO):

<table>
<thead>
<tr>
<th>CO1</th>
<th>To gain knowledge in the basic concepts of vector valued functions, limits, derivatives and its geometrical interpretations.</th>
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<tr>
<td>CO2</td>
<td>Understand the concept of scalar and vector fields.</td>
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<td>CO3</td>
<td>Understand and apply the concepts extreme values and Lagrange multipliers for simple optimization problems.</td>
</tr>
<tr>
<td>CO4</td>
<td>Understand and apply the concepts line and double integrals to various problems including Green’s theorem for plane</td>
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</table>
Unit I
The Precise definition of a Limit – One-Sided Limits and Limits at Infinity – Infinite Limits and Vertical Asymptotes – Continuity – Tangents and Derivatives.
(Sections 2.1, 2.3-2.7)

Unit II
(Sections 4.1-4.4, 5.2-5.4)

Unit III
(Sections 14.1-14.8)

Unit IV
(Sections 16.1-16.4)

Unit V
Surface Areas and Surface Integrals – Parameterized Surfaces – Orientation of Surfaces – Stoke's Theorem and Divergence Theorem.
(Sections 16.5-16.8)

Text books:

References:

Mapping of CO’s and PO’s

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**COMPUTER SCIENCE PAPER - I**

21CSA102 PROBLEM SOLVING AND ALGORITHMIC THINKING 3-0-2 4

**OBJECTIVES:** To enable students to keep pace with the changes in the IT and to describe the main principles of procedure oriented programming, the central formalisms used in the description of programming languages.

**Course Outcome:**

<table>
<thead>
<tr>
<th>CO1</th>
<th>To apply algorithmic thinking to solve problems</th>
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<tbody>
<tr>
<td>CO2</td>
<td>To learn designing and implementation of algorithms for a given problem</td>
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<tr>
<td>CO3</td>
<td>To apply the basic programming construct for problem solving</td>
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<tr>
<td>CO4</td>
<td>To understand an algorithm by tracing its computational states, identifying bugs and correcting them</td>
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</tbody>
</table>

Unit I
Introduction, Information and data, Number Systems-Binary, Hexadecimal, Octal, Conversion, BCD, Data encoding. Boolean algebra, Simplification of Boolean expression.

Techniques of Problem Solving: Flowcharting.

**Unit II**


**Unit III**

Algorithm design techniques-Divide and conquer method: binary search as a divide-and-conquer algorithm, finding maximum and minimum, Strassen’s matrix multiplication, Greedy method: Knapsack problem, minimum cost spanning trees, Prim’s algorithm, Kruskal’s algorithm.

**Unit IV**

Data organization: List and Arrays, Modularization, Problem Solving: Factoring and Recursion Techniques

**Unit V**

Problem solving with algorithms – Searching and Sorting techniques: Linear Search, Binary Search, Comparison of Linear and Binary Search, Selection Sort, Bubble sort, Insertion Sort, Comparison of Sorting techniques.

**TEXTBOOKS:**

REFERENCES:


Mapping of CO’s and PO’s:

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21ENV200 Environmental Science and Sustainability 3-0-0  3

Unit 1

Biodiversity: Species, Genetic & Ecosystem Diversity, Origin of life and significance of biodiversity, Value of Biodiversity, Biodiversity at Global, National and Local Levels, India as a Mega-Diversity Nation (Hotspots) & Protected Area Network, Community Biodiversity Registers. Threats to Biodiversity, Red Data book, Rare, Endangered and Endemic Species of India. Conservation of Biodiversity. People’s action. Impacts, causes, effects, control measures, international, legal and regulatory frameworks of: Climate Change, Ozone depletion, Air pollution, Water pollution, Noise pollution, Soil/land degradation/pollution

Unit 2

Linear vs. cyclical resource management systems, need for systems thinking and design of cyclical systems, circular economy, industrial ecology, green technology. Specifically apply these concepts to: Water Resources, Energy Resources, Food Resources, Land & Forests Waste management. Discuss the interrelation of environmental issues with social issues such as: Population, Illiteracy, Poverty, Gender equality, Class discrimination, Social impacts of development on the poor and tribal communities, Conservation movements: people’s movements and activism, Indigenous knowledge systems and traditions of conservation.

Unit 3

Common goods and public goods, natural capital/tragedy of commons, Cost benefit analysis of development projects, Environment Impact Assessment (EIA), Environment Management Plan (EMP), Green business, Eco-labeling, Problems and solutions with case studies. Global and national state of housing and shelter, Urbanization, Effects of unplanned development case studies, Impacts of the building and road construction industry on the environment, Eco-homes/Green buildings, Sustainable communities, Sustainable Cities. Ethical issues related to resource consumption, Intergenerational ethics, Need for investigation and resolution of the root cause of unsustainability, Traditional value systems of India, Significance of holistic value-based education for true sustainability.
TEXTBOOKS/ REFERENCES:


Semester II

21ENG111 Professional Communication 1 0 2 2

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.

<table>
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<tr>
<th>COs</th>
<th>Course Outcomes</th>
<th>Justification</th>
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</thead>
<tbody>
<tr>
<td>CO 1</td>
<td>Demonstrate competency in oral and written communication</td>
<td>Presentation, writing assignment</td>
</tr>
<tr>
<td>CO 2</td>
<td>Apply different styles of communication in professional context</td>
<td>Business letters, circulars, memos, e-mails</td>
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<tr>
<td>CO 3</td>
<td>Participate in different planned &amp; extempore</td>
<td>Presentation, speech</td>
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</table>
Communicative Activities

| CO 4 | Interpret and discuss facts and information in a given context | Group discussion |
| CO 5 | Develop critical and analytical thinking | Essays, book reviews |

Unit I
Vocabulary Building: Prefixes and Suffixes; One word substitutes, Modal auxiliaries, Error Analysis: Position of Adverbs, Redundancy, modifiers (displaced, dangling etc)

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
Mini Project and Presentation

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

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**21CUL111**  
**CULTURAL EDUCATION II**  
2-0-0 2

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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**PHYSICS PAPER - II**

**21PHY116HEAT AND THERMODYNAMICS**  
3-0-2 4
OBJECTIVE: To enable students to see relation between linear and rotational motion and understand the production and propagations of waves in elastic media. And also understand the laws of thermodynamics and its applications.

Course Outcome:

<table>
<thead>
<tr>
<th>CO1</th>
<th>Ability to explain the kinetic theory of gases.</th>
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<tbody>
<tr>
<td>CO2</td>
<td>To understand the basic concept of heat and first law of thermodynamics.</td>
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<tr>
<td>CO3</td>
<td>To gain the knowledge about Carnot’s engine. Second law of thermodynamics and its application.</td>
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<tr>
<td>CO4</td>
<td>Interpretation thermodynamic potential and Maxwell’s equation.</td>
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<tr>
<td>CO5</td>
<td>To analyse the statistical interpretation of laws of thermodynamics</td>
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<tr>
<td>CO6</td>
<td>Ability to do experiment on heat and thermodynamics.</td>
</tr>
</tbody>
</table>

Unit I


Unit II

Heat and First Law of Thermodynamics: Thermal equilibrium, Zeroth law of thermodynamics, ideal gas temperature scale, heat as a form of energy, quantity of heat and specific heat, molar heat capacities of solids, the mechanical equivalent of heat, heat and work; First law of thermodynamics, Discussion on usefulness of First Law of Thermodynamics in Meteorology, some special cases of the first law of thermodynamics – (i) adiabatic process, (ii) isothermal process, (iii) isochoric process, (iv) cyclic process, (v) free expansion.

Unit III
Entropy and Second Law of Thermodynamics: Introduction, reversible and irreversible processes, the Carnot cycle, Carnot engine, Carnot theorem, absolute scale of temperature, second law of thermodynamics, efficiency of engines, the thermodynamic temperature scale, entropy in reversible and irreversible processes, entropy and the II law, entropy and disorder, consequences of II and III law of thermodynamics, Second law of thermodynamics as a probabilistic statement.

Low temperature Physics – Porous Plug experiment, temperature of inversion, principle of regenerative cooling, liquefaction of air by Linde’s method.

Unit IV

Thermodynamic potentials: Internal Energy, Enthalpy, Helmholtz function, Gibbs function, relations among these functions, Gibbs-Helmholtz equations

Maxwell’s Thermodynamic Relations: Derivation of Maxwell’s thermodynamic relations, TdS equations, Internal energy equations, Heat capacity equations. Change of temperature during adiabatic process using Maxwell’s relations

Unit V

The Statistical Physics: statistical basics of thermodynamics, probability distribution, micro and macro states, constraints, Distribution of particles and energy states. Statistical interpretation of second law of thermodynamics, Boltzmann’s canonical distribution law and its application.

PRACTICALS

(A minimum of ten experiments to be done from the list given below)

1. Study of the oscillations of a column of water as a function of its length and study of damped oscillation.
2. To determine the velocity of sound at room temperature and the end correction by setting up a resonance column (first resonance length).
3. Study of torsional oscillations of a loaded wire and determination of the rigidity modulus of the material of the wire.
4. Verification of Stefan’s Boltzmann law using Potentiometer.
5. Study of Newton’s law of cooling.
7. Specific heat of a solid by the method of mixtures.
8. Determination of latent heat of fusion of ice by calorimetric method.
10. Study of transverse vibrations on a sonometer. To determine the frequency by (i) absolute method, (ii) Comparison method
11. Melde’s experiment – determination of frequency
12. Frequency of AC by a sonometer.

Mapping of CO’s and PO’s

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TEXTBOOKS:


REFERENCES:
Course Objectives:

- Understand the basic concepts of vector space, subspace, basis and dimension.
- Familiar the inner product space. Finding the orthogonal vectors using inner product.
- Understand and apply linear transform for various matrix decompositions.
- Understand basic concepts of eigenvalues and eigenvectors.

Course Outcomes:

<table>
<thead>
<tr>
<th>CO1</th>
<th>Understand and apply the basic concepts of matrix theory in to problems.</th>
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<tr>
<td>CO2</td>
<td>Understand the basic concepts of vector space, subspace, basis and dimension</td>
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<tr>
<td>CO3</td>
<td>Understand the basic concepts of inner product space, norm, angle, Orthogonality and projection and implementing the Gram-Schmidt process, to obtain least square solution</td>
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<td>CO4</td>
<td>Understand the concept of linear transformations, the relation between matrices and linear transformations, kernel and range.</td>
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<tr>
<td>CO5</td>
<td>Understand the concepts of eigenvalue and eigenvector and apply to diagonalization problems.</td>
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Unit I

(Sections: 1.1-1.7,2.1)
Unit II

(Sections: 4.1 – 4.8)

Unit III

(Sections 6.1 – 6.4)

Unit IV

(Sections 7.1 – 7.3)

Unit V

(Sections 8.1 – 8.5, 5.1-5.2)

TEXTBOOKS


REFERENCES:

Mapping of CO’s to PO’s

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**COMPUTER SCIENCE PAPER - II**

21CSA111                                      DATA STRUCTURE 3- 0 -2  4

**Objectives:** Learn fundamentals of data structures and their applications essential for programming/problem solving.

**Course Outcome:**

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>CO1</td>
<td>Understanding the basics of data structures, linear data structures such as stacks, queues and their applications.</td>
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<tr>
<td>CO2</td>
<td>Understanding of linked list and its applications</td>
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<tr>
<td>CO3</td>
<td>Analyze and apply non-linear data structures: Graphs, Trees to solve problem</td>
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<tr>
<td>CO4</td>
<td>Able to develop applications using suitable data structures</td>
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</tbody>
</table>
Unit I

Introduction to data structures, types, ADT, Arrays: 1D, 2D array, memory representation, applications of arrays. Stacks: Stack ADT; Stack applications: Infix to postfix conversion, Evaluation of postfix expression, Recursion.

Unit II

Queues: Queue ADT; Circular queues; Priority queues; Queue applications: A Mazing Problem, Multiple Stacks and Queues. Linked Lists: List ADT; Linked implementation of Stacks, Queues; Header node; Circular linked lists; Doubly linked lists

Unit III

Hashing: Symbol table; Hash function; Collision resolution techniques: Open addressing, Separate chaining. Graph: Graph ADT; Preliminaries; Matrix and Adjacency List representation of Graphs.

Unit IV

Tree: Tree ADT; Preliminaries; Binary Trees; Representation of Binary Trees; Binary tree traversal; Application of Binary Tree: Evaluation of Expression, Symbol Table construction.

Lab

Searching and Sorting: Linear Search, Binary Search – Analysis, Bubble Sort, Insertion Sort, Merge sort, Quick Sort
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. Hashing

Non-Linear Data Structures: Basic concepts of trees, Implementation of trees, Traversal, Binary tree, BST.

Textbook:

Reference:

CO, PO Mapping:

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21LAW200 INDIAN CONSTITUTION 2-0-0 2

OBJECTIVE: The preliminary objective is to ensure that every student has some knowledge about Indian Constitution.

Unit I
Meaning and Importance of Constitution, Preamble and Salient Features of the Constitution.

Unit II

Fundamental Rights, Right to Equality, Right to Freedom, Right against exploitation, Right to freedom of religion, Cultural and Educational Rights, Right to Constitutional Remedies and Duties, Directive Principles of State Policy.

Unit III

Union Government – Lok Sabha and Rajya Sabha Composition, Powers and functions: The President, The Prime Minister and Supreme Court: Role Position and Powers/functions.

Unit IV

State Government - Legislative Assembly and Legislative Council: Composition, Powers and functions: The Governor, Chief Minister and High Court: Role, Position and Powers/functions.

Unit V

Local self-Government, Panchayat Raj System in India; Election Commission; Public Service Commissions, Role, powers and function

Skill development Activities:
- Court Visit & Report Presentation
- Group discussion(Fundamental rights and duties)

REFERENCES:

1. Introduction to The constitution of India – M V Pylee, Vikas publishing house Pvt LTD
2. Introduction to The constitution of India – Dr. Durga das Basu, 19th edition Reprint 2007
<table>
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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.

**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,- Saptatalas 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 AbhinavaBharati. The course introduces various styles of Indian classical dance such as Bharatanatyan, 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 KalariPayattu.

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 fact sheet 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 lead 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.
Objective: To enable students to acquire a broad conceptual framework of electromagnetic phenomena.

Course Outcome:

| CO1 | To demonstrate basic knowledge in electrostatics and electric dipole. |
| CO2 | Apply the basic principles of electrostatics solve the problems of Dielectric constant and polarizability. |
| CO3 | Analysis of different laws of magneto statics. |
| CO4 | Ability to implement basic principles of electromagnetic induction. |
| CO5 | Explain the basic concepts of alternating current and filters. |
| CO6 | Ability to do experiments on electricity and magnetism. |

Unit I

Electrostatics: Electrical pressure on a charged surface. The path traced by a charged particle in a transverse electric field. The attracted disc electrometer – construction, theory and applications.

Review of concept of electric field and electric field due to point charge. Electric field due to (i) electric dipole, (ii) line of charge and (iii) charged disc

A dipole in an electric field, torque on a dipole in uniform and non-uniform E fields, potential energy of an electrical dipole.

Unit II

Electric Fields in matter: Capacitance, parallel plate capacitor, calculation of capacity of a spherical and cylindrical capacitor, energy stored in a capacitor, capacitor with dielectric, atomic view of dielectrics, polarization, electric field due to a polarised material, Gauss’s
law in dielectrics, Dielectric constant, Energy density of an electrostatic field (with and without dielectric). Polarisability and susceptibility – Frequency dependence of polarisability, Clausius- Mossotti equation.

Unit III

Magneto statics: Review of Ampere’s law, B near a long wire, Magnetic lines of induction, force between two parallel conductors, definition of ampere, B for a solenoid, Biot-savart’s law, and applications of Biot-savart’s law.
The magnetic field, Lorentz force and definition of magnetic field, magnetic induction, magnetic force on a current element, circulating charges, Cyclotron resonance frequency, Cyclotron.Magnetisation, magnetization current density, magnetic field intensity, magnetic susceptibility and permeability.

Unit IV

Inductance: Self-inductance, LR circuit, energy in a magnetic field, magnetic energy density.
Alternating current and filter: RMS values, Response of LR, CR and LCR circuits to sinusoidal voltages (discussion using the j symbol), Series and parallel resonance, Half-power frequencies, bandwidth and Q-factor, Power in electrical circuits, power factor, Maximum power transfer theorem (with proof).

Unit V

Electromagnetic Theory And Maxwell’s Equations (12 hrs.) : Displacement current, Setting up of Maxwell’s equations in SI units, Hertz experiment, Travelling electromagneticwave, Wave equations (qualitative and quantitative) – Energy transport and Poynting vector, Poynting theorem. A radiation pressure (Normal and Oblique incidence). Concept of electricdipole, magnetic dipole, expression for energy radiated by a dipole (No derivation)

PRACTICALS
(A minimum of ten experiments to be done from the list given below)

1. Determination of Q factor by series resonance
2. Determination of Q factor by parallel resonance
3. Determination of self-inductance of a coil using Anderson’s Bridge
4. Determination of capacitance by measuring impedance of RC circuit
5. Determination of Inductance by measuring impedance of RL circuit
6. De Sauty’s Bridge.
7. Determination of resistivity of a material using low resistance
8. Study of decay of current in LR and RC circuit
9. Measurement of B by current balance
10. To show that the behavior of an inductance in an AC circuit is analogous to that of a resistor which obeys Ohm’s Law and hence to measure inductance.
11. High pass filter.
12. Low pass filter.

Mapping of CO’s and PO’s

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</table>

TEXTBOOKS:

1. Electricity and Magnetism, Fewkes and Yarwood.
2. Electricity and Magnetism:A N Matveev, Mir Publishers, Moscow.
3. Electricity and Magnetism, F.W.Sears, Addison Wesley Co.

REFERENCES:


MATHEMATICS PAPER - III

21MAT206 DIFFERENTIAL EQUATIONS 3-1-0 4

Objectives: To enable students to develop the knowledge of standard concepts of ordinary differential equations and apply analytical techniques to compute solutions to various differential equations.

Course Outcomes:

| CO1 | Understand and apply the basic concepts of differential equations in to problems. |
CO2  Solve basic application problems described by second order linear differential equations with constant coefficients.

CO3  Create and analyze mathematical models using higher order differential equations to solve application problems

CO4  Understand the concept of Lagrange’s linear equation, Methods to solve the first order partial differential equations

CO5  Understand the concepts of homogeneous and non-homogeneous linear partial differential equations of higher order.

Unit I


(Part I: 1.1-1.9, 2.12-2.22)

Equations of first order but of higher degree: Equations solvable for $\frac{dy}{dx}$, y, x, equations in Clairaut’s form – equations reducible to Clairaut’s form.

(Part I: 4.1-4.11)

Unit II


(Part I: 5.1-5.5, 6.1-6.3, 1.12, 1.13, 5.26-5.27, 7.1-7.5)

Unit III

Systems of first order linear equations: Conversion of nth order differential equation to n first order differential equations – homogeneous linear system with constant coefficients – fundamental matrices – complex eigenvalues – repeated eigenvalues –
simultaneous linear differential equations with constant coefficients – simultaneous linear differential equations with variable coefficients.

(Part I: 8.1-8.3, 2.1-2.7)

**Partial Differential Equations**
Review of partial differential equations (order, degree, linear, nonlinear).

**Unit IV**

Formation of equations by eliminating arbitrary constants and arbitrary functions.
**Solutions of partial differential equations:** General – particular and complete integrals – Lagrange’s linear equation – Charpit’s method – Methods to solve the first order partial differential equations of the forms \( f(p,q) = 0 \), \( f(z,p,q) = 0 \), \( f_1(x,p) = f_2(y,q) \) and Clairut’s form \( z = px + qy + f(p,q) \) where \( p = \frac{\partial z}{\partial x} \) and \( q = \frac{\partial z}{\partial y} \).

(Part III: 1.1 – 1.5, 2.3-2.12, 3.1-3.2, 3.7-3.8, 3.10-3.18)

**Unit V**

Classification of partial differential equations of second order – Homogeneous linear partial differential equations with constant coefficient of higher order – Non-homogeneous linear partial differential equations of higher order.

(Part III: 8.1, 4.1-4.12)

**Text books:**


**References:**


Mapping of CO’s to PO’s

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**Objectives:** To introduce the basics of data communications and computer networks with network protocols, architectures and modern networking technologies.

**Course Outcome:**

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<th>CO</th>
<th>Description</th>
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<tbody>
<tr>
<td>CO1</td>
<td>Build an understanding of the fundamental concepts of data communication and computer networking.</td>
</tr>
<tr>
<td>CO2</td>
<td>Understand how errors detected and corrected that occur in transmission</td>
</tr>
<tr>
<td>CO3</td>
<td>An awareness about routing, IP addresses and subnetting</td>
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<tr>
<td>CO4</td>
<td>Know about routing mechanisms and different routing protocols</td>
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</table>

**Unit I**

Unit II

Modems - Guided Media - Unguided Media, Data Link Layer Design Issues-Services provided to the Network Layer-Framing-Error Control-Flow Control- Error Detection and Correction

Unit III


Unit IV


Unit V


Lab programs

1. Study of different types of Network cables and Practically implement the cross-wired cable and straight through cable using clamping tool.
2. Study of Network Devices in Detail.
3. Study of network IP.
4. Connect the computers in Local Area Network.
5. Study of basic network command and Network configuration commands.
6. Performing an Initial Switch Configuration.
7. Write a program for error detecting code using CRC-CCITT (16- bits).
8. Write a program to find the shortest path between vertices using bellman-ford algorithm.
9. Using TCP/IP sockets, write a client – server program to make the client send the file name and to make the server send back the contents of the requested file if present.
10. Write a program on datagram socket for client/server to display the messages on client side, typed at the server side.
11. Write a program for simple RSA algorithm to encrypt and decrypt the data.
12. Write a program for congestion control using leaky bucket algorithm.

Textbooks:

1. Computer Networks (Fifth Edition) – Andrew S. Tanenbaum (Prentice Hall of India)

References:

3. Data communication and Networking(Fourth Edition)- Behrouz A Forouzan(Tata Mcgraw Hill)

CO, PO Mapping:

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21SSK201 LIFE SKILLS I 1-0-2 2
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:

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

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.

21CSA207 WEB TECHNOLOGY 1-0-2 2

OBJECTIVES: Fundamental concepts of HTML-5 with cascading style sheet concepts, Understanding the areas of JavaScript, PHP concepts.

Course Outcomes:

1) Provides basic concepts of HTML-5 and CSS
2) Demonstrate the CSS concepts
3) Able to build the forms and simple web applications.
4) Learn to use JavaScript for the webpages
5) Understand how to use PHP in webtechnology

CO-PO Mapping

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**Unit I**

Introduction to HTML, basic HTML elements, formatting tags- bold, italic, size, underline, deleted, emphasize. Color: color names, color values, marquee, paragraph, link tags, image tag, list – ordered list, unordered list, definition list, Superscript, Subscript. HTML table – row span, column span, body color, border, cell spacing, cell padding, align, caption. Multimedia elements- Inserting Audio files, inserting Video files, screen control attributes. Frames and frameset attribute.

**Lab Topics:** Exercise on Marquee, Various tags, Lists, Table, Multimedia elements, Frames.

**Unit II**
Introduction to Forms, Get and Post methods, Text Input Controls: text, password, email, url, number, range, date, month, time, week. Label, Checkboxes Controls, Radio Box Controls, Select Box Controls, Text area, File Select boxes, Buttons, Submit and Reset Button, text field tag, File Upload, required attribute.

**Lab Topics**: Forms with all attributes.

**Unit III**

Introduction to CSS, Types of style sheets, Applying styles to specific groups of elements – class selector, id selector, CSS background, CSS text, CSS fonts, color, image, CSS box model. JavaScript-Variables, Control statements Loops, Arrays, String Handling writing the functions in JavaScript. Introduction to PHP-Variables, Control statements, PHP Forms.

**Lab Topics**: Different types of CSS, Selectors, Basic JavaScript programs, PHP Forms.

**TEXTBOOKS:**


**Reference:**

Web Reference: - W3Schools.com

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**Semester IV**

**PHYSICS PAPER – IV**

21PHY216OPTICS 3-0-2 4

**Objective**: To enable students to understand that light is a wave phenomenon and apply the understanding of wave phenomenon to light.
Course outcomes:

<table>
<thead>
<tr>
<th>CO1</th>
<th>Ability to understand and analyze the wave nature of light and interference.</th>
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<tbody>
<tr>
<td>CO2</td>
<td>Gain the knowledge about classification of diffraction and its application.</td>
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<tr>
<td>CO3</td>
<td>Understand the basic concept of polarization and its devices.</td>
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<tr>
<td>CO4</td>
<td>Understand the basic phenomenon of scattering of light with different examples.</td>
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<tr>
<td>CO5</td>
<td>Study laser and its applications are to import knowledge and to develop skills and to use modern instruments in the day-to-day life.</td>
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<tr>
<td>CO6</td>
<td>Ability to do experimentation on wave optics.</td>
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</table>

Unit I


Unit II

Diffraction: Fraunhoffer and Fresnel: Diffraction, Diffraction at a single slit, double slit, Diffraction by multiple slits, Diffraction grating, Resolving power – Rayleigh’s criterion, Resolving power of a grating and telescope. Fresnel diffraction, half period zone, zone plate, diffraction at a circular aperture and at a straight edge (qualitative treatment only).

Unit III

Polarization: Polarization by reflection, Brewster’s law, Mauls law, Double refraction, Production and detection of linearly, circularly and elliptically polarized light, Quarter and half wave plates, Polaroid’s, Discussion on use of Polaroid sheets in preparing tinted sunglasses, Optical activity.

Unit IV
Scattering of Light: A brief discussion on Tyndall effect, Rayleigh scattering and Raman effect. Blue of the sky and ocean. A qualitative account of fluorescence and phosphorescence. Raman effect: Classical and quantum theory of Raman effect, experimental method for studying Raman spectra, Raman spectrum, study of Raman effect using Lasers, intensity of Raman lines, Polarization of Raman lines, characteristic properties of Raman lines, applications of Raman effect.

Unit V


PRACTICALS:

1. Determination of wavelength of mercury spectral lines using Diffraction Grating by normal incidence method
2. Determination of the refractive index of the material of a prism by minimum deviation method
3. Determination of Cauchy’s constants using a prism, grating and spectrometer
4. Determination of the resolving power of a telescope
5. Determination of wave length of monochromatic light source using Bi-Prism
6. Resolving power of a grating
7. Wavelength and wavelength difference using a Michelson’s interferometer
8. Determination of the thickness of paper by interference at a wedge
9. Determination of the radius of curvature of the lens by Newton’s Rings
10. Determination of the refractive index of a liquid by Newton’s rings
11. Verification of Brewster’s Law
12. Refractive index of a prism by i-d curve

Mapping of CO’s and PO’s
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**TEXTBOOKS:**


**REFERENCES:**

3. Khanna and Bedi: Sound

<table>
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</table>
Unit I
(Chapters 1-3)

Unit II
(Chapters 4-6)

Unit III
(Chapters 7, 9, 10)

Unit IV
(Chapters 12, 13)

Unit V
Quotient Rings and Ideals – Homomorphism of rings and rings of polynomials.
(Chapters 28-30)

(Chapters 14-16)
TEXTBOOKS:


REFERENCES:


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**COMPUTER SCIENCE PAPER - IV**

**21CSA216** ANALYSIS AND DESIGN OF ALGORITHMS3-0-03

**Objectives:** To introduce techniques for analyzing the efficiency of computational algorithms and to provide knowledge about various sorting and searching techniques.

**Course Outcome:**

<table>
<thead>
<tr>
<th>CO1</th>
<th>Analyze the asymptotic performance of algorithms</th>
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<tbody>
<tr>
<td>CO2</td>
<td>Demonstrate a familiarity with major algorithms and data structures.</td>
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<tr>
<td>CO3</td>
<td>Apply important algorithmic design paradigms and methods of analysis.</td>
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<td>CO4</td>
<td>Synthesize efficient algorithms in common engineering design situations.</td>
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<tr>
<td>CO5</td>
<td>Learn about famous Graph problems</td>
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</table>

**Unit I**

Introduction-types of algorithms-properties of algorithms-implementation and empirical analysis-analysis of algorithms-classifications of algorithms and their efficiencies-best case, average case and worst-case analysis.
Unit II

Analysis of recursive programs: Recurrence Relation: Substitution method, Recursion 
Tree Methods, Master Method.

Unit III

Bubble sort, quick sort, selection sort, heap sort, insertion sort, merge sort,-analysis of 
sorting Algorithms. Greedy Algorithm: Fractional Knap-sack Problem- Task Scheduling 
Problem.

Unit IV

Dynamic Programming: Matrix Multiplication Problem- 0/1 Knap-sack Problem. 
Branch and Bound – backtracking.

Text books:

References:

COMPUTER SCIENCE PAPER-V

21CSA217DATABASE MANAGEMENT SYSTEMS3-0-2  4

Objectives:To understand the role of a database management system in an organization 
by understanding basic database concepts, including the structure and operation of the 
relational data model.

Course Outcome:
<table>
<thead>
<tr>
<th>CO1</th>
<th>To apply the basic concepts of Database Systems and Applications</th>
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<tbody>
<tr>
<td>CO2</td>
<td>To familiarize basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.</td>
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<tr>
<td>CO3</td>
<td>To understand ER-model to relational tables, populate relational database and formulate SQL queries on data with improve the database design by normalization</td>
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<tr>
<td>CO4</td>
<td>To improve the database design by normalization technique</td>
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</table>

**Unit I**
Database Management System model: Introduction, Implication of Database, Applications Database System; Data Independence; Data Modelling for a Database; Advantages and Disadvantages of Database Management System, DBMS Vs. RDBMS, Entities, Attributes, Relationships and Relationships Types.

**Unit II**
Database System Architecture: Three Level Architecture of DBMS, The External Level or Subschema, The Conceptual Level or Conceptual Schema, The Internal Level or Physical Schema, Mapping; Database Management System Facilities, Data Definition Language, Data Manipulation Language; Database Manager, Database Administrator, Data Dictionary; Distributed Processing, Information and Communications Technology System (ICT), Client / Server Architecture

**Unit III**

**Unit IV**
SQL: Categories of SQL Commands; Data Definition; Data Manipulation Statements, SELECT - The Basic Form, Subqueries, GROUP BY Feature.

**Unit V**
Normalization: Functional Dependency; Anomalies in a Database; Properties of Normalized Relations; First Normalization; Second Normal Form; Third Normal Form; Boyce-Codd Normal Form (BNCF); Fourth and Fifth Normal Form. Transaction Processing: Atomicity Consistency and Isolation, Durability, Transaction States.

**Lab Cycle Programs**

1. Student should decide on a case study and formulate the problem statement.
2. Conceptual Designing using ER Diagrams (Identifying entities, attributes, keys and relationships between entities, cardinalities, generalization, specialization etc.)
3. Converting ER Model to Relational Model (Represent entities and relationships in Tabular form, Represent attributes as columns, identifying keys)
4. Normalization -To remove the redundancies and anomalies in the above relational tables, Normalize up to Third Normal Form
5. Creation of Tables using SQL- Overview of using SQL tool, Data types in SQL, Creating Tables (along with Primary and Foreign keys), Altering Tables and Dropping Tables
6. Practicing DML commands- Insert, Select, Update, Delete
7. Practicing Queries using ANY, ALL, IN, EXISTS, NOT EXISTS, UNION, INTERSECT, CONSTRAINTS etc.
8. Practicing Sub queries (Nested, Correlated) and Joins (Inner, Outer and Equi).
9. Practice Queries using COUNT, SUM, AVG, MAX, MIN, GROUP BY, HAVING, VIEWS Creation and Dropping.
10. Practicing on Triggers - creation of trigger, Insertion using trigger, Deletion using trigger, Updating using trigger
12. Cursors- Declaring Cursor, Opening Cursor, Fetching the data, closing the cursor.

**References:**

CO, PO Mapping:

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21SSK211  LIFE SKILLS II  1-0-2  2


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.thegrammarbook.com online teaching resources
8. www.englishpage.com online teaching resources and other useful websites.
Objective: To enable students to understand the physics of semiconductors and their applications in basic electronic circuits.

Course outcomes:

<table>
<thead>
<tr>
<th>CO1</th>
<th>Understand the basic concept of semiconductors its characteristics and application.</th>
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<tbody>
<tr>
<td>CO2</td>
<td>Apply different configuration of transistor to study its uses.</td>
</tr>
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<td>CO3</td>
<td>Ability to understand and apply different type of sinusoidal oscillator.</td>
</tr>
<tr>
<td>CO4</td>
<td>Understand basic logic gates and OP-AMP and its application.</td>
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<tr>
<td>CO5</td>
<td>Understand the basic process in communication electronics.</td>
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</tbody>
</table>

Unit I


Unit II
Transistors and Applications: Bipolar junction transistor (PNP and NPN) transistors, different configurations and characteristics, current components in CE configuration, large signal and small signal dc current gains, transistor biasing – self bias circuit, Load line and operating point. Transistor as an amplifier: Transistor as a two port device, h-parameters and analysis of CE amplifier using h parameter equivalent circuit, simplified h-parameter circuit, stabilization of voltage gain in CE amplifiers, Two stage amplifiers, RC coupling, frequency response of CE amplifier. Comparison of transistor configurations. Emitter follower circuit and its use. Transistor as Power amplifier. FET construction and its characteristics – MOSFET characteristics. Concept of feedback in amplifiers and advantages of negative feedback.

Unit III


Unit IV


Unit V

Communication Electronics: Basic theory of amplitude modulation, Power in modulated carrier, single side band transmission, Basic idea of frequency and phase modulation. Modulated class C amplifier, demodulation, and PN diode as demodulator linear and square law detection. Propagation of radio waves, different layers of ionosphere and their

Mapping of CO’s and PO’s

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</tbody>
</table>

**TEXTBOOKS:**

1. V.K. Mehta: Electronics.

**REFERENCES:**

2. Resnick: Special theory of relativity
3. A.P French: Special relativity
5. C. Kittel: Introduction to solid state physics
6. A J. Dekkar: Solid State physics
7. J.B. Blackmore: Introduction to solid state physics
8. S V Subramanyam : Experiments in Electronics
9. R P Jain: Modern Digital Electronics
Objective: To gain hands-on experience with the basic electronic equipment

Course outcomes:
CO1: To analyze experimental I-V characteristics of different diodes, transistors and oscillators.
CO2: To analyze op-amp characteristics by constructing different logical circuits.
CO3: To verify inverse square law using phototransistor.

(A minimum of ten experiments to be performed from the following list)
1. Junction diode characteristics
2. Zener diode characteristics
3. Junction Transistor characteristics
4. FET characteristics
5. Wien Bridge Oscillator.
6. UJT characteristics.
7. Full adder using AND, OR and XOR gates
8. Study of op-amp characteristics.
9. Measurement of efficiency and output power of LED.
10. Verification of the inverse square law for light intensity using a phototransistor.
13. Amplitude demodulator.
14. Logic gates – AND, OR, NOT, NOR and XOR using IC 7402

Mapping of CO’s and PO’s
Objectives: To enable students to understand the basic properties of the field of real numbers and understand notion of continuous functions and their properties.

Course Outcomes:

<table>
<thead>
<tr>
<th>CO1</th>
<th>CO2</th>
<th>CO3</th>
<th>CO4</th>
<th>CO5</th>
</tr>
</thead>
<tbody>
<tr>
<td>To understand the concept of Absolute value. Know the concept of supremum</td>
<td>Know the concept of Convergence, Divergence and Oscillatory sequence</td>
<td>Know the concept of continuous function, discontinuity, uniformly continuous.</td>
<td>Application of derivative like Taylor’s theorem and Maclaurin’s theorem</td>
<td>To apply the concept Riemann integral to analyze problem.</td>
</tr>
</tbody>
</table>

Unit I


Chapter-1 (Sec.1.1-1.3), Chapter-2 (Sec.2.1-2.5)
Unit II


Chapter-3 (Sec.3.1-3.7), Chapter-9 (Sec.9.1-9.3)

Unit III

**Limits and Continuous Functions:** Limits of Functions – Limit Theorems – Some Extensions of the limit concept – Continuous Functions – Combinations of Continuous Functions – Continuous Functions on Intervals – Uniform Continuity.

Chapter-4 (Sec.4.1-4.3), Chapter-5 (Sec.5.1-5.4)

Unit IV

**Differentiation:** The Derivative – The Mean Value Theorem – L'Hospital's Rules – Taylor's Theorem.

Chapter-6 (Sec.6.1-6.4)

Unit V

**The Riemann Integral:** Riemann Integral – Riemann Integrable Functions – The Fundamental Theorem - Approximate Integration.

Chapter-7 (Sec.7.1-7.4)

TEXTBOOKS:


REFERENCES:


MATHEMATICS PAPER - VI

21MAT308 DISCRETE MATHEMATICS 2-1-0 3

Objectives: To enable students to understand the basics of logic, permutations and combinations and use effectively algebraic techniques to analyze basic discrete structures and algorithms

Course Outcomes:

<table>
<thead>
<tr>
<th>CO1</th>
<th>To understand the basic concepts of Mathematical reasoning, set and functions.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO2</td>
<td>To understand various counting techniques and principle of inclusion and exclusions.</td>
</tr>
<tr>
<td>CO3</td>
<td>Understand the concepts of various types of relations, partial ordering and equivalence relations.</td>
</tr>
<tr>
<td>CO4</td>
<td>Apply the concepts of generating functions to solve the recurrence relations.</td>
</tr>
<tr>
<td>CO5</td>
<td>Familiarize the fundamental concepts of graph theory and shortest path algorithm.</td>
</tr>
</tbody>
</table>

Unit I

Chapter-1 (Sections: 1.1.-1.7)

Unit II

Chapter-5 (Sections: 5.1-5.3)
Unit III

Advanced Counting Techniques and Relations: Recurrence Relations – Solving Linear Recurrence Relations – Solutions of Homogeneous Recurrence Relations.

Chapter-6 (Sections: 6.1-6.2)

Unit IV

Relations and Their Properties: Representing Relations – Closure of Relations – Equivalence Relations – Partial Ordering.

Chapter-7 (Sections: 7.1, 7.3-7.6)

Unit V

Graph Theory: Introduction to Graphs – Graph Operations – Graph and Matrices – Graph Isomorphism – Connectivity – Euler and Hamilton Paths – Shortest Path Problems.

Chapter-8 (Sections: 8.1, 8.3-8.6)

TEXTBOOKS:


REFERENCES:


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COMPUTER SCIENCE PAPER – VI

21CSA305 OPERATING SYSTEM 3-0-0 3
Objectives: Fundamental concepts and designs will be covered along with basics of process management. To provide theoretical and problem-solving aspects of CPU scheduling and memory management techniques.

Course Outcome:

| CO1 | Understand the basic concepts of OS with different types of OS, different services along with the various system calls |
| CO2 | Get the knowledge of process management, various operations on process and Inter process communication; Understand the various process scheduling algorithms |
| CO3 | Learn about deadlocks, methods of handling deadlocks, preventing deadlocks etc., |
| CO4 | Understand the various techniques of memory management |

Unit I

Unit II
Process Management: Process Concept-Process Scheduling-Operations on processes-Cooperating processes-Inter Process Communication

CPU Scheduling: Basic concepts-Scheduling criteria-Scheduling Algorithms-First Come First Served Scheduling, Shortest job First Scheduling, Round Robin Scheduling, Multilevel Queue Scheduling, Multilevel Feedback Queue Scheduling. Process synchronization: Background, critical section problem, semaphores, monitors, producer consumer problem, dining philosophers problem, readers and writers problem.

Unit III
Unit IV

TEXTBOOKS:

REFERENCES:

CO, PO Mapping:

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COMPUTER SCIENCE LAB 01  0-0-2    1

21CSA382 R Programming

Objective: Understand the basics of fundamentals of R. Understand the design and development process using R programming language. Understand how data is analyzed and visualized using statistic functions.

COURSE OUTCOMES (CO)
CO1: Understand the Fundamentals of R.

CO2: Get an idea how to use different functions in R, how to read data into R, accessing R packages, writing R functions, debugging, and organizing data using R functions.

CO3: Learn the Basics of statistical data analysis and visualization techniques using R

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</table>

**Experiments**

<table>
<thead>
<tr>
<th>Experiments</th>
<th>CO</th>
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<tbody>
<tr>
<td>Installing R on personal machines. Installing R and R-Studio environment</td>
<td>CO1</td>
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<tr>
<td>and The basic functionality of R.</td>
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<tr>
<td>Write an R-program to illustrate different types of variable types, strings</td>
<td>CO1</td>
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<tr>
<td>and basic Arithmetic Operation.</td>
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<tr>
<td>Write an R-program to illustrate Relational Operators, Logical Operator,</td>
<td>CO1</td>
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<td>Assignment Operators, and Miscellaneous Operators.</td>
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<tr>
<td>Write an R-program to illustrate Conditional operation.</td>
<td>CO1</td>
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<tr>
<td>Write an R-program to illustrate Control operation</td>
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<tr>
<td>Requirement</td>
<td>Course Outcome (CO)</td>
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<tr>
<td>Write an R-program to illustrate the Built in functions and user-defined function.</td>
<td>CO2</td>
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<tr>
<td>Write an R-program to illustrate String operation.</td>
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<tr>
<td>Write an R-program to illustrate vectors and list operation.</td>
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<td>Write an R-program to illustrate Performing Arithmetic of Matrices</td>
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<tr>
<td>Write an R-program to illustrate Descriptive Statistics analysis such as Data Range, Frequencies, Mode, Mean and Median.</td>
<td>CO3</td>
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<tr>
<td>Write an R-program to illustrate data visualization Techniques such as histogram, bar-chart, pie chart, scatter plot, box plot, tree map, .., etc.</td>
<td>CO3</td>
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</tbody>
</table>

**TEXTBOOKS:**


**21CSA383 Python Programming**

**Objective:** To facilitate with the ability to visualize, analyze, solve complex problems, make decisions and technical skills that prepare them for immediate employment and providing a deeper understanding of the technology.

**Course Outcome (CO):**

**CO1:** Understand Python syntax and semantics, various datatypes and operators.

**CO2:** Demonstrate of Input and Output statements along with Control statements.
CO3: Demonstrate proficiency in Functions, Parameter passing techniques and Recursion.

CO4: Implementation of various Searching and Sorting techniques.

CO5: Implement Python Programs using core data structures like Lists, Tuples and Dictionaries.

CO-PO Mapping:

Lab Cycle:

1. Write a program to demonstrate basic data type in python.

2. Write a program to interpret calculator in python (using arithmetic operators)

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</table>

3. Write a program to demonstrate operations (unary, assignment, relational, logical, Boolean, Bitwise and membership) in python

4. i) Write a program to demonstrate input and output statements in python.
   ii) Write a program that takes two numbers as command line arguments and prints its sum.

5. Write a program on basic control statements: if, if else, if elif statements in python.

6. Write a program on basic loops: while, for, infinite, nested loops in python.

7. i) Write a program on functions: To compute gcd, lcm of two numbers.
ii) Write a program on recursion & parameter passing techniques using python: checks whether the given number is Armstrong

8. Write a program on searching Techniques:

i) Check the element is in the list or not by using Linear search & Binary search using python.

ii) Write a program on sorting Techniques: Bubble, Selection, Insertion and Merge sort

9. Write a program to create, concatenate and print a string, accessing substring from a given string and all other string operations. Demonstrate a given string is palindrome or not.

10. Write a program to demonstrate working with lists and tuples in python.

i) Finding the sum and average of given numbers using lists.

ii) Write a program which accepts a sequence of comma-separated numbers from console and generate a list and a tuple which contains every number. Suppose the following input is supplied to the program: 34, 67, 55, 33, 12, 98.

11. Write a program to count the numbers of characters in the string and store them in a dictionary data structure Write a program to use split and join methods in the string and trace a birthday of a person with a dictionary data structure.

12. Write a program to display file contents and to copy file contents from one file to another using python.

TEXTBOOKS:


REFERENCES:


21CSA384 MATLAB

OBJECTIVE: Understand the basics of fundamentals of Matlab Programming. Understand the design and development process using Matlab Programming. Understand how data is analyzed and visualized using statistic functions.

COURSE OUTCOMES (CO)
CO1: Understand the Fundamentals of Matlab.
CO2: Get an idea how to use different functions in Matlab, how to read data into Matlab, accessing Matlab packages, writing Matlab functions, debugging, and organizing data using Matlab functions.
CO3: Learn the Basics of statistical data analysis and visualization techniques using Matlab

CO –PO AFFINITY MAP:

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</table>
**TEXTBOOKS:**


<table>
<thead>
<tr>
<th>Experiments</th>
<th>CO</th>
</tr>
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<tbody>
<tr>
<td>Understanding Matlab environment, Matlab tool box and The basic functionality of Matlab.</td>
<td>CO1</td>
</tr>
<tr>
<td>Write a program to illustrate different types of variable types, strings and basic Arithmetic Operation.</td>
<td>CO1</td>
</tr>
<tr>
<td>Write a program to illustrate Relational Operators, Logical Operator, Assignment operators.</td>
<td>CO1</td>
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<tr>
<td>Write a program to illustrate Conditional operation.</td>
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<td>CO3</td>
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21CSA385 Data Visualization-Lab

Objectives: This course is all about data visualization, the art and science of turning data into readable graphics. We’ll explore how to design and create data visualizations based on data available and tasks to be achieved. This process includes data modelling, data processing, mapping data attributes to graphical attributes, and strategic visual representation based on known properties of visual perception as well as the task.

Course Outcomes

CO1. understand the data summarization using statistical measures.

CO2. Prepare the data for processing using various cleaning procedures.

CO3. Learn to implement the correlation of data and transform data in a standard format.

CO4. explore the implementation of reduction of huge data in to reduced format using various methods.

CO – PO Mappings:

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Unit I

Installation of Jupiter notebook and Spider-install various visualization packages. Summarizing of data-mean, median, mode, midrange, range, IQR, five number summary, boxplot, standard deviation, variance, q-q plot, cosine similarity.

Unit II

Preparation and cleaning of data-missing value, smoothing, regression, clustering.

Unit III

Integration of data-chi-square test, Data transformation – normalization.

Unit IV

Reduction of data- PCA, histogram, sampling.

TEXTBOOKS/ REFERENCES:

1. Jiawei Han, Micheline Kamber and Jian Pei, “Data mining concepts and Techniques”, Third Edition, Elsevier Publisher, 2006.


21CSA386 Windows Programming using Dot Net
Objective: Windows programming course provides an introduction to programming using the VB.NET. Students are introduced to the application development cycle, structure of programs, and specific language syntax.

Course Outcomes

<table>
<thead>
<tr>
<th>CO</th>
<th>Course Outcomes</th>
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</thead>
<tbody>
<tr>
<td>CO1</td>
<td>To make the students to use Visual Basic.Net to build Windows applications using structured and object-based programming techniques.</td>
</tr>
<tr>
<td>CO2</td>
<td>Students will be able to design/develop programs with GUI interfaces</td>
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<tr>
<td>CO3</td>
<td>Assemble multiple forms, modules, and menus into working VB.NET solutions</td>
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<tr>
<td>CO4</td>
<td>Build integrated VB.NET solutions using files and structures with printing capabilities</td>
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<tr>
<td>CO5</td>
<td>Translate general requirements into data-related solutions using database concepts</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CO-PO Affinity Map</th>
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<tbody>
<tr>
<td>PO/CO</td>
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Introduction to .NET, .NET Framework features & architecture, CLR, Common Type System, MSIL, Assemblies and class libraries. Introduction to visual studio, Project basics, types of project in .Net, IDE of VB.NET- Menu bar, Toolbar, Solution Explorer, Toolbox, Properties Window, Form Designer, Output Window, Object Browser. The environment: Editor tab, format tab, general tab, docking tab. visual development & event drive Programming -Methods and events.
The VB.NET Language- Variables - Declaring variables, Data Type of variables, Forcing variables declarations, Scope & lifetime of a variable, Constants, Arrays, types of array, control array, Collections, Subroutines, Functions, Passing variable Number of Argument Optional Argument, Returning value from function.


Database programming with ADO.NET – Overview of ADO, from ADO to ADO.NET, Accessing Data using Server Explorer. Creating Connection, Command, Data Adapter and Data Set with OLEDB and SQLDB. Display Data on data bound controls, display data on data grid.

TEXT BOOKS/ REFERENCES:

1. Vb.net programming black book by Steven Holzner –Dreamtech publications
2. Mastering vb.net by EvangelosPetroutsos- bpb publications Introduction to .netframework-Worx publication

21CSA387 Software Testing

Course Objective
Analyze the requirements for the given problem statement. Design and implement various solutions for the given problem. Employ various design strategies for problem solving.

Course Outcomes

CO1- Design and implement the solution for given problem in any programming language(C,C++,JAVA)

CO2 - Derive test cases for any given problem.

CO3 - Apply the appropriate technique for the design of flow graph.

CO4 - Create appropriate document for the software entity.

Articulation Matrix (CO-PO and PSO Mapping)

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Lab Cycle

1 Understand The Automation Testing Approach (Theory Concept).

2 Using Selenium IDE, Write a test suite containing minimum 4 test cases.

3 Understanding Test Automation. Using Selenium write a simple test script to validate each field of the registration page (Eg: Facebook Registration Page)

4 Install Selenium server and demonstrate it using a script in Java/PHP.

5 Conduct a test suite for any two web sites.
6 Write and test a program to login a specific web page.
7 Write test cases to validate a mobile number using one time pin identification (OTP).
8 Write and Test a program to find out list of employees having salary greater than Rs 50,000 and age between 30 to 40 years.
9 Write and test a program to update 10 student records into table into Excel file.
10 Write and test a program to select the number of students who have scored more than 60 in any one subject (or all subjects).
11 Write and test a program to provide total number of objects present / available on the page.
12 Write and test a program to get the number of list items in a list / combo box.
13 Write and test a program to count number of items present on a desktop.
14 Understanding the use of bug tracking and testing tool Bugzilla and Jira.
15 Open ended Experiment: Mini Project – Not for exam but to compulsory to be included in Record. (Test cases for Admission form, Shopping cart, Travel Booking, Hotel Booking, Utility Bill Payment.)

Reference book (At least 2)


21CSA388 Object Oriented Programming
Course Objective: Identify and practice the object-oriented programming concepts and techniques, practice the use of C++ classes, constructor, inheritance, friend functions and file I/O stream concepts.

Course Outcome:

1. Implement Object Oriented Programming basic concepts in C++.

2. Creating simple programs using classes and objects in C++.

3. Implement the constructors and inheritance in C++.


5. Implement Object Oriented Programs using exceptional handling concepts

CO-PO Mapping

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Lab Programs

Basic Programs
1. Print hello world message.

2. Create four function calculators for fractions.

3. Write a program that takes length as input in feet and inches. The program should then convert the lengths in centimeters and meters and display it on screen.
   - Print the largest among three integer numbers.

Constructors

4. Create a class student to store and print the details of student inside a class.

5. Display odd and even numbers upto a set limit “n” by defining member functions to display even and odd numbers outside the class.

6. Define a class to represent a bank account. Include the following members
   a. Data Members
      i. Account No
      ii. Name
      iii. Type
      iv. Balance
   b. Member Functions
      i. Deposit an amount
      ii. Withdraw an amount
      iii. To display name and balance

7. Execute Program to create a bank account using initial amount of Rs 500 and perform all the operations – deposit, withdraw and balance using default and parameterized constructor. Also create an array of object.

Function & Operator Overloading
8. Create class average and member functions setvalue() and mean() where setvalue() initializes values of a and b. mean() calculates the mean of two numbers and arguments to function mean() is the object of class average. Display the mean value.

9. Write an overloaded function to calculate and return the area of a square, a circle, a rectangle. Then call it from the main function.

10. Overload unary minus, ++, =, =, and >.

11. Overload = and + in a string operation.

12. Overload binary operator + while adding complex numbers.

13. Overload + operator to concatenate two strings.

14. Write a program to demonstrate this pointer.

**Friend Function**

15. Create a Box class which contains width and height. Using a Friend function print the width of the box object.

**Inheritance**

16. Create a class student and include data member roll_number. Derive a class test from student base class to include member function marks(x,y). Create class sports with member function get_score. The class result is derived from base classes test and sports that sums the values of x, y and score.

17. Create object of derived class and invoke all member functions to illustrate multilevel and multiple inheritance.

**Virtual Functions**

18. Implement the concept of Virtual functions.

19. Implement pure virtual function and abstract class.

**Exceptions and File handling**

20. Implement the exception.
21. Program to read details of employees from terminal and display them by creating files.

**TEXTBOOKS:**


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21SSK301     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.

Semester VI

PHYSICS PAPER -VII

21PHY316 ATOMIC AND MOLECULAR PHYSICS 3-1-0 4

Objective:To enable students to apply the basic knowledge of classical and quantum mechanics at the atomic and molecular level.

Course outcomes:

1. To understand the basic idea of X-ray spectrum and its usage in analyzing different types of crystals.
2. To understand the different aspects of studying the structure of an atom and to know different types of methods to find the charge of an electron.
3. To acquire the knowledge of Zeeman effect and its classical and quantum approach.
4. To understand the basic idea of molecular spectra and to acquire the knowledge about different types of molecular spectra.
5. To understand the basic idea of Electro-Magnetic theory and to set up maxwell’s equation

Unit I
Bragg's law and Bragg spectrometer. A brief mention of different types of crystals. Structures of NaCl and KCl crystals.
Compton Effect – Expression for Compton Shift.

Unit II

Atomic Spectra (16 hrs)
The Electron: Determination of e/m of an electron by Thomson method, Determination of charge of an electron by Millikan's oil drop method.
Atomic Spectra: Inadequacy of Bohr atomic model, correction due to finite mass of the nucleus, Rydberg constant in terms of reduced mass, Excitation and Ionization potentials, Franck-Hertz experiment, Bohr-Sommerfeld Model of atom, vector model of an atom, Electron spin, space quantization, magnetic moment of an electron due to its orbital motion. Stern-Gerlach experiment and its theory.

Unit III


Unit IV

Molecular Spectra (10 hrs): Molecular formation, the H molecular ion, H₂ – molecule. Salient features of molecular spectra.
Rotation, vibration and electronic spectra of molecules, associated quantum numbers and selection rules. Theory of pure rotation and rotation-vibration spectra, Raman and IR spectra, simple applications.
Unit V

**NMR Spectroscopy:** Introduction to NMR spectroscopy, Chemical shifts and J-coupling
One-dimensional proton NMR One dimensional NMR of X-nuclei (13C, 15N, 31P and 19F)Homonuclear 2D NMR Heteronuclear 2D NMRStructure determination of moleculesMapping of CO’s and PO’s

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**TEXTBOOKS:**

1. Atomic and nuclear physics -Littlefield and T.V. Thorley
2. Molecular spectra – G Herzberg
3. Fundamental university physics, vol. 3 – Aloson and Finn

**REFERENCES:**

1. Perspectives of Modern Physics Beiser.
2. Electromagnetism, Reitz and Milford.
4. Introduction to modern Physics- F.R. Richtmeyer. E.H. Kennard and T. Lauritsen
5. Lasers – A K Gatak
6. Modern Physics - K.S. Krane
7. Introduction to modern Physics – H S Mani and G K Mehta

PHYSICS PAPER-VIII
**Objective:** To gain the knowledge of analyzing different types of optical spectrum and spectral response of electronic devices.

**Course outcome:**
CO1: To examine Hydrogen spectrum and to calculate Rydberg constant.
CO2: To analyze different spectrum of different molecule.
CO3: To examine the spectral response of Photocell and Photodiode.

*(A minimum of eight experiments from the following)*
1. Determination of Rydberg constant by studying the Fraunhoffer spectrum
2. Analysis of powder X ray photograph
3. Study of the characteristics and spectral response of a photocell (selenium photocell)
4. Study of hydrogen spectrum
5. Analysis of band spectrum of PN molecule.
6. Analysis of rotational spectrum of nitrogen.
7. Analysis of rotational vibrational spectrum of a diatomic molecule (HBr).
8. Absorption spectrum of KMnO₄
9. Determination of dipole moment of an organic liquid

**Mapping of CO’s and PO’s**

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Objectives: To enable students to obtain knowledge of theory of complex functions of a complex variable and get acquainted with different methods and techniques of series and bilinear transformations.

Course Outcomes:

| CO1 | To understand the concepts of Analytic function, Cauchy-Riemann equations and Harmonic function. |
| CO2 | Applying the concept of mapping like translation, rotation, magnification and inverse. |
| CO3 | Apply and analyze to solve problem using contour integral. |
| CO4 | Application of Taylor’s series, Laurent’s series to solve problems. |
| CO5 | Evaluating using the concept of Singularities, poles, residue theorem. |

Unit I


(Chapters 1 & 2)

Unit II

Conformal mappings – bilinear transformations – Special bilinear transformations – fixed points.

Chapter-9 (Sections: 9.1-9.4)

Unit III
Introduction to complex Integration – Contour integral – Primitives – Cauchy-Goursat theorem – Winding number – Cauchy’s integral formula.

Chapter-4 (Sections: 4.1-4.4, 4.6, 4.7)

Unit IV


Chapters- 5 & 6 (Sections: 5.1-5.2, 6.1-6.3, 6.5, 6.6)

Unit V


Chapter-7 (Sections: 7.1-7.3)

Classification of Singularities – Residues – Poles and zeroes.

Chapter-7 (Sections: 7.1-7.3)

TEXTBOOKS:

REFERENCES:
MATHEMATICS PAPER VIII

21MAT317 PROBABILITY AND STATISTICS 3-1-0 4

Objectives: To enable students to understand the properties of probability and probability distributions and apply wide variety of specific statistical methods.

Course Outcomes:

| CO1 | Understand the basic concepts of probability and probability modelling. |
| CO2 | Gain in depth knowledge about statistical distributions, properties and real time applications. |
| CO3 | Find measures of central tendency for distribution of sample statistics |
| CO4 | To understand the concept of theory of estimation |
| CO5 | Ability to make decisions under uncertainties using statistical testing of hypothesis |

Unit I


(Sections: 2.1 – 2.7)

Unit II


(Sections: 3.1-3.7, 3.9)

Unit III

(Sections: 4.1-4.6, 4.9)

Unit IV


(Sections: 5.1, 5.3, 5.5)

Unit V

Point Estimation of Parameters: General Concept of Point Estimation – Methods of Point Estimation – Sampling distributions – Chi-square, t and F distributions (only definitions and use) – Central Limit Theorem.

Simple Linear Regression: Empirical Models – Simple Linear Regression.

(Sections: 7.1-7.5, 4.10.2, 8.3.1, 10.5.1, 11.1, 11.2)

TEXTBOOKS:


REFERENCES:

Objective: To enable the students to pursue the variety of machine learning concepts along with practical exposure that can help them dream career as data analyst and data scientist.

Course Outcome:
CO1: Ability to select and implement machine learning techniques and computing environment that are suitable for the applications under consideration.
CO2: Ability to understand and apply scaling up machine learning techniques and associated computing techniques and technologies.
CO3: Ability to recognize and implement various ways of selecting suitable model parameters for different machine learning techniques.
CO4: To develop skills of using recent machine learning software for solving practical problems.
CO5: To gain experience of doing independent study and research.

Unit I
Introduction to ML; Problems, data and tools. Learning systems, goals, challenges and applications of machine learning system. Aspects of developing system, training data, testing data, concept representation, classification errors, validation.

Unit II
Linear regression, SSE, gradient decent, bias and variance estimation, overfitting and underfitting, regularization. Logistic regression, Problems on regression, sample case studies.
Unit III
Hypothesis representation, decision boundary, cost function, multi-class classification. Nearest neighbor methods. Decision Tree learning, representing concepts as decision trees, picking the best splitting attribute: entropy and information gain. Case studies using decision trees and nearest neighbor method.

Unit IV
Probability and classification, Naïve Bayes classification, Non-linear predictions, EM algorithm, kernels, Kernel regression, kernels, Support vector machine (SVM) and kernels, kernel optimization. Sample case study on SVM with multiple kernels.

Unit V

Lab

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REFERENCES:

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COMPUTER SCIENCE LAB 02 0-0-2 1

21CSA382R Programming

Objective: Understand the basics of fundamentals of R. Understand the design and development process using R programming language. Understand how data is analyzed and visualized using statistic functions.
COURSE OUTCOMES (CO)

CO1: Understand the Fundamentals of R.

CO2: Get an idea how to use different functions in R, how to read data into R, accessing R packages, writing R functions, debugging, and organizing data using R functions.

CO3: Learn the Basics of statistical data analysis and visualization techniques using R.

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Experiments

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<td>Installing R on personal machines. Installing R and R-Studio environment</td>
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<td>and The basic functionality of R.</td>
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<td>Write an R-program to illustrate different types of variable types, strings</td>
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<td>and basic Arithmetic Operation.</td>
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<td>Write an R-program to illustrate Relational Operators, Logical Operator,</td>
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<td>Assignment Operators, and Miscellaneous Operators.</td>
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<td>Write an R-program to illustrate Conditional operation.</td>
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<td>Write an R-program to illustrate Control operation</td>
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</table>
Write an R-program to illustrate the Built in functions and user-defined function.  

Write an R-program to illustrate String operation.  

Write an R-program to illustrate vectors and list operation.  

Write an R-program to illustrate Performing Arithmetic of Matrices  

Write an R-program to illustrate Descriptive Statistics analysis such as Data Range, Frequencies, Mode, Mean and Median.  

Write an R-program to illustrate data visualization Techniques such as histogram, bar-chart, pie chart, scatter plot, box plot, tree map, .., etc.  

TEXT BOOK:  


21CSA383  Python Programming  

Objective:  

To facilitate with the ability to visualize, analyze, solve complex problems, make decisions and technical skills that prepare them for immediate employment and providing a deeper understanding of the technology.  

Course Outcome (CO):
**CO1:** Understand Python syntax and semantics, various datatypes and operators.

**CO2:** Demonstrate of Input and Output statements along with Control statements.

**CO3:** Demonstrate proficiency in Functions, Parameter passing techniques and Recursion.

**CO4:** Implementation of various Searching and Sorting techniques.

**CO5:** Implement Python Programs using core data structures like Lists, Tuples and Dictionaries.

**CO-PO Mapping:**

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</table>
Lab Cycle:

1. Write a program to demonstrate basic data type in python.

2. Write a program to interpret calculator in python (using arithmetic operators)

3. Write a program to demonstrate operations (unary, assignment, relational, logical, Boolean, Bitwise and membership) in python

4. i) Write a program to demonstrate input and output statements in python.
   ii) Write a program that takes two numbers as command line arguments and prints its sum.

5. Write a program on basic control statements: if, if else, if elif statements in python.

6. Write a program on basic loops: while, for, infinite, nested loops in python.

7. i) Write a program on functions: To compute gcd, lcm of two numbers.
   ii) Write a program on recursion & parameter passing techniques using python: checks whether the given number is Armstrong

8. Write a program on searching Techniques:
   i) Check the element is in the list or not by using Linear search & Binary search using python.
   ii) Write a program on sorting Techniques: Bubble, Selection, Insertion and Merge sort

9. Write a program to create, concatenate and print a string, accessing substring from a given string and all other string operations. Demonstrate a given string is palindrome or not.

10. Write a program to demonstrate working with lists and tuples in python.
i) Finding the sum and average of given numbers using lists.

ii) Write a program which accepts a sequence of comma-separated numbers from console and generate a list and a tuple which contains every number. Suppose the following input is supplied to the program: 34, 67, 55, 33, 12, 98.

11. Write a program to count the numbers of characters in the string and store them in a dictionary data structure. Write a program to use split and join methods in the string and trace a birthday of a person with a dictionary data structure.

12. Write a program to display file contents and to copy file contents from one file to another using python.

Text Books:


Reference Books:


MATLAB

Objective: Understand the basics of fundamentals of Matlab Programming. Understand the design and development process using Matlab Programming. Understand how data is analyzed and visualized using statistic functions.
COURSE OUTCOMES (CO)
CO1: Understand the Fundamentals of Matlab.
CO2: Get an idea how to use different functions in Matlab, how to read data into Matlab, accessing Matlab packages, writing Matlab functions, debugging, and organizing data using Matlab functions.
CO3: Learn the Basics of statistical data analysis and visualization techniques using Matlab

CO – PO AFFINITY MAP:

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Experiments

- Understanding Matlab environment, Matlab tool box and The basic functionality of Matlab.
  - CO1
- Write a program to illustrate different types of variable types, strings and basic Arithmetic Operation.
  - CO1
- Write a program to illustrate Relational Operators, Logical Operator, Assignment operators.
  - CO1
Write a program to illustrate Conditional operation.

Write a program to illustrate Control operation

Write a program to illustrate the Built in functions and user-defined function.

Write a program to illustrate String operation.

Write a program to illustrate vectors and list operation.

Write a program to illustrate Performing Arithmetic of Matrices

Write a program to illustrate Descriptive Statistics analysis such as Data Range, Frequencies, Mode, Mean and Median.

Write a program to illustrate data visualization Techniques such as histogram, bar-chart, pie chart, scatter plot, box plot, tree map, .., etc.

TEXT BOOK:


21CSA385 Data Visualization-Lab

Objectives: This course is all about data visualization, the art and science of turning data into readable graphics. We’ll explore how to design and create data visualizations based on data available and tasks to be achieved. This process includes data modelling, data
processing, mapping data attributes to graphical attributes, and strategic visual representation based on known properties of visual perception as well as the task.

Course Outcomes

CO1. understand the data summarization using statistical measures.

CO2. Prepare the data for processing using various cleaning procedures.

CO3. Learn to implement the correlation of data and transform data in a standard format.

CO4. explore the implementation of reduction of huge data in to reduced format using various methods.

CO – PO Mappings:

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Syllabus

Unit-1

Installation of Jupiter notebook and Spider-install various visualization packages. Summarizing of data-mean, median, mode, midrange, range, IQR, five number summary, boxplot, standard deviation, variance, q-q plot, cosine similarity.

Unit-2

Preparation and cleaning of data-missing value, smoothing, regression, clustering.
Unit-3
Integration of data-chi-square test, Data transformation – normalization.

Unit-4
Reduction of data - PCA, histogram, sampling.

TEXT BOOKS/ REFERENCES:

1. Jiawei Han, Micheline Kamber and Jian Pei, “Data mining concepts and Techniques”, Third Edition, Elsevier Publisher, 2006.


21CSA386 Windows Programming using Dot Net

Objective: Windows programming course provides an introduction to programming using the VB.NET. Students are introduced to the application development cycle, structure of programs, and specific language syntax.

Course Outcomes

<table>
<thead>
<tr>
<th>CO1</th>
<th>To make the students to use Visual Basic.Net to build Windows applications using structured and object-based programming techniques.</th>
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<td>CO2</td>
<td>Students will be able to design/develop programs with GUI interfaces</td>
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<td>CO3</td>
<td>Assemble multiple forms, modules, and menus into working VB.NET solutions</td>
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<td>CO4</td>
<td>Build integrated VB.NET solutions using files and structures with printing capabilities</td>
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<td>CO5</td>
<td>Translate general requirements into data-related solutions using database concepts</td>
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Introduction to .NET, .NET Framework features & architecture, CLR, Common Type System, MSIL, Assemblies and class libraries. Introduction to visual studio, Project basics, types of project in .Net, IDE of VB.NET- Menu bar, Toolbar, Solution Explorer, Toolbox, Properties Window, Form Designer, Output Window, Object Browser. The environment: Editor tab, format tab, general tab, docking tab. visual development & event drive Programming -Methods and events.

The VB.NET Language- Variables -Declaring variables, Data Type of variables, Forcing variables declarations, Scope & lifetime of a variable, Constants, Arrays, types of array, control array, Collections, Subroutines, Functions, Passing variable Number of Argument Optional Argument, Returning value from function.


Database programming with ADO.NET – Overview of ADO, from ADO to ADO.NET,Accessing Data using Server Explorer. Creating Connection, Command, Data
Adapter and Data Set with OLEDB and SQLDB. Display Data on data bound controls, display data on data grid.

TEXT BOOKS/ REFERENCES:
1. Vb.net programming black book by Steven Holzner –Dreamtech publications
2. Mastering vb.net by EvangelosPetroutsos- bpb publications Introduction to .net framework-Worx publication

21CSA387 Software Testing

Course Objective
Analyse the requirements for the given problem statement. Design and implement various solutions for the given problem. Employ various design strategies for problem solving.

Course Outcomes
CO1- Design and implement the solution for given problem in any programming language(C,C++,JAVA)
CO2 - Derive test cases for any given problem.
CO3 - Apply the appropriate technique for the design of flow graph.
CO4 - Create appropriate document for the software entity.

Articulation Matrix (CO-PO and PSO Mapping)

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Lab Cycle

2. Using Selenium IDE, Write a test suite containing minimum 4 test cases.
3. Understanding Test Automation. Using Selenium write a simple test script to validate each field of the registration page (Eg: Facebook Registration Page)
4. Install Selenium server and demonstrate it using a script in Java/PHP.
5. Conduct a test suite for any two web sites.
6. Write and test a program to login a specific web page.
7. Write test cases to validate a mobile number using one time pin identification(OTP)
8. Write and Test a program to find out list of employees having salary greater than Rs 50,000 and age between 30 to 40 years.
9. Write and test a program to update 10 student records into table into Excel file.
10. Write and test a program to select the number of students who have scored more than 60 in any one subject (or all subjects).
11. Write and test a program to provide total number of objects present / available on the page.
12. Write and test a program to get the number of list items in a list / combo box.
13. Write and test a program to count number of items present on a desktop.
14. Understanding the use of bug tracking and testing tool Bugzilla and Jira
15 Open ended Experiment: Mini Project – Not for exam but to compulsory to be included in Record. (Test cases for Admission form, Shopping cart, Travel Booking, Hotel Booking, Utility Bill Payment.)

Reference book (At least 2)


21CSA388 Object Oriented Programming

Course Objective: Identify and practice the object-oriented programming concepts and techniques, practice the use of C++ classes, constructor, inheritance, friend functions and file I/O stream concepts.

Course Outcome:

1. Implement Object Oriented Programming basic concepts in C++.

2. Creating simple programs using classes and objects in C++.

3. Implement the constructors and inheritance in C++.


5. Implement Object Oriented Programs using exceptional handling concepts

CO-PO Mapping
Lab Programs

Basic Programs

8. Print hello world message.

9. Create four function calculators for fractions.

10. Write a program that takes length as input in feet and inches. The program should then convert the lengths in centimeters and meters and display it on screen.

   • Print the largest among three integer numbers.

Constructors

11. Create a class student to store and print the details of student inside a class.

12. Display odd and even numbers upto a set limit “n” by defining member functions to display even and odd numbers outside the class.

13. Define a class to represent a bank account. Include the following members

c. Data Members
v. Account No
vi. Name
vii. Type
viii. Balance
d. Member Functions
iv. Deposit an amount
v. Withdraw an amount
vi. To display name and balance

14. Execute Program to create a bank account using initial amount of Rs 500 and perform all the operations – deposit, withdraw and balance using default and parameterized constructor. Also create an array of object.

Function & Operator Overloading

8. Create class average and member functions setvalue() and mean() where setvalue() initializes values of a and b. mean() calculates the mean of two numbers and arguments to function mean() is the object of class average. Display the mean value.

9. Write an overloaded function to calculate and return the area of a square, a circle, a rectangle. Then call it from the main function

10. Overload unary minus , ++ ,=, ,and >.

11. Overload = and + in a string operation.

12. Overload binary operator + while adding complex numbers

13. Overload + operator to concatenate two strings.

14. Write a program to demonstrate this pointer.

Friend Function

15. Create a Box class which contains width and height. Using a Friend function print the width of the box object.

Inheritance
16. Create a class student and include data member roll_number. Derive a class test from student base class to include member function marks(x,y). Create class sports with member function get_score. The class result is derived from base classes test and sports that sums the values of x,y and score.

17. Create object of derived class and invoke all member functions to illustrate multilevel and multiple inheritance.

Virtual Functions

18. Implement the concept of Virtual functions

19. Implement pure virtual function and abstract class.

Exceptions and File handling

20. Implement the exception.

21. Program to read details of employees from terminal and display them by creating files.

TEXT BOOKS


21SCI398 PROJECT Credit – 6

To allow students to gain research experience in experimental and theoretical areas of basic sciences and to enhance their skills in scientific and technical writing and communication. Through the project, student will gain exposure to current and recent literature in physics, chemistry and interdisciplinary areas and will be trained to propose novel research problems and develop methodologies to solve them.
Students with an inclination towards physics will be encouraged to work on problems in both fundamental and applied branches of physics employing experimental as well as theoretical/computational techniques. Students opting for chemistry will apply experimental and theoretical techniques to solve problems in inorganic, organic and physical chemistry and their application in the areas of industry, biology, medicine, energy and environment.

Besides topics on pure physics and chemistry, students will also be encouraged to work in interdisciplinary areas such as nanosciences, medicinal chemistry, material science, modeling and simulation etc.

**ELECTIVES – MATHEMATICS**

**21MAT431**  
**OPERATIONS RESEARCH**  
3-0-0  3

**OBJECTIVES:**
To enable students to
- Understand the concept of linear programming and its problems
- Apply the knowledge of networks

**Unit I**


**Unit II**

**Transportation Models:** Introduction to transportation - mathematical formulation of transportation problem, methods for initial basic feasible solution methods, MODI method for optimal.
Unit III

**Assignment Models:** Introduction to assignment problem, mathematical formulation of assignment problem.

Unit IV

**Queuing Theory:** Introduction to queuing theory, characteristics of queuing theory, single channel queuing models with finite and infinite size, solution to single channel queuing models.

Unit V

**CPM and PERT:** Network logic, concepts and definition, network scheduling by critical path method, program evaluation and review technique.

**TEXTBOOKS AND REFERENCES:**


21MAT432 NUMERICAL METHODS 3-0-0 3

**OBJECTIVES:** To enable students to
- Understand the concept of interpolation and approximation
- Apply various techniques of solving transcendental and polynomial equations

Unit I
Roots of Transcendental and Polynomial Equations: Bisection method, Iteration methods based on first degree equation, Rate of convergence, system of nonlinear equations.
Solution of System of Linear Algebraic Equations: Iteration methods
Sections: 2.2, 2.3, 2.5, 2.7, 3.4, 3.5, 3.6

Unit II

Interpolation and Approximation: Lagrange and Newton interpolation for unequal intervals, Finite difference operators, Interpolating polynomials using finite differences.
Sections: 4.2, 4.3, 4.4.

Unit III

Differentiation and Integration: Numerical differentiation, Methods based on interpolation, Numerical integration, Methods based on undetermined coefficients.
Sections: 5.2, 5.6, 5.7, 5.8

Unit IV

Sections: 6.1, 6.3, 6.4

Unit V

Sections: 12.1, 12.2, 12.3

TEXTBOOKS:

REFERENCES:


21MAT433 INTEGRAL TRANSFORMS AND FOURIER SERIES  3-0-0  3

OBJECTIVES: To enable students to

- Acquaint with the knowledge of fourier analysis and Laplace transforms
- Solve the linear ordinary differential equations

Unit I

Fourier Analysis: Fourier series, Complex Form of Fourier Series, Parseval’s Identity,

Unit II

Fourier Integrals, Fourier integral theorem.

Unit III

Infinite Complex Fourier Transforms, Sine and Cosine Transforms, Properties, Convolution theorem and Parseval’s theorem.

Unit IV
**Laplace Transforms:** Laplace Transforms, Inverse Transforms, Properties, Transforms of Derivatives and Integrals, Second Shifting Theorem, Unit Step Function and Dirac-Delta Function, Differentiation and Integration of Transforms.

**Unit V**

Convolution, Initial and Final Value Theorems, Periodic Functions, Solving Linear Ordinary Differential Equations with Constant Coefficients, System of Differential Equations and Integral Equations.

**TEXTBOOKS:**


**REFERENCES:**


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**21MAT434**  
**APPLIED STATISTICS**  
**OBJECTIVES:** To enable students to
- Understand the concept of statistical inference of two samples
- Apply statistical techniques in quality control
Unit I

Sections: 9.1-9.9

Unit II

Statistical Inference for Two Samples: Inference on the Difference in Means of Two Normal Distributions, Variance Known and Unknown, A nonparametric tests for difference in Two means, Paired t test, Inference on the variances of the Two Normal Distributions.
Sections: 10.1-10.6

Unit III

Sections: 13.1-13.4

Unit IV

Design of Experiment with several factors: Introduction – Latin Square Design – statistical model for LSD, computation of sum of squares – two factor factorial experiment – main and interaction effects, data and statistical model- computation of sum of squares.
Sections : 14.1-14.5

Unit V

Statistical Quality Control: Quality improvement and statistics, Introduction to control limits - control charts for variables – X-bar chart, R-chart, S chart for individual observations- attribute control charts – Control charts for Proportions and for defects per unit.
Sections: 15.1-15.6
TEXTBOOKS:


REFERENCES:


21MAT435 NUMBER THEORY

OBJECTIVES: To enable students to

• Understand the concept of divisibility, congruencies and arithmetical functions
• Understand the concept of primitive roots and Diophantine equations

Unit I

Divisibility: Definition, properties, division algorithm, greatest integer function (Sec 1.1)
Primes: Definition, Euclid’s Theorem, Prime Number Theorem (statement only), Goldbach and Twin Primes conjectures, Fermat primes, Mersenne primes. The greatest common divisor: Definition, properties, Euclid’s algorithm, linear combinations and the GCD - The least common multiple: Definition and properties. The Fundamental Theorem of Arithmetic: Euclid’s Lemma, canonical prime factorization, divisibility, gcd, and lcm in terms of prime factorizations. Primes in arithmetic progressions: Dirichlet’s Theorem on primes in arithmetic progressions (statement only) (Sec 1.2 to 1.5)

Unit II

Congruences: Definitions and basic properties, residue classes, complete residue systems, reduced residue systems - Linear congruences in one variable, Euclid’s algorithm -
Simultaneous linear congruences, Chinese Remainder Theorem - Wilson's Theorem - Fermat's Theorem, pseudoprimes and Carmichael numbers - Euler's Theorem (Sec 2.1 to 2.6).

Unit III

Arithmetic functions: Arithmetic function, multiplicative functions: definitions and basic examples - The Moebius function, Moebius inversion formula - The Euler phi function, Carmichael conjecture - The number-of-divisors and sum-of-divisors functions - Perfect numbers, characterization of even perfect numbers (Sec 3.1 to 3.6).

Unit IV

Quadratic residues: Quadratic residues and nonresidues - The Legendre symbol: Definition and basic properties, Euler's Criterion, Gauss' Lemma - The law of quadratic reciprocity (Sec 4.1 to 4.3).

Unit V

Primitive roots:
The order of an integer - Primitive roots: Definition and properties - The Primitive Root Theorem: Characterization of integers for which a primitive root exists (Sec 5.1 to 5.3).

Diophantine Equations
Linear Diophantine Equations - Pythagorean triples – Representation of an integer as a Sum of squares (Sec 6.1, 6.3, 6.5).

TEXTBOOK:

REFERENCES:


21MAT436 SPECIAL FUNCTIONS 3-0-0 3

OBJECTIVES: To enable students to
• Understand gamma and beta functions
• Solve the Legendre equations using various techniques

Unit I

Gamma and Beta Functions and Elliptic Functions
Part II: 4.1 – 4.11

Unit II

Special functions, power series solution of differential equations, ordinary point; Solution about singular points, Frobenius method. Bessel’s equation, solution of Bessel’s equation, Bessel’s functions $J_n(x)$.
Part II: 8.5-8.6, 8.8-8.10, 11.1, 11.2.

Unit III

Recurrence Formulae, Equations reducible to Bessel’s equation, orthogonality of Bessel’s Functions, A generating function for $J_n(x)$.
Part II: 11.8, 11.10, 11.11.

Unit IV
Legendre’s equation, Legendre’s polynomial $P_n(x)$, Legendre’s function of the second kind $[Q_n(x)]$, General solution of Legendre’s equation, Rodrigue’s formula, Legendre polynomials, A generating function of Legendre’s polynomial.

Part II: 9.1-9.4.

Unit V

Orthogonality of Legendre polynomials, Recurrence formulae for $P_n(x)$ Green’s function – Green’s Identities – Generalized functions


TEXTBOOKS:
1) M.D. Raisinghania, Ordinary and Partial Differential Equations, S.Chand, 18th edition, 2016

REFERENCES:
2) N. N. Lebedev - Special Functions and Their Applications, PHI.

ELECTIVES – PHYSICS

21PHY331 MEDICAL PHYSICS 3-0-0 3

OBJECTIVE: To enable students to provide Medical Physics support with the goal of improving the effectiveness and safety in the use of Physics and technologies in medicine.

Course outcomes:
1. Ability to describe the mechanism of the body.
2. To explain the acoustics of the body.
3. Ability to explain the application of X-rays in medical field.
4. Ability to explain the application of radiation in medical field.
5. Ability to explain the protection given to patient, staff and public from radiation.

UNIT I:


UNIT II:

**Acoustics of the body**: Nature and characteristics of sound, Production of speech, Physics of the ear, Diagnostics with sound and ultrasound. Optical system of the body: Physics of the eye. Electrical system of the body: Physics of the nervous system, Electrical signals and information transfer.

UNIT III:

**X-RAYS**: Electromagnetic spectrum, production of x-rays, x-ray spectra, Bremsstrahlung, Characteristic x-ray. X-ray tubes & types: Coolidge tube, x-ray tube design, tube cooling stationary mode, Rotating anode x-ray tube, Tube rating, quality and intensity of x-ray. X-ray generator circuits, half wave and full wave rectification, filament circuit, kilo voltage circuit, types of X-Ray Generator, high frequency generator, exposure timers and switches, HT cables, HT generation.

UNIT IV:

**Radiation Physics**: Radiation units exposure, absorbed dose, units: rad, grey, relative biological effectiveness, effective dose, inverse square law. Interaction of radiation with

UNIT V:


Mapping of CO’s and PO’s

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**TEXT BOOKS:**

REFERENCES:

1) Christensen’s Physics of Diagnostic Radiology: Curry, Dowdey and Murry - Lippincot Williams and Wilkins (1990)

21PHY332 RENEWABLE ENERGY AND ENERGY HARVESTING     3-0-0    3

OBJECTIVE: To enable students to understand the use of different sources of energy.

Course outcomes:

1. Understand the need of energy conversion and the various methods of energy storage.
2. Explain the field applications of solar energy.
3. Identify Winds energy and Tidal energy as alternate form of energy and to know how it can be tapped.
4. Ability to explain the Geothermal and Hydro energy, its mechanism of production and its applications.
5. Ability to explain the electro-magnetic energy harvesting and its application.

UNIT I:

UNIT II: Solar energy: Solar energy, its importance, storage of solar energy, solar pond, non convective solar pond, applications of solar pond and solar energy, solar water heater, flat plate collector, solar distillation, solar cooker, solar green houses, solar cell, absorption air conditioning. Need and characteristics of photovoltaic (PV) systems, PV models and equivalent circuits, and sun tracking systems.


Hydro Energy: Hydropower resources, hydropower technologies, environmental impact of hydro power sources.
Piezoelectric Energy harvesting: Introduction, Physics and characteristics of piezoelectric effect, materials and mathematical description of piezoelectricity, Piezoelectric parameters and modeling piezoelectric generators, Piezoelectric energy harvesting applications, Human power

UNIT V:

Electromagnetic Energy Harvesting: Linear generators, physics mathematical models, recent applications.

Carbon captured technologies, cell, batteries, power consumption

Environmental issues and Renewable sources of energy, sustainability.

Mapping of CO’s and PO’s

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REFERENCES:

1) Non-conventional energy sources - G.D Rai - Khanna Publishers, New Delhi
2) Solar energy - M P Agarwal - S Chand and Co. Ltd.
21PHY333 INTRODUCTION TO NANOPHYSICS AND APPLICATIONS  3-0-0  3

Objective: To enable students to provide knowledge about nanotechnology and its applications in Physics by focusing on different areas.

Course outcomes:
1. To acquire the knowledge of nano-size and its aspects different fields of sciences
2. To explain the properties of nanomaterials and size-effect.
3. To explain different approaches in fabricating nanomaterials and to understand the basics knowledge of quantum confinement in fabricating nanomaterials.
4. To explain how nanomaterials are characterized using different instruments and their principle of working.
5. To apply the applications of nanomaterials in different fields of physics.

UNIT I:

Introduction: relation of nano to other sciences - chemistry, biology, astronomy, geology, nano in nature.

UNIT II:

Properties of nano-materials: size effect, particle’s size, shape, and density, melting point, surface tension, gettability, surface area and pore, composite structure, crystal structure, surface characteristics; mechanical, electrical, properties, and optical properties.

UNIT III:

UNIT IV:

Characterization of nanoparticles: X-Ray diffraction, examples of XRD, Debye-Scherzer formula; FTIR: principle, methodologies and accessories; SEM: basics and primary mode of operation, applications; TEM: basic principles; STM: basic principles and instrumentation; AFM: basics, modes of operation and applications; Photoluminescence: basic principles.

UNIT V:

Application of nanophysics: Carbon nanostructures: Fullerenes, CNTs and their applications; MEMS and NEMS devices; Quantum Cascade Lasers, Smart materials, GMR and Spintronic, multifarious.

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REFERENCES:

OBJECTIVE: To enable students to understand the atmosphere of Earth and the climate change.

Course outcomes:
1. Be able to describe the basic structure of an atmosphere and the climate system.
2. Be able to use fundamental thermodynamics to derive expressions for the variation of temperature, pressure, and air density with height.
3. Be able to explain fundamental fluid dynamics involved in atmosphere.
4. Be able to explain stratospheric chemistry approach involved in atmosphere.
5. Be able to describe the detailed explanation of climate change.

UNIT I:

Earth - Atmosphere system – Introduction, Composition and structure, Radiative equilibrium, Energy budget, General circulation, Historical perspectives, Weather & Climate

UNIT II:

Atmospheric thermodynamics – Ideal gas law, First law of thermodynamics, Atmospheric composition, Hydrostatic balance, Entropy & potential temperature, Parcel concepts, Available potential energy, Moisture in the atmosphere, Saturated adiabatic lapse rate, Tephigram, Cloud formation
Atmospheric radiation – Basic physical concepts, Radiative transfer equation, basic spectroscopy of molecules, Transmittance, Absorption by atmospheric gases, Heating rates, Greenhouse effect revisited, Simple scattering model.

UNIT III:

Basic fluid dynamics – Mass conservation, material derivative, alternative form of continuity equation, equation of state for the atmosphere, Navier-Stokes equation, Rotating frames of reference, equations of motion in coordinate form, geostrophic and hydrostatic approximation, Pressure coordinates and geopotential, Thermodynamic energy equation; Atmospheric fluid dynamics – vorticity and potential vorticity, Boussinesq approximation, Quasi-geostrophic motion, Gravity waves, Rossby waves, Boundary layers, Instability

UNIT IV:

Stratospheric chemistry – Thermodynamics and chemical reactions, Chemical kinetics, Bimolecular reactions, Photo-dissociation, Stratospheric ozone, Transport of chemicals, Antarctic ozone hole.
Atmospheric remote sounding – Observations, remote sounding from space and ground;
Atmospheric modeling – Hierarchy of models, Numerical methods, Uses of complex numerical models, Lab models

UNIT V:

Climate change – Introduction, energy balance model, some solutions of the linearised energy balance model, Climatic feedbacks, Radiative forcing due to increase in Carbon dioxide.
Projects based on Modules 4 and 5 (Reading a journal paper & reproducing calculations, Numerical modeling and / or data analyses)

TEXTBOOKS/REFERENCES
3. Holton JR: An introduction to Dynamic Meteorology, 4E, AP, 2004

Mapping of CO’s and PO’s

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**21PHY335 BIOPHYSICS 3-0-0 3**

**OBJECTIVE:** To enable students to study the selected biological phenomena using physical principles.

**Course outcomes:**

1. Ability to explain the basics laws in physics and chemistry, various techniques to study biomolecules.
2. Be able to apply various spectroscopic methods to study biomolecules.
3. Ability to explain fundamentals of molecular modelling and macromolecular structure.
4. Be able to apply the neuro science as application in biophysics.
UNIT I:


UNIT II:

Spectroscopy: UV spectroscopy, circular dichroism, Fluorescence spectroscopy, IR, Raman and Electron spin spectroscopy, NMR spectroscopy.

UNIT III:

Molecular Modeling & Macromolecular Structure: building the structure of H₂O₂, nucleic-acid structure, monomers, polymers, double helical structure of DNA, Polymorphism and nanostructure of DNA, structure of RNA, protein structure: amino acids, virus structure

UNIT IV:


UNIT V:

TEXTBOOKS:

Mapping of CO’s and PO’s

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21PHY336 SPACE PHYSICS 3-0-0 3

OBJECTIVE: To enable students to study in detail about physics and kinematics of the planetary bodies.

Course outcomes:
1. Be able to brief about the history of solar-terrestrial physics.
2. Be able to explain about space plasma physics.
3. Be able to explain solar winds and Interplanetary Magnetic Field.
4. Be able to explain the interaction of solar winds with magnetized planets.
5. Be able to brief about magnetosphere.

UNIT I:

Brief history of solar-terrestrial physics – The variables Sun and the heliosphere. Earth’s space environment and upper atmosphere.
UNIT II:


UNIT III:

Solar wind & Interplanetary Magnetic Field(IMF), Shocks and Instabilities in space.

UNIT IV:

Solar wind interactions with magnetized planets – Introduction, planetary magnetic fields, spherical harmonic expansions, geomagnetic field and its measurements, variations in Earth’s field.

UNIT V:

Magnetosphere – Dynamics, Sw-Magnetosphere interactions; Ionosphere, Currents in space and Ionosphere; Neutral – Dynamics.

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</table>
Course objective: Understanding of the scientific method of work and the evolution of physics from the classical to its modern era.

Course Outcomes:

1. To apply the basic ideas of Lagrangian mechanics to solve classical problems.
2. To explain the failures of Classical mechanics and the origin of Quantum mechanics.
3. To explain the dual nature of light and uncertainty principle and apply it in answering curious question.
4. To apply the advancement in Quantum mechanics in problem solving.

Unit-1


Unit-2

Quantum Theory: Origin of Quantum theory, Black body Radiations, Distribution of energy in the Spectrum of black body Radiation, Photoelectric effect, Laws of photoelectric emission, Ritz combination principle, Planck’s radiation.

Unit-3

Unit-4

**Schroedinger Equation and its Application:** Concept of Wave function “Ψ”, Schroedinger Equations- Time dependent form, Expectation Value, Operators, Time Independent Schrodinger equation (Steady State form), Particle in one dimensional box, energy Quantization, Wave function.

**Reference Books:**

- Modern Physics – J. B. Rajam – 2004
- Introduction to Quantum Mechanics - David J. Griffiths – 1994

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**Course objective:** Understanding the physics of semiconductors materials and to discuss their functionalities in modern electronic and optoelectronic devices.

**Course outcome:**
1. To apply the ideas of semiconductors and explain the concept of Brillouin zone
2. To explain the concept doping and to apply it to solve problems on fermi energy and DoS
3. To explain the concept of electron-hole pair generation
4. To apply the concept of semiconductors in constructing electronic devices

Unit 1:
**Introduction to solid state materials**: crystal structure - Reciprocal lattice - Brillouin zone and rules for band (k - space) representation. Dynamics of electrons in periodic potential: Kronig - penny and nearly free electron models - Real methods for band structure calculations; Bandgaps in semiconductors - Holes and effective mass concept - Properties of conduction and valance bands.

Unit 2:
**Carriers and doping**: Fermi distribution and energy - Density of states - Valance and conduction band density of states - intrinsic carrier concentration - intrinsic Fermi level. Extrinsic semiconductors: n and p type doping - Densities of carriers in extrinsic semiconductors and their temperature dependence - extrinsic semiconductor Fermi energy level - Degenerate and non - degenerate semiconductors - Bandgap engineering

Unit 3:

Unit 4:
**Semiconductor as device**: Processing of Semiconductor devices (Brief), p - n and Semiconductor junctions - Homo and hetero Junctions. Semiconductors Quantum structures, Density of states and excitons, Semiconductor photonic structures: 1D, 2D and 3D photonic crystals.

Reference books:

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ELECTIVES – COMPUTER SCIENCE

21CSA431 SOFTWARE ENGINEERING 3-0-0 3

COURSE OBJECTIVE: The course covers a spectrum of software processes and the initial requirements elicitation through design and development to system evolution.

Course Outcomes:

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<th>CO</th>
<th>Course Outcome</th>
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<tr>
<td>CO1</td>
<td>Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.</td>
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<td>CO2</td>
<td>Students get an overall idea about SRS and different Process Models.</td>
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<tr>
<td>CO3</td>
<td>Decide on a process model for developing a software project</td>
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<td>CO4</td>
<td>An overall idea about Testing strategies, different methods and Testability concept is provided to the students.</td>
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<tr>
<td>CO5</td>
<td>All maintenance concepts, types of changes, maintenance side effects are given to students along with the idea of software re-engineering. Apply quality attributes in software development life cycle.</td>
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CO – PO Mappings

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UNIT I:


UNIT II:


UNIT III:


UNIT IV:

UNIT V:
Software Maintenance - Reverse Engineering and Reengineering

TEXT BOOK:

REFERENCE:

21CSA432 THEORY OF COMPUTATION 3 0 0 3

OBJECTIVE: The course introduces various computation models like Finite State Automata, Push down Automata and Turing machine and also to be aware of decidability and undesirability of various problems.

<table>
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<tr>
<th>CO</th>
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<tbody>
<tr>
<td>1</td>
<td>To understand the theory and practice of theory of computation, languages</td>
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<tr>
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<td>To learn finite state machines used in computers</td>
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<td>To learn context free grammars, parsing techniques.</td>
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<td>To understand the Pushdown Automata</td>
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<td>5</td>
<td>To learn about Turing Machines (TM) used in decidability and NP Problems</td>
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</table>
UNIT I:
Introduction to Theory of Computation, Languages and Strings, Computation, Finite State Machines (FSM): Formal Definition of a DFA, Deterministic Finite Automata, Regular languages, Designing DFA, Formal Definition of an NDFA, Nondeterministic NDFAs, Minimizing States, NDFA to DFA Conversion.

UNIT II:
Regular Expressions (RE) introduction to RE, Some RE Examples, Applications of REs, Manipulating and Simplifying REs. Regular Grammars: Definition- Regular Grammars and Regular languages. Regular Languages (RL) and Non regular Languages. Properties of RLs, Canonical form of Regular languages. Pumping Lemma for Regular Grammars.

UNIT III:
Context-Free Grammars (CFG): CFGs and languages, designing CFGs, simplifying CFGs, Derivation and Parse trees, Ambiguity, Normal Forms. Chomsky Normal Form (CNF), Greibach Normal Form, Pumping Lemma for CFG.

UNIT IV:
Pushdown Automata (PDA): Definition of non-deterministic PDA, Deterministic and Nondeterministic PDAs, Non-determinism and Halting. PDA & Context-Free Grammar.

UNIT V:
Introduction to Turing machines-Variants of Turing Machines (TM), the model of Linear Bounded automata: Decidability: Definition of an algorithm, decidability,
decidable languages, undecidable languages, halting problem of TM, - Complexity: Growth rate of functions, the classes of P and NP.

TEXT BOOKS:

REFERENCES:
5) Basavaraj S. Anami, Karibasappa K G, Formal Languages and Automata theory, Wiley India, 2012

21CSA434 COMPILER DESIGN 3-0-0 3

OBJECTIVE: To enable the students to understand the various stages of compiling a program including the process of code generation and optimization.

Course Outcome

| CO1 | Understand concepts in automata theory and theory of computation. |
| CO2 | Understand the structure of compilers and the corresponding steps in the compilation process and explain scanning and lexical analysis in the context of the compilation process. |
| CO3 | Define the various categories of languages and grammars |
| CO4 | Gives an idea of various optimization techniques |
CO – PO Mapping

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Syllabus

UNIT I:
Introduction to Compilers: Language Translators- Compilation and Interpretation-Language processors –Introduction to compiler, The Phases of Compiler-Errors Encountered in Different Phases, symbol Table, Construction tools, and common programming language features.

UNIT II
Lexical Analysis: Role of Lexical Analyzer-Lexical Errors-Expressing Tokens by Regular Expressions-Converting Regular Expression to DFA- Minimization of DFA-Language for Specifying Lexical Analyzers-LEX-Design of a simple lexical analyzer for a programming language.

UNIT III

UNIT IV
Syntax Directed Translation: Syntax directed Definitions-Construction of Syntax Tree, Bottomup Evaluation of S-Attribute, Design of predictive translator - Type Systems-
Specification of a simple type checker-Equivalence of Type Expressions-Type Conversions.

UNIT V

TEXT BOOK:

REFERENCES:
2) Steven S. Muchnick, “Advanced Compiler Design & Implementation”, Morgan Kaufmann
3) C. N. Fisher and R. J. LeBlanc “Crafting a Compiler with C”, Pearson Education

21CSA435 DISTRIBUTED COMPUTING 3-0-0 3

Objective: To understand the basic concept of client server computing and various distributed computing technologies that are in use today.

Course Outcome

<table>
<thead>
<tr>
<th>CO1</th>
<th>Understand the requirements for distributed computing systems and how they can be used to facilitate the programming of distributed systems.</th>
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<td>CO2</td>
<td>To learn and apply knowledge of distributed computing techniques and methodologies</td>
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<td>CO3</td>
<td>Understand Distributed File Systems and Distributed Shared Memory and apply Distributed web-based system.</td>
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<tr>
<td>CO4</td>
<td>To gain experience in the design, development, and performance analysis of distributed applications.</td>
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CO-PO Mapping

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UNIT I:
Distributed Systems: Fully Distributed Processing systems –Networks and interconnection structures – designing a distributed processing system

UNIT II:
Distributed systems: Pros and Cons of distributed processing –Distributed databases – the challenges of distributed data –loading, factors –managing the distributed resources division of responsibilities

UNIT III:
Design considerations: Communication Line loading –line loading calculations partitioning and allocation -data flow systems –dimensional analysis-network database design considerations analysis-database decision trees synchronization of network databases

UNIT IV:
Client server network model: Concept –file server –printer server and e-mail server

UNIT V:
Distributed databases: An overview, distributed databases-principles of distributed databases levels of transparency-distributed database design-the R* project techniques problem of heterogeneous distributed databases

TEXT BOOKS:
[2]. Uyless D. Black, “Data communication and distributed networks”
[3]. Joel M.Crichllow “introduction to distributed & parallel computing

21CSA436 Data Mining 3 0 0 3

COURSE OBJECTIVE: To introduce students to the basic concepts and techniques of Data Mining. To develop skills of using recent data mining software for solving practical problems

COURSE OUTCOMES

1. To understand data mining basic concepts, types of data mining and Preprocessing techniques.

2. To Understand and apply a wide range of clustering, estimation, prediction, and classification algorithms, including k-means clustering and Mining frequent patterns.

3. To apply the most current data mining techniques and applications, such OLAP & OLTP concepts and other current issues.

4. To Understand the mathematical statistics foundations of the algorithms outlined above.

Articulation Matrix (CO-PO and PSO Mapping)

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UNIT I:
Introduction: Evolution and Importance of Data Mining-Types of Data and Patterns Mined-
Technologies-Applications-Major Issues in Data Mining.

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

UNIT III:

UNIT IV:
Mining Frequent Patterns: Basic Concept – Frequent Item Set Mining Methods – Mining Association Rules – Association to Correlation Analysis- Classification and Predication: Issues - Decision Tree Induction - Bayesian Classification – Rule Based Classification – k-Nearest mining Classification. Prediction –Accuracy and Error measures - Clustering: Overview of Clustering – Types of Data in Cluster Analysis – Major Clustering Methods.

TEXT BOOKS / REFERENCES:
1. Jiawei Han, Micheline Kamber and Jian Pei, “Data mining concepts and Techniques”, Third Edition, Elsevier Publisher, 2006.
Objectives: This AI course covers key concepts like Statistics, Intelligence, Heuristic search, knowledge representation, and understanding. This program is delivered through our interactive learning model with live sessions by industry oriented projects.

Course Outcomes

CO1: Understand history and basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning

CO2: Demonstrate awareness heuristic searching mechanism of intelligent systems

CO3: Explore the knowledge representation of intelligent systems through various rules and theorems.

CO4: Understand the various searching techniques, constraint satisfaction problem and example problems- game playing techniques.

CO – PO Mappings

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Unit – 1

Unit 2

Unit 3

Unit 4

TEXTBOOKS:

REFERENCES:
2. Introduction to Artificial Intelligence – Eugene Charnaik, Drew McDermott (Pearson Education Asia)
Course Objective (About one or two line)

• The course will introduce the students to the basic concepts of data analysis
• It will explore the concepts initially through computational experiments and then try to understand the concepts/theory behind it.

Course Outcomes

CO1: Analyse the data generated by experiments and simulation

CO2: Develop models for the systems of interest from the observed data

CO3: Evaluate the efficacy of different data driven models developed in order to predict the behaviour of the system

Articulation Matrix (CO-PO and PSO Mapping)

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Unit I

The need for data analysis – variables and data – graphs and distributions – measures of centre and spread – normal distribution – z-scores – correlation – functions

Unit-II

Unit III


Unit IV

Data Visualization Techniques, Hierarchical Visualization Techniques, Visualizing Complex Data and Relations.

Textbooks / References

**Course objective:** The course covers the concepts of image processing and basic analytical methods to be used in image processing. To familiarize students with image enhancement, image compression techniques and understanding segmentation and morphological processing techniques.

**Course outcomes:**

CO1: Students will be able to compare different methods for image acquisition, storage and representation in digital devices and computers

CO2: Students will be able to interpret the mathematical principles in digital image enhancement and apply them in spatial domain

CO3: Students will be able to interpret the mathematical principles in digital image enhancement and apply them in frequency domain

CO4: Students will be able to apply various methods for segmenting image and identifying image components

CO5: Students will be able to summarize different reshaping operations on the image and their practical applications

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UNIT I
Introduction to Image processing: Fundamental steps in image processing, Components of image processing system, Pixels, Imaging Geometry, Spatial Domain, Frequency Domain, sampling and quantization, Basic relationship between pixels, Applications of Image Processing

UNIT II

UNIT III

UNIT IV

UNIT V

Morphological Operations Basics of Set Theory, Dilation and Erosion - Dilation, Erosion, Structuring Element, Opening and Closing, Hit or Miss Transformation. Representation and Description Representation

TEXT BOOK:

2. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing (English) 3rd Edition

REFERENCE:


21CSA440IOT 3-0-0 3

OBJECTIVE: To explore various components of Internet of things such as Sensors, internetworking and cyber space and to design and implement IoT circuits and solutions.

Course Outcome
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<tr>
<th>CO1</th>
<th>Understand general concepts of Internet of Things</th>
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<td>Recognize various devices, sensors and applications</td>
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<td>CO3</td>
<td>Apply design concept to IoT solutions</td>
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<td>CO4</td>
<td>Analyze various M2M and IoT architectures</td>
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<td>CO5</td>
<td>Evaluate design issues in IoT applications</td>
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<td>CO6</td>
<td>Create IoT solutions using sensors, actuators and Devices</td>
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**CO-PO Mapping**

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**Introduction to IoT:** Sensing, Actuation, Networking basics, Communication Protocols, Sensor Networks, Machine-to-Machine Communications, IoT Definition, Characteristics. IoT Functional Blocks, Physical design of IoT, Logical design of IoT, Communication models & APIs.

**M2M to IoT** - The Vision - Introduction, From M2M to IoT, M2M towards IoT - the global context, A use case example, Differing Characteristics. Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT

**M2M vs IoT An Architectural Overview** - Building architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. Reference Architecture and Reference Model of IoT

**IoT Reference Architecture** - Getting Familiar with IoT Architecture, Various architectural views of IoT such as Functional, Information, Operational and Deployment. Constraints affecting design in IoT world - Introduction, Technical design Constraints.
Domain specific applications of IoT: Home automation, Industry applications, Surveillance applications, Other IoT application.


TEXT BOOKS: