Amrita Vishwa Vidyapeetham

Department of Sciences

Amrita School of Arts and Science

Mysuru Campus, Mysuru

BSc (Physics, Mathematics and Computer Science) Syllabus

Semester I

21ENG101 Communicative English 2 0 2 3

Objectives:

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

COs	Course Outcomes	Justification
CO 1	Demonstrate competency in all the four linguistic skills, viz. listening, speaking, reading and writing	Assignments, Reading Comprehension, Speaking and Listening Activities
CO 2	Apply different styles of communication in professional context	Group Discussion, debates
CO 3	Participate in different planned & extempore communicative activities	Extempore speeches, presentations
CO 4	Interpret and discuss facts and information in a given context	Reading Comprehension, writing tasks involving critical analysis

CO 5	Develop an appreciation for human values	Literary Analysis and Discussion of Ethical Precepts

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:

1. Ruskin Bond, *Time Stops at Shamli and Other Stories,* Penguin Books India Pvt Ltd, 1989
2. Syamala, V. *Speak English in Four Easy Steps*, Improve English Foundation Trivandrum: 2006
3. Online sources
4. M Nagarajan, T Sashisekaran, S Ramamurthy *Indian Prose for Effective Communication : A Practical Programme for Colleges* Trinity Press (An imprint of Laxmi Publications Pvt. Ltd.

References:

5. Ruskin Bond, *Time Stops at Shamli and Other Stories,* Penguin Books India Pvt Ltd, 1989
6. Martinet, Thomson, *A Practical English Grammar*, IV Ed. OUP, 1986.
7. Murphy, Raymond, *Murphy's English Grammar,* CUP, 2004

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)

PHYSICS PAPER - I

21PHY106MECHANICS 3-0-2 4

Course Objectives: To enable students to understand Newtonian mechanics and apply Newton's laws to explain natural physical phenomena.

Course Outcomes (CO):

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

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

Fundamental Definitions, Flow characteristics, Classifications of fluids, Fluid properties, Ideal fluids, Equation of Continuity,Irrational and rational Flow, Potential and stream functions, Viscous fluids, critical velocity, Derivation of Poiseuille's Equation.

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.
7. Conservation of momentum in an explosion.
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:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	1	3	3	3		1				3	2	3	
CO2	3	1	3	3	3		1				3	2	3	
CO3	3	1	2	1	3		1				3	2	3	
CO4	3	1	3	3	3		1				3	2	3	
CO5	3	2	2	3	3		1				3	2	3	
CO6	3	2	3	3	3	2	2			3	2	2	3	

TEXTBOOKS:

1. J C Upadhyaya, "*Classical Mechanics*", Himalaya Publishing house, Reprint-**2013**.
2. D S Mathur, "*Mechanics*", S Chand and company, New Delhi, Reprint-**2001**.
3. BrijLal, N Subrahmanyam, "*Properties of matter*", 6th edition, Eurasia publishing house Ltd.New Delhi, Reprint-**1993**.

REFERENCES:

1. Halliday, Resnick, Jearl Walker, "*Principles of Physics"* 9th edition, Wiley, **2013**.
2. Berkeley Physics Course, Vol-1 "*Mechanics"*, 2nd edition, Charles Kittle, Walter D Knight,Malvin A Ruderman, Carl A Helmholz, Burton J Moyer, Tata McGraw Hill Education Private Limited, New Delhi, (SIE)-**2011**.
3. D S Mathur, *"Elements of properties of matter"*, S Chand and company, New Delhi, Reprint-**2007**.

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):

CO1	To gain knowledge in the basic concepts of vector valued functions, limits, derivatives and its geometrical interpretations.
CO2	Understand the concept of scalar and vector fields.
CO3	Understand and apply the concepts extreme values and Lagrange multipliers for simple optimization problems.
CO4	Understand and apply the concepts line and double integrals to various problems including Green's theorem for plane

CO5	Understand the concepts of surface integrals, divergence theorem and Stokes theorem.

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

Extreme values of Functions – The Mean Value Theorem – Monotonic Functions and the First Derivative Test – Concavity and Curve Sketching – Integration-Riemann Sum – Definite integrals – The Fundamental Theorem of Calculus.

(Sections 4.1-4.4, 5.2-5.4)

Unit III

Functions in Several Variables – Limits and Continuity in Higher Dimensions – Partial Derivatives – Chain Rule – Directional Derivatives and Gradients – Tangent Planes and Differentials – Extreme Values and Saddle Points – Lagrange Multipliers.

(Sections 14.1-14.8)

Unit IV

Line integrals – Vector fields, Work, Circulation and Flux – Path Independence, Potential Functions and Conservative Fields – Green's Theorem in the Plane.

(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:

1. G.B. Thomas and R.S. Finney, *Calculus*, 11th Edition, Pearson, 2009.

References:

1. Monty J. Strauss, Gerald J. Bradley and Karl J. Smith, *Calculus*, 3rd Edition, 2002.
2. Dennis G. Zill and Michael R.Cullen, *Advanced Engineering Mathematics*, 2nd edition, CBS Publishers, 2012.
3. Srimanta Pal and Subhodh C Bhunia, *Engineering Mathematics*, 9th edition, John Wiley and Sons, 2012.
4. James Stewart, *Calculus: Early Transcendentals*, 8th Edition, Cengage (India), 2016.

Mapping of CO's and PO's

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	1	2	-	2	3	3	4
CO2	1	3	-	2	4	3	4
CO3	1	2	1	2	3	3	3
CO4	2	3	2	1	4	2	4
CO5	1	3	1	1	4	2	4

COMPUTER SCIENCE PAPER - I

21CSA102PROBLEM SOLVING AND ALGORITHMIC THINKING3-0-2 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:

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

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

Problem Solving and Algorithmic Thinking Overview – problem definition, Algorithm – definition, Algorithm Analysis: Algorithm, Properties of a good algorithm, efficiency considerations, Complexity: time complexity, space complexity, Asymptotic notations: Big O notation, best case, worst case, average case, simple examples, recursion and its elimination- recursive and no-recursive algorithms for binary search. Practical examples, properties, representation, algorithms v/s programs.

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:

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

REFERENCES:

1. Ferragina P, Luccio Computational Thinking: First Algorithms, Then Code. Springer; 2018.

2. Beecher Computational Thinking: A beginner's guide to Problem-solving and Programming. BCS Learning & Development Limited; 2017.

Mapping of CO's and PO's:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO 8**	**PO 9**	**PO 10**	**PS O1**	**PS O2**	**PS O3**	**PS O4**
CO 1	3	1	1	1			1					1	1	1
CO 2	3	2	3		3			3	3	3		1	2	
CO 3	2	1	2				1			1	2	1		
CO 4	1	1	2	1	2		1	1			2	1		

21ENV200Environmental Science and Sustainability3-0-0 3

Unit 1

State of Environment and Unsustainability, Need for Sustainable Development, Traditional conservation systems in India, People in Environment, Need for an attitudinal change and ethics, Need for Environmental Education, Overview of International Treaties an Conventions, Overview of Legal and Regulatory Frameworks.
Environment: Abiotic and biotic factors, Segments of the Environment, Biogeochemical Cycles, Ecosystems (associations, community adaptations, ecological succession, Food webs, Food chain, ecological pyramids), Types of Ecosystems – Terrestrial ecosystems, Ecosystem Services, Economic value of ecosystem services, Threats to ecosystems and conservation strategies.

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

Unit 2

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

Unit 3

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

TEXTBOOKS/ REFERENCES:

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

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.

COs	Course Outcomes	Justification
CO 1	Demonstrate competency in oral and written communication	Presentation, writing assignment
CO 2	Apply different styles of communication in professional context	Business letters, circulars, memos, e-mails
CO 3	Participate in different planned & extempore	Presentation, speech

	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**, d**angling etc)

Unit II

Instruction, Suggestion & Recommendation - Sounds of English: Stress, Intonation

- Essay writing: Analytical and Argumentative

Unit III

Circulars,Memos – BusinessLetters - 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
2. Michael Swan. *Practical English Usage*, Oxford University Press. 2005
3. Anderson, Paul. *Technical Communication: A Reader Centered Approach*,

V Edition, Hercourt, 2003.

4. Raymond V. Lesikar and Marie E. Flatley. *Basic Business Communication*, Tata

McGraw Hill Pub. Co. New Delhi. 2005. Tenth Edition.

5. Thampi, G. Balamohan. *Meeting the World: Writings on Contemporary Issues*. Pearson, 2013.
6. Lynch, Tony. *Study Listening*. New Delhi: CUP, 2008.
7. Kenneth, Anderson, Tony Lynch, Joan Mac Lean. *Study Speaking*. New Delhi: CUP, 2008.
8. Marks, Jonathan. *English Pronunciation in Use*. New Delhi: CUP, 2007.
9. Syamala, V. *Effective English Communication For You (Functional Grammar, Oral and Written Communication)*: Emerald, 2002.

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)

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:

CO1	Ability to explain the kinetic theory of gases.
CO2	To understand the basic concept of heat and first law of thermodynamics.
CO3	To gain the knowledge about Carnot's engine. Second law of thermodynamics and itsapplication.
CO4	Interpretation thermodynamic potential and Maxwell's equation.
CO5	To analyse the statistical interpretation of laws of thermodynamics
CO6	Ability to do experiment on heat and thermodynamics.

Unit I

Kinetic Theory of Gases: Introduction, Kinetic Theory of Gases, kinetic theory as particle model and usefulness of the model in explaining the regular structure of crystals (Review), an ideal gas – a macroscopic description, an ideal gas – a microscopic description, kinetic calculation of pressure, kinetic interpretation of temperature, ideal gas scale, intermolecular forces, specific heat of an ideal gas, law of equipartition of energy.

Mean free path, van der Waal's equations of State, critical constants, application to liquefaction of gases.

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.

UnitIV

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.
6. Determination of Thermal conductivity of a bad conductor by Lee Charlton method.
7. Specific heat of a solid by the method of mixtures.
8. Determination of latent heat of fusion of ice by calorimetric method.
9. J by Joules Calorimeter.
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

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	2	2	3	3	2	1				3	2	3	
CO2	3	2	2	3	3	1	1				3	2	3	
CO3	3	2	3	3	3	1	1				3	2	3	
CO4	3		2	3	3	1	1				3	2	3	
CO5	3	2	3	3	3	1	1				3	2	3	
CO6	3	3	3	3	3	2	2			3	2	3	3	

TEXTBOOKS:

1. Halliday and Resnick: Fundamentals of Physics, 9th edition, Wiley India, 2011.
2. Brijlal,N. Subramanyam P.S. Hemne: Heat Thermodynamics and Statistical Physics, 1st Edition. S Chand Publishing, 2007.
3. S C Gupta: Thermodynamics, 1st edition, Pearson, 2005.

REFERENCES:

1. R. H. Dittaman and M. W. Zemansky: Heat and Thermodynamics, 7th edition, The McGraw - Hill companies, 2007.
2. S. J. Blundell and K. M. Blundell: Concepts in Thermal Physics, 2nd edition, Oxford University Press, 2006.

MATHEMATICS PAPER - II

21MAT116 LINEAR ALGEBRA 3 -1 -0 4

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:

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

Unit I

Matrices: Determinant and inverse of a matrix – Trace and Transpose – Determinants – Symmetric and Skew Symmetric Matrices – Hermitian and Unitary matrices – System of linear equations – consistency and solutions by Guess methods.
(Sections: 1.1-1.7,2.1)

Unit II

Vector Spaces: Real Vector spaces – Sub spaces – Linear independence – Coordinates and Basis – Dimension – Change of Basis – Row Space – Column Space and Null Space – Rank and Nullity.
(Sections: 4.1 – 4.8)

Unit III

Inner Product Spaces: Inner products – Orthogonality – Gram Schmidt Process – QR Decomposition – Best Approximation – Least Squares.
(Sections 6.1 – 6.4)

Unit IV

Eigen values and Eigen vectors: Problems in Eigen Values and Eigen Vectors – Diagonalization – Orthogonal Matrices – Orthogonal Diagonalization – Quadratic Forms.
(Sections 7.1 – 7.3)

Unit V

Linear Transformations: General Linear Transformations – Relation between matrices and linear transformations – Kernel and range of a linear transformation – Isomorphisms – Compositions and Inverse Transformations – Matrices for General Linear Transformations – Similarity.
(Sections 8.1 – 8.5, 5.1-5.2)

TEXTBOOKS

1. Howard Anton and Chris Rorres, "*Elementary Linear Algebra*", Tenth Edition, John Wiley & Sons, 2010.
2. Kenneth Hoffmann and Ray Kunze, *Linear Algebra*, Second Edition, Prentice Hall, 1971.
3. I. N. Herstein, 'Topics in Algebra', Second Edition, John Wiley and Sons, 2000.

REFERENCES:

1. Nabil Nassif, Jocelyne Erhel, Bernard Philippe, Introduction to Computational Linear Algebra, CRC press, 2015.
2. Gilbert Strang, "*Linear Algebra and Its Applications*", Fourth Edition, Cengage, 2006.

Mapping of CO's to PO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	2	-	2	4	4	3
CO2	1	3	-	2	4	2	4
CO3	1	2	-	1	3	4	3
CO4	1	2	2	2	3	4	4
CO5	2	3	2	1	4	4	4

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:

CO1	Understanding the basics of data structures, linear data structures such as stacks, queues and their applications.
CO2	Understanding of linked list and its applications
CO3	Analyze and apply non- linear data structures: Graphs, Trees to solve problem
CO4	Able to develop applications using suitable data structures

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:

Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, PearsonEducation

Reference:

1. Samanta, Debasis. Classic data structures. PHI Learning Pvt. Ltd., 2004.
2. Cormen, Thomas H. Introduction to algorithms. MIT press, 2009.

CO, PO Mapping:

	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO1	PSO2	PSO3	PSO4
CO 1	3		**2**	**1**	**1**									**1**
CO 2	**3**		**3**	**2**	**2**									**2**
CO 3	**2**		**3**	**3**	**2**									**2**
CO 4	**3**		**2**	**3**	**3**									**3**

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

Semester III

21AVP201/	**AMRITA VALUES PROGRAMME - I**	**1-0-0 1**
21AVP211	**AMRITA VALUES PROGRAMME - II**	**1-0-0 1**

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

Life Style and Therapy using Yoga

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

PHYSICS PAPER - III

21PHY206 ELECTRICITY AND MAGNETISM 3 -0- 2 4

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

Electromagnetic Induction: Review of Faraday's law, Faraday's experiment, Lenz's law, Time varying magnetic fields, Application in betatron.

Inductance*:* Self-inductance, LR circuit, energy in a magnetic field, magnetic energy density.

Alternating current and filter: R M S 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 impudence of RC circuit
5. Determination of Inductance by measuring impudence 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

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	2	3	3	3	1	2				3	2	3	
CO2	3	2	3	3	3	1	2				3	2	3	
CO3	3	2	3	3	3	1	2				3	2	3	
CO4	3	2	3	3	3	1	2				3	2	3	
CO5	3	2	3	3	3	1	2				3	2	3	
CO6	3	2	3	3	3	2	3				2	3	3	

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.

4. K. K. Tewari: Electricity and magnetism, S.Chand Co. Ltd., New Delhi, Reprint 2007.

REFERENCES:

1. Fundamentals of Physics, 6th Edition, David Halliday, Robert Resnick and Jearl Walker, John Wiley, Inc.

2. Fundamentals of Electricity and Magnetism:A F Kipp, McGraw Hill.

3. Halliday/Resnick/Walker: Fundamentals of Physics, 8th edition, John Wiley &Sons(Asia) Pvt. Ltd.

4. B. B. Laud: Electrodynamics, Wiley Eastern Limited, New Delhi.

5. David. J. Griffiths: Introduction to Electrodynamics, 3rd edition, Prentice-Hall of India Private Limited, New Delhi.

6. W.H. Hayt and J. A. Buck: Engineering Electromagnetism, 6th edition, Tata McGraw Hill, New Delhi.

7. BrijLal and N. Subrahmanyam: A text book of Electricity and Magnetism, 19th edition-RatanPrakashanMandir, Educational and University Publishers, Agra.

8. A.B.Bhattacharya and R.Bhattacharya, Under Graduate Physics, Volume II, New Central Book Agency(P) Ltd., Kolkata.

9. D.N. Vasudeva: Fundamentals of Magnetism and Electricity, 12th edition-S.Chand and Co. Ltd., New Delhi

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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 andnon-homogeneous linear partial differential equations of higher order.

Unit I

Review of differential equations (order – degree – linear – nonlinear – implicit and explicit form of solution – general solutions – particular solution – singular solution) – Exactness – non-exact equations reduce to exact form.

(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

Equations of Second order: Linear homogeneous differential equations with constant coefficients – Euler-Cauchy equation – Linear Non-homogeneous Differential Equations: Wronskian – linear independence – Method of undetermined coefficients – Method of variation of parameters.

(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:

1. M.D. Raisinghania, *Ordinaryand Partial Differential Equations*, 18th edition, S.Chand, 2016.

References:

1. William E. Boyce and Richard C.DiPrima, *Elementary differential equations and boundary value problems*, 9th edition, Wiley India, 2012.
2. Nita H, Shah, *Ordinary and Partial Differential Equations: Theory and Applications*,2nd edition, PHI learning, 2015.
3. Dennis Zill, *A First Course in Differential Equations*, 9th edition, Cengage Learning, 2009.

Mapping of CO's to PO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	2	-	2	4	4	3
CO2	1	3	-	2	4	2	4
CO3	1	2	-	1	3	4	3
CO4	1	2	2	2	3	4	4
CO5	2	3	2	1	4	4	4

COMPUTER SCIENCE PAPER - III

21CSA206DATA COMMUNICATION AND COMPUTER NETWORK3-0-2 4

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

Course Outcome:

CO1	Build an understanding of the fundamental concepts of data communication and computer networking.
CO2	Understand how errors detected and corrected that occur in transmission
CO3	An awareness about routing, IP addresses and subnetting
CO4	Know about routing mechanisms and different routing protocols

Unit I

Introduction to Data Communication, Network, Protocols & standards and standards organizations - Line Configuration - Topology - Transmission mode - Classification of Network - OSI Model - Layers of OSI Model.

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

Elementary Data Link Protocols- Sliding Window Protocols- Multiple Access Protocols-An overview of IEEE Standard for LANs, MAC Address.

UnitIV

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

Unit V

Repeaters - Bridges - Routers - Gateway - Routing algorithms - TCP/IP Network, Transport and Application Layers of TCP/IP - World Wide Web.

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:

1. **Computer Networking "A Top-Down Approach"** (Fifth Edition)-James F. Kurose-Keith W. Ross (Pearson)
2. **Computer Networks - Protocols, Standards and Interfaces** (Second Edition) UylessBlack(Prentice Hall of India Pvt. Ltd.)
3. **Data communication and Networking**(Fourth Edition)- Behrouz A Forouzan(Tata Mcgraw Hill)

CO, PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	1	-	2	1	-	-	-	-	-	-				-
CO2	1	-	1	2	-	-	-	-	1	-			2	-
CO3	-	-	1	1	1	3	-	-	-	-			1	-
CO4	1	-	-	1	-	3	-	1	-	1		1		1

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:

1. A Communicative Grammar of English: Geoffrey Leech and Jan Svartvik. Longman, London.
2. Adair J (1986) - "Effective Team Building: How to make a winning team", London, U.K: Pan Books.
3. Gulati S (2006) - "Corporate Soft Skills", New Delhi, India: Rupa& Co.
4. The Hard Truth about Soft Skills, by Amazone Publication.

REFERENCES:

1. Quantitative Aptitude, by R S Aggarwal, S Chand Publ.
2. Verbal and Non-verbal Reasoning, 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.
6. More Games Teams Play, by Leslie Bendaly, McGraw-Hill Ryerson.
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 andCSS
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

	PO1	PO2	PO3	PO4	PO5	PO6	P07	P08	P09	P10	PSO1	PSO2	PSO3	PSO4
CO 1	3	1												1
CO 2	1	2	1											1
CO 3	2		2	2										2
CO 4	2			2										2
CO 5	1	2	3	1										2

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:

1. The Complete Reference, HTML & CSS by Thomas a Powell latest edition.

2. Web Programming, 3rd edition by Chris Bates.

Reference:

Web Reference: - W3Schools.com

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:

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

Unit I

Wave Nature of Light and Interference: Light-electromagnetic spectrum, Rotating mirror method of determination of speed of light, Huygen's principle, explanation of reflection and refraction, Fermat's Principle, Phase change on reflection, total internal reflection. Young's experiment - coherence, intensity distribution and visibility of fringes, Newton's rings, Fresnel's Biprism, interference in thin films, colours of thin films, interference at an air wedge, Michelson's interferometer.

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

Introduction to Lasers: Spontaneous and stimulated emission, density of states, Einstein's A and B coefficients. Ratio of stimulated to spontaneous transitions in a system in thermal equilibrium, condition for amplification, population inversion, methods of optical pumping, energy level schemes of He-Ne and Ruby Laser. Properties and uses of Lasers.Basic concepts of holography – construction of hologram – Discussion on the use of holograms in daily life - Recording and reproduction of holograms.

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	3	3	1	1				2	3	3	
CO2	3	2	3	3	3	1	1				2	3	3	
CO3	3	2	3	3	3	1	1				2	3	3	
CO4	3	2	3	3	3	1	1				2	3	3	
CO5	3	2	3	3	3	1	1				2	3	3	
CO6	3	3	3	3	3	2	2			3	2	3	3	

TEXTBOOKS:

1. N SubramanyamBrijlal: Waves and Oscillations, 2nd edition, VikasPublishing house Pvt. Ltd. New Delhi.
2. A.B.BhattacharyaR.Bhattacharya, Under Graduate Physics, Volume I, New Central BookAgency(P) Ltd., Kolkata.
3. N. SubrahmanyamBrijlal and Dr. M.N. Avadhanulu: A text book of Optics, 24threvisededition-S.Chand& company Ltd, New Delhi

REFERENCES:

1. Halliday/Resnick/Walker: Fundamentals of Physics, 8th edition, John Wiley &Sons(Asia) Pte.
Ltd.
2. F A Jenkins and H E White: Optics, McGraw-Hill, 3rd Edition, (1957)
3. Khanna and Bedi: Sound
4. S K Gupta, O P Varma: Waves and Oscillations, 3rd edition, R.Chand& Co., New Delhi.

5. R.L. Saihgal, A Text Book of Sound, S.Chand& Company Ltd. New Delhi, Reprint 1990.
6. P.K.Mittal& Jai DevAnand, A Text Book of Sound, Har-Anand Publications, New Delhi.
7. N V Suryanarayana: Electrical Measurements and Measuring Instruments, 1st edition, S.Chand& Co. Ltd., New Delhi.
8. H S Kalsi: Electronic Instrumentation, 2nd edition, Tata McGraw-Hill Publishing Co. Ltd., New Delhi.
9. D.R. Khanna and H.R. Gulati: Fundamentals of Optics, 15thedition- R. Cjand publishers, New Delhi.
10. R. MurugeshanKiruthigaSivaprasath: Optics and Spectroscopy, 17th revised edition- S.Chand& company Ltd, NewDelhi.

MATHEMATICS PAPER - IV

21MAT216 **MODERN ALGEBRA** **3-1-0 4**

Objectives: To enable students to understand fundamental concepts of algebra and apply results from elementary group theory to solve contemporary problems.

Course Outcomes:

CO1	Effectively write abstract mathematical proofs in a clear and logical manner
CO2	Locate and use theorems to solve problems in number theory and theory of polynomials over a field
CO3	Demonstrate ability to think critically by interpreting theorems and relating results to problems in other mathematical disciplines
CO4	Demonstrate ability to think critically by recognizing patterns and principles of algebra and relating them to the number system
CO5	Work effectively with others to discuss homework problems put on the board. This will be assessed through class discussions.

Unit I

Introduction to Groups – Symmetries of a Square – The Dihedral Groups – Definition and Examples of Groups – Elementary Properties of Groups – Finite Groups – Subgroups: Terminology and Notation – Subgroup Tests – Examples of Subgroups.

(Chapters 1-3)

Unit II

Cyclic Groups – Properties of Cyclic Groups – Classification of Subgroups of Cyclic Groups – Permutation Groups – Properties of Permutations – Isomorphisms: Definition and Examples – Cayley's Theorem – Properties of Isomorphisms – Automorphisms.

(Chapters 4-6)

Unit III

Cosets and Lagrange's Theorem – Application of Cosets to Permutation Groups – Normal Subgroups – Factor Groups – Applications of Factor Groups – Group Homomorphisms: Definition and Examples – Properties of Homomorphisms – The First Isomorphism Theorem.

(Chapters 7, 9, 10)

Unit IV

Rings – Motivation and Definition – Examples of Rings – Properties of Rings – Subrings – Integral Domains – Fields – Characteristic of a Ring.

(Chapters 12, 13)

Unit V

Quotient Rings and Ideals – Homomorphism of rings and rings of polynomials.

(Chapters 28-30)

Ideals – Factor Rings – Prime Ideals and Maximal Ideals – Ring Homomorphisms: Definition and Examples – Properties of Ring Homomorphisms – The Field of Quotients – Polynomial Rings: Notation and Terminology – The Division Algorithm and Consequences.

(Chapters 14-16)

TEXTBOOKS:

1. Johan B. Fraleigh, *A First course in abstract algebra*, 3rd edition, Narosa, 2000.
2. Joseph A. Gallian, *Contemporary Abstract Algebra*, 4th edition, Narosa, 2008.

REFERENCES:

1. Garrett Birkoff and Saunders Mac Lane, *A Survey of Modern Algebra*, 1st edition, Universities Press, 2003.
2. I. N. Herstein, *Topics in Algebra*, 2nd Edition, John Wiley and Sons, 2000.
3. M. Artin, *Algebra*, 2nd Edition, Prentice Hall inc., 1994.

COMPUTER SCIENCE PAPER - IV

21CSA216 ANALYSIS AND DESIGN OF ALGORITHMS3-0-03

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

Course Outcome:

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

Unit I

Introduction-types of algorithms-properties of algorithms-implementation and empiricalanalysis-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 sortingAlgorithms. 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:

Algorithms in C++(third edition)-Robert Sedgwick (Pearson education Asia).

References:

Introduction to algorithms by Thomas H.Cormen MIT; 3rd edition (2010).

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:

CO1	To apply the basic concepts of Database Systems and Applications
CO2	To familiarize basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.
CO3	To understand ER-model to relational tables, populate relational database and formulate SQL queries on data with improve the database design by normalization
CO4	To improve the database design by normalization technique

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

Relational Algebra: Basic Operations, Union, Difference, Intersection, Cartesian product; Additional Relational Algebraic Operations, Projection, Selection, JOIN, Division. Database Models and Implementation: Data Model and Types of Data Model, Relational Data Model, Hierarchical Model, Network Data Model. Entity-Relationship Model: E-R Diagrams, Notation used in E-R Model, Relationships and Relationship Types, Case study to implement E-R Diagrams.

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
11. Procedures- Creation of Stored Procedures, Execution of Procedure, and Modification of Procedure.
12. Cursors- Declaring Cursor, Opening Cursor, Fetching the data, closing the cursor.

References:

1. Silberschatz. Korth. Sudarshan: "Database System Concepts" 6th Edition Mcgraw-HillInternational Edition
2. Ivan Bayross: "Sql- PL/SQL The Programming Language Of Oracle"- 4th Edition-BPBPublications

CO, PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	1	2	3	1	2	1	1	-	-	-	-	2	-	1
CO2	1	2	2	2	2	2	-	-	-	-	-	-	-	2
CO3	2	3	3	3	2	2	2	1	-	-	-	1	1	1
CO4	2	2	1	1	1	1	-	-	-	-	-	1	-	1

21SSK211 **LIFE SKILLS II** **1-0-2 2**

Professional Grooming and Practices: Basics of Corporate culture, Key pillars of Business Etiquette. Basics of Etiquette: Etiquette – Socially acceptable ways of behaviour, Personal hygiene, Professional attire, Cultural Adaptability. Introductions and Greetings: Rules of the handshake, Earning respect, Business manners. Telephone Etiquette: activities during the conversation, Conclude the call, To take a message. Body Language: Components, Undesirable body language, Desirable body language. Adapting to Corporate life: Dealing with people.

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:

1. A Communicative Grammar of English: Geoffrey Leech and Jan Svartvik. Longman, London.
2. Adair J (1986) - "Effective Team Building: How to make a winning team", London, U.K: Pan Books.
3. Gulati S (2006) - "Corporate Soft Skills", New Delhi, India: Rupa& Co.
4. The Hard Truth about Soft Skills, by Amazone Publication.

REFERENCES:

1. Quantitative Aptitude, by R S Aggarwal, S Chand Publ.
2. Verbal and Non-verbal Reasoning, R S Aggarwal, S Chand Publ.
3. Quantitative Aptitude by AbjithGuha, Tata McGraw hill Publ.
4. More Games Teams Play, by Leslie Bendaly, McGraw-Hill Ryerson.
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.

Semester V

PHYSICS PAPER - V

21PHY306 **BASIC ELECTRONICS** **3 -1 -0 4**

Objective: To enable students to understand the physics of semiconductors and their applications in basic electronic circuits.

Course outcomes:

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

Unit I

Semiconductor Characteristics and Applications Review: Intrinsic and extrinsic semiconductors, electrons and holes in intrinsic and extrinsic semiconductors, conduction by electrons and holes, conductivity of a semiconductor, Energy bands in semiconductors. Carrier concentrations in intrinsic and extrinsic semiconductors, Fermi level, donor and acceptor levels in extrinsic semiconductors. P-N junction diode – depletion layer, conduction in PN junction diode, characteristics, diode resistance.
Half wave and full wave rectifiers, power output and efficiency, Ripple factors.
Breakdown in diodes – Zener breakdown, Zener diode characteristics and application in voltage regulation.LEDs, photo diodes, LDRs and Solar cells.

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

Basic Principlesof sinusoidal oscillators, Statement and explanation of Barkhausen criterion for sustained oscillations, RC phase –shift Oscillator, explanation of: tank circuit and Development of oscillations in an LC circuit, Hartley Oscillator, Colpitt's Oscillator, Wien Bridge Oscillator, Piezoelectric effect, Piezoelectric Oscillator.

Unit IV

Digital Electronics: Binary to decimal and decimal to binary conversion, Binary addition and subtraction, Octal number system, Hexadecimal system and conversions.
Construction and working of AND and OR logic gates using diodes. Construction of NOT gate using transistor. Symbols and truth table for AND, OR, NOT, NAND NOR and Ex-OR logic gates. Boolean algebra, Boolean laws, D'morgan's theorem. NAND and NOR as universal gates. Introduction to OP-AMP. Differential amplifiers, principle of OP-AMP, OP-AMP parameters, Applications – Addition, Subtraction, differentiation and integration.

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

functions, Radio communication: Role of ionosphere in radio communication. Block diagram of Radio transmission. The block diagram and diagram of super heterodyne AM Receiver.

Mapping of CO's and PO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO04
CO1	3	2	3	3	3	2	1				3	2	3	
CO2	3	2	3	3	3	2	1				3	2	3	
CO3	3	2	3	3	3	2	1				3	2	3	
CO4	3	2	3	3	3	2	1				3	2	3	
CO5	3	2	3	3	3	2	1				3	2	3	

TEXTBOOKS:

1. V.K. Mehta: Electronics.
2. BapatYN: Electronic circuits and Systems, TMH , New Delhi.
3. RamakantGaekwad: Operational amplifiers and Linear Integrated Circuits, Prentice hall of India ltd, New Delhi.

REFERENCES:

1. Concepts of modern physics, 6th Edition- A Beiser
2. Resnick: Special theory of relativity
3. A.P French: Special relativity
4. Malvino: Electronic principles, Fifth edition
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

10. Malvino and Leach: Digital principles and applications
11. Grob B: Basic Electronics
12. Boylestead: Network analysis

PHYSICS PAPER-VI

21PHY386 PRACTICALS 0- 0 -2 1

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.
11. Study of Optocoupler.
12. Study of Divergence of Diode laser.
13. Amplitude demodulator.
14. Logic gates – AND, OR, NOT, NOR and XOR using IC 7402

Mapping of CO's and PO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	3	3	2	2			3	2	3	3	
CO2	3	2	3	3	3	2	2			3	2	3	3	
CO3	3	2	3	3	3	2	2			3	2	3	3	

MATHEMATICS PAPER - V

21MAT307 REAL ANALYSIS 3-1 -0 4

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:

CO1	To understand the concept of Absolute value. Know the concept of supremum
CO2	Know the concept of Convergence, Divergence and Oscillatory sequence
CO3	Know the concept of continuous function, discontinuity, uniformly continuous.
CO4	Application of derivative like Taylor's theorem and Maclaurin's theorem
CO5	To apply the concept Riemann integral to analyze problem.

Unit I

Review: Sets and Functions – Mathematical Induction – Finite and Infinite Sets. **The Real Numbers:** The Algebraic and Order Properties of R – Absolute Value and the Real Line – The Completeness Property of R – Applications of the Supremum Property – Intervals.

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

Unit II

Sequences and Series: Sequences and Their Limits – Limit Theorems – Monotone Sequences – Subsequences and the Bolzano-Weierstrass Theorem – The Cauchy Criterion – Properly Divergent Sequences – Introduction to Infinite Series – Absolute Convergence of Infinite series – Tests for Absolute convergence – Tests for Non-absolute convergence.

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:

1. Robert Gardner Bartle, Donald R. Sherbert, *Introduction to Real Analysis*, 4th Edition, John Wiley & Sons, 2011.

REFERENCES:

1. Tom M. Apostol, *Mathematical Analysis,* 2nd Edition, Narosa publishing house, New Delhi,1989.
2. Rudin. W, *Principles of Mathematical Analysis,* 3rd Edition, McGraw-Hill International Editions, 1976.

H.L. Royden and P.M. Fitzpatrick, *Real Analysis*, 4th Edition. Pearson Education Asia Limited, 2010.

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:

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

Unit I

Logic: Logic – Prepositional Equivalence – Predicate and Quantifiers – Theorem Proving.

Chapter-1 (Sections: 1.1.-1.7)

Unit II

Basics of Counting – Pigeonhole Principle – Permutation and Combinations.

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:

1. Kenneth H. Rosen, *Discrete Mathematics and its Applications*, 6th edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2007.

REFERENCES:

1. R.P. Grimaldi, *Discrete and Combinatorial Mathematics*, 5th Edition, Pearson Education, 2007.
2. Thomas Koshy, *Discrete Mathematics with Applications*, 1st edition, Academic Press, 2004.
1. Liu, *Elements of Discrete Mathematics*, 2ndedition, Tata McGraw- Hill Publishing Company Limited, 2004.

COMPUTER SCIENCE PAPER – VI

21CSA305OPERATING SYSTEM 3-0-0 3

Objectives: Fundamental concepts and designs will be covered along with basics of process management. To provide theoretical and problemsolving aspects of CPU scheduling and memory management techniques.

Course Outcome:

CO1	Understand the basic concepts of OS with different types of OS, different servicesalong with the various system calls
CO2	Get the knowledge of process management, various operations on process andInter 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

Introduction to Operating Systems: Mainframe systems-Desktop systems-Multiprocessor systems-Distributed systems-Clustered systems-Real-time systems-Handheld systems Operating System Structures: Systemcomponents-OperatingSystemservices-Systemcalls-SystemPrograms-System Structures-System Design and Implementation-System Generation.

Unit II

Process Management: ProcessConcept-ProcessScheduling-Operationsonprocesses-Cooperatingprocesses-Inter Process Communication

CPU Scheduling: Basicconcepts-Schedulingcriteria-SchedulingAlgorithms-FirstComeFirstservedScheduling, 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

Deadlocks: SystemModel-DeadlockCharacterization-MethodsforhandlingDeadlocks-DeadlockPrevention-Deadlock Avoidance-Deadlock detection-Recovery from deadlock.

Unit IV

Memory Management: Background-Swapping-ContiguousMemoryallocation-Paging-Segmentation-SegmentationwithPaging.VirtualMemory:Background-Demandpaging-Process creation-Page replacement-Allocation of Frames-Thrashing.

TEXTBOOKS:

1. Abraham SilberSchartz- peter B Galvin-Greg Gagne, Operating system Concepts. Eighth Edition,Addison-Wesley(2003)
2. A.Godbole - Operating Systems - Tata McGraw Hill Publications

REFERENCES:

1. H.M Deitel - Operating Systems - Second Edition - Pearson Edition Asia

CO, PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	2		2	3	3									3
CO2	2		1	3	3									3
CO3	1		1											1
CO4	2		1	3	3									1

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

CO –PO AFFINITY MAP:

PO→ / CO↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	**3**	**2**	**1**	**-**	**3**	**-**	**-**	**-**	**-**	**-**				**1**
CO2	**3**	**1**	**2**	**1**	**2**	**-**	**-**	**-**	**-**	**-**				**2**
CO3	**-**	**-**	**-**	**3**	**2**	**-**	**-**	**-**	**-**	**-**				**2**

Experiments	**CO**
Installing R on personal machines. Installing R and R-Studio environment and The basic functionality of R.	CO1
Write an R-program to illustrate different types of variable types, strings and basic Arithmetic Operation.	CO1
Write an R-program to illustrate Relational Operators, Logical Operator, Assignment Operators, and Miscellaneous Operators.	CO1
Write an R-program to illustrate Conditional operation.	CO1
Write an R-program to illustrate Control operation	CO1

Write an R-program to illustrate the Built in functions and user-defined function.	CO2
Write an R-program to illustrate String operation.	CO2
Write an R-program to illustrate vectors and list operation.	CO2
Write an R-program to illustrate Performing Arithmetic of Matrices	CO2
Write an R-program to illustrate Descriptive Statistics analysis such as Data Range, Frequencies, Mode, Mean and Median.	CO3
Write an R-program to illustrate data visualization Techniques such as histogram, bar-chart, pie chart, scatter plot, box plot, tree map, .., etc.	CO3

TEXTBOOKS:

1. Sandip Rakshit, R Programming for Beginners, McGraw Hill Education (India), 2017, ISBN: 978-93-5260-455-5.

2. Seema Acharya, Data Analytics using R, McGrawHill Education (India), 2018, ISBN: 978-93-5260-524-8.

3. Andrie de Vries, Joris Meys, R for Dummies A Wiley Brand, 2nd Edition, John Wiley and Sons, Inc, 2015, ISBN: 978-1-119-05580-8

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)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	2		1	1			1							1
CO2	1		2	1	1		2							1
CO3	1	1	2	2	1	1	2							2
CO4	2		2	1	2	1	3							2
CO5	1		2	1	1		3							2

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:

1. Dr. R. Nageswara Rao, "Core Python Programming", 2nd Edition, Dreamtech Press, 2018. ISBN: 978-93-86052-30-8

2. Al Sweigart, "Automate the Boring Stuff with Python",1st Edition, No Starch Press, 2015.

REFERENCES:

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd Edition, Green Tea Press, 2015.

2. Gowrishankar S, Veena A, "Introduction to Python Programming", 1st Edition, CRC Press/Taylor & Francis, 2018. ISBN-13: 978-0815394372

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:

PO→ / CO↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	-	3	-	-	-	-	-				1
CO2	3	1	2	1	2	-	-	-	-	-				2
CO3	-	-	-	3	2	-	-	-	-	-				2

TEXTBOOKS:

1. Mahafza, Bassem R. Radar Systems Analysis and Design Using MATLAB Third Edition. CRC press, 2013.

Experiments	**CO**
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.	CO1
Write a program to illustrate Control operation	CO1
Write a program to illustrate the Built in functions and user-defined function.	CO2
Write a program to illustrate String operation.	CO2
Write a program to illustrate vectors and list operation.	CO2
Write a program to illustrate Performing Arithmetic of Matrices	CO2
Write a program to illustrate Descriptive Statistics analysis such as Data Range, Frequencies, Mode, Mean and Median.	CO3
Write a program to illustrate data visualization Techniques such as histogram, bar-chart, pie chart, scatter plot, box plot, tree map, .., etc.	CO3

2. Kattan, Peter Issa. Matlab for Beginners: A gentle approach. Petra books, 2008.

3. Franco-Pereira, Alba M. An introductory course in matlab: Matlab for beginners. Diss. Master's thesis, Master in Business Administration and Quantitative Methods, Universidad Carlos III de Madrid, 2010.[Online]. Available: http://webs. uvigo. es/alba. franco/eng/Tutorial completo. pdf, 2010.

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:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PSO 1	PSO 2	PSO 3	PSO 4
CO1	3	2	3	3	3	-	2	-	1	-	-	2	3	3

CO2	3	2	3	3	3	-	2	-	1	-	-	2	3	3
CO3	3	3	3	3	3	-	1	1	-	-	1	2	3	3
CO4	3	2	3	3	3	1	1	-	1	1		3	3	3

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.

2. K.P.Soman, Shyam Diwakar and V.Ajay, "Insight into data mining Theory and Practice", Prentice Hall of India, 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

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

	CO-PO Affinity Map													
PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	1		3	2	1		1				0	0	0	3
CO2	1	1	2	1	0						0	0	0	3
CO3	0	1	1	1	1						0	0	0	2
CO4	0	1	1	1	1						0	0	0	2
CO5	1	1	1	1	1						0	0	0	2

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.

Control flow statements: conditional statement, loop statement. Msgbox&Inputbox. Workingwith Forms: Loading, showing and hiding forms, GUI Programming with Windows Form:Common Controls, scroll bar, Timer, ListView, TreeView, toolbar, StatusBar. Properties,Methods and events. OpenFileDilog, SaveFileDialog, FontDialog, ColorDialog, PrintDialog.Link Label. Designing menu. Object oriented Programming: Classes & objects, fieldsProperties, Methods & Events, constructor, inheritance. Access Specifiers: Public Private,Projected.

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

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	1		2	2	2							2	2	1
CO2	3		3	1	1							2	3	2
CO3			1	1									1	
CO4	2		2	2	2							2	2	2

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)

1. Testing in 30+ Open-Source Tools, Rahul Shende, Shroff Publishers & Distributor Pvt. Ltd, ISBN 13: 9789350231005 (page numbers from 15 to 117)

2. http://seleniumhq.org/

3. http://sourceforge.net/projects/sah

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++.

4. Understanding Friend functions, Function & Operator Overloading, Virtual functions.

5. Implement Object Oriented Programs using exceptional handling concepts

CO-PO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**P07**	**P08**	**P09**	**P10**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO 1	3	1					1							1
CO 2	1	2					1				1			1
CO 3	2						1							2
CO 4	2	1					1							2
CO 5	2	1					1				1			3

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:

A. E.Balaguruswamy, "Object Oriented Programming with C++", Fourth Edition, Tata McGraw-Hill, 2008.
B. Herbert Schildt,"The Complete reference C++ ",Fourth Edition,Tata McGraw Hill,2003.

21SSK301 LIFE SKILLS III 1-0-2 2

Team Work: Value of Team work in organizations, Definition of a Team, Why Team, Elements of leadership, Disadvantages of a team, Stages of Team formation. Group Development Activities: Orientation, Internal Problem Solving, Growth and Productivity, Evaluation and Control. Effective Team Building: Basics of Team Building, Teamwork Parameters, Roles, Empowerment, Communication, Effective Team working, Team Effectiveness Criteria, Common characteristics of Effective Teams, Factors affecting Team Effectiveness, Personal characteristics of members, Team Structure, Team Process, Team Outcomes.

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 toknow 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

X-Rays: Continuous X-ray spectra. Duanne and Hunt limit. Characteristic X ray spectra, Moseley's law and its significance, X-ray energy levels.
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.
Spin-orbit interaction and Fine structure of spectral lines.Quantum numbers and selection rules.Pauli's exclusion principle.Electronic configuration of atoms.Valence electron and a brief mention of L-S and J-J coupling for trio electron atoms.

Unit III

Zeeman effect: Introduction, experimental study of normal Zeeman effect, theory of normal Zeeman effect, expression for Zeeman effect, quantum theory of normal Zeeman effect, anomalous Zeeman effect, Paschen-Back effect and Stark effect.

Unit IV

Molecular Spectra (10 hrs): Molecular formation, the H molecular ion, H_2 – 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 molecules

Mapping of CO's and PO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	3	1	3	3	3	1	2				3	2	3	
CO2	3	1	3	3	3	1	2				3	2	3	
CO3	3	1	3	3	3	1	2				3	2	3	
CO4	3	1	3	3	3	1	2				3	2	3	
CO5	3	1	3	3	3	1	2				3	2	3	

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.
3. Concepts of modern physics, Fifth Edition- ABeiser
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

21PHY387 **PRACTICALS** **0-0-2 1**

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 $KMnO_4$
9. Determination of dipole moment of an organic liquid
10. Spectral response of a photodiode and its I –V characteristics.

Mapping of CO's and PO's

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	2	3	3	3	2	2			3	2	3	3	
CO2	3	2	3	3	3	2	2			3	2	3	3	
CO3	3	2	3	3	3	2	2			3	2	3	3	

MATHEMATICS PAPER VII

21MAT316COMPLEX ANALYSIS 2-1-0 3

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	Appling 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, Lourent's series to solve problems.
CO5	Evaluating using the concept of Singularities, poles, residue theorem.

Unit I

Definition – Algebra of complex numbers – polar forms – regions – Limits – continuity – differentiability – CR equations – Analytic Functions – Harmonic Functions.

(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

Sequences – series – power series – uniform convergence of power series – Taylor's series – Laurent's series – Integration and differentiation of Power series.

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

Unit V

Zeros and singularities of analytic functions – types of singularities – poles – residue theorem.

Chapter-7 (Sections: 7.1-7.3)

Classification of Singularities – Residues – Poles and zeroes.

Chapter-7 (Sections: 7.1-7.3)

TEXTBOOKS:

1. H S Kasana, *Complex variables and Theory and Applications*, 2nd edition, Prentice Hall India.

REFERENCES:

1. S. Ponnusamy, *Foundations of Complex Analysis*, 2nd Edition, Narosa Publishing House, 2005.
2. J.W. Brown and R.V. Churchil, *Complex Variable and Applications*, 8th edition, McGraw Hill, 2008.
3. R. Roopkumar, *Complex Analysis*, 1st edition, Pearson Education, Chennai, 2014.

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

Probability Concepts: Sample Space and Events: Random Experiments – Sample Space – Events – Interpretations of Probability: Introduction – Axioms of probability – Addition Rules – Conditional Probability – Multiplication and Total Probability Rules – Independence – Bayes Theorem.

(Sections: 2.1 – 2.7)

Unit II

Discrete Random Variables and Distributions: Discrete Random Variables – Probability Distributions – Probability Mass Function – Cumulative Distribution Functions – Mean – Variance – Discrete Uniform Distribution – Binomial Distribution – Geometric and Negative Binomial Distribution – Poisson Distributions.

(Sections: 3.1-3.7, 3.9)

Unit III

Continuous Random Variables and Distributions: Continuous Random Variables – Probability Distributions and Probability Density Functions – Cumulative Distribution Functions – Mean – Variance – Continuous Uniform Distribution – Exponential Distribution – Normal Distribution – Chebyshevs Inequality – Moment-Generating Functions.

(Sections: 4.1-4.6,4.9)

Unit IV

Two Dimensional Discrete and Continuous Random Variables: Joint Probability Distributions – Marginal Probability Distributions – Conditional Probability Distributions –
Independence – Covariance and Correlation.

(Sections:5.1, 5.3, 5.5)

Unit V

Point Estimation of Parameters: GeneralConcept 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:

1. Douglas C. Montgomery and George C. Runger, *Applied Statistics and Probability for Engineers*, 3rd edition, John Wiley and Sons Inc., 2005

REFERENCES:

1. Ravichandran J., *Probability and Statistics for engineers*, 1st Reprint Edition, Wiley India, 2012.
2. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers and Keying Ye, *Probability and Statistics for Engineers and Scientists*, 9th Edition, Pearson Education Asia, 2007.
3. Sheldon M. Ross, *Introduction to Probability and Statistical Inference*, 6th edition, Pearson.

4. A. Papoulis and Unnikrishna Pillai, *Probability, Random Variable and Stochastic Processes*, 4th edition, McGraw Hill, 2002.

COMPUTER SCIENCE PAPER - VII

21CSA315INTRODUCTION TO MACHINE LEARNING 3-0-24

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

Neural networks learning, non-linear hypothesis, model representation, perceptron, cost function, back propagation algorithm. Unsupervised learning, clustering, different clustering methodologies. Dimensionality Reduction, Data compression, PCA, LDA algorithm. Current problems on machine learning.

Lab

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

TEXTBOOKS:

1. Machine Learning, Tom Mitchell, McGraw Hill, 1997
2. Christopher, M. Bishop. Pattern Recognition and Machine Learning, Springer-Verlag New York, 2016.

REFERENCES:

1. Duda, Richard, Peter Hart, and David Stork, "Pattern Classification" Second Edition, New York, NY: Wiley-Interscience, 2000.
2. Hastie, T., R. Tibshirani, and J. H. Friedman, "The Elements of Statistical Learning: DataMining, Inference and Prediction", New York, Springer, 2001.

CO – PO Affinity Map

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS01**	**PS O2**	**PS O3**	**PS O4**
CO 1	3	1	1	-	-	-	-	-	-	-	-	-	-	-	-	
CO 2	2	1	2	2	-	-	-	-	-	-	-	-	-	-	-	
CO 3	1	1	3	-	-	1	1	1	-	-	-	-	-	-	2	
CO 4	2	1	2	1	-	-	-	1	-	-	-	-	-	-	-	
CO 5	1	2	2	1	2	1	-	1	1	3	-	-	1	-	1	3

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

CO –PO AFFINITY MAP:

PO→ / CO↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	**3**	**2**	**1**	**-**	**3**	**-**	**-**	**-**	**-**	**-**				**1**
CO2	**3**	**1**	**2**	**1**	**2**	**-**	**-**	**-**	**-**	**-**				**2**
CO3	**-**	**-**	**-**	**3**	**2**	**-**	**-**	**-**	**-**	**-**				**2**

Experiments	**CO**
Installing R on personal machines. Installing R and R-Studio environment and The basic functionality of R.	CO1
Write an R-program to illustrate different types of variable types, strings and basic Arithmetic Operation.	CO1
Write an R-program to illustrate Relational Operators, Logical Operator, Assignment Operators, and Miscellaneous Operators.	CO1
Write an R-program to illustrate Conditional operation.	CO1
Write an R-program to illustrate Control operation	CO1

Write an R-program to illustrate the Built in functions and user-defined function.	CO2
Write an R-program to illustrate String operation.	CO2
Write an R-program to illustrate vectors and list operation.	CO2
Write an R-program to illustrate Performing Arithmetic of Matrices	CO2
Write an R-program to illustrate Descriptive Statistics analysis such as Data Range, Frequencies, Mode, Mean and Median.	CO3
Write an R-program to illustrate data visualization Techniques such as histogram, bar-chart, pie chart, scatter plot, box plot, tree map, .., etc.	CO3

TEXT BOOK:

1. Sandip Rakshit, R Programming for Beginners, McGraw Hill Education (India), 2017, ISBN: 978-93-5260-455-5.

2. Seema Acharya, Data Analytics using R, McGrawHill Education (India), 2018, ISBN: 978-93-5260-524-8.

3. Andrie de Vries, Joris Meys, R for Dummies A Wiley Brand, 2nd Edition, John Wiley and Sons, Inc, 2015, ISBN: 978-1-119-05580-8

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:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	2		1	1			1							1
CO2	1		2	1	1		2							1
CO3	1	1	2	2	1	1	2							2

CO4	2		2	1	2	1	3							2
CO5	1		2	1	1		3							2

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:

1. Dr. R. Nageswara Rao, "Core Python Programming", 2nd Edition, Dreamtech Press, 2018. ISBN: 978-93-86052-30-8

2. Al Sweigart, "Automate the Boring Stuff with Python",1st Edition, No Starch Press, 2015.

Reference Books:

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd Edition, Green Tea Press, 2015.

2. Gowrishankar S, Veena A, "Introduction to Python Programming", 1st Edition, CRC Press/Taylor & Francis, 2018. ISBN-13: 978-0815394372

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:

PO→ / CO↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	**3**	**2**	**1**	**-**	**3**	**-**	**-**	**-**	**-**	**-**				**1**
CO2	**3**	**1**	**2**	**1**	**2**	**-**	**-**	**-**	**-**	**-**				**2**
CO3	**-**	**-**	**-**	**3**	**2**	**-**	**-**	**-**	**-**	**-**				**2**

Experiments	**CO**
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.	CO1
Write a program to illustrate Control operation	CO1
Write a program to illustrate the Built in functions and user-defined function.	CO2
Write a program to illustrate String operation.	CO2
Write a program to illustrate vectors and list operation.	CO2
Write a program to illustrate Performing Arithmetic of Matrices	CO2
Write a program to illustrate Descriptive Statistics analysis such as Data Range, Frequencies, Mode, Mean and Median.	CO3
Write a program to illustrate data visualization Techniques such as histogram, bar-chart, pie chart, scatter plot, box plot, tree map, .., etc.	CO3

TEXT BOOK:

1. Mahafza, Bassem R. Radar Systems Analysis and Design Using MATLAB Third Edition. CRC press, 2013.

2. Kattan, Peter Issa. Matlab for Beginners: A gentle approach. Petra books, 2008.

3. Franco-Pereira, Alba M. An introductory course in matlab: Matlab for beginners. Diss. Master's thesis, Master in Business Administration and Quantitative Methods, Universidad Carlos III de Madrid, 2010.[Online]. Available: http://webs. uvigo. es/alba. franco/eng/Tutorial completo. pdf, 2010.

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:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PSO 1	PSO 2	PSO 3	PSO 4
CO1	3	2	3	3	3	-	2	-	1	-	-	2	3	3
CO2	3	2	3	3	3	-	2	-	1	-	-	2	3	3
CO3	3	3	3	3	3	-	1	1	-	-	1	2	3	3
CO4	3	2	3	3	3	1	1	-	1	1		3	3	3

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.

2. K.P.Soman, Shyam Diwakar and V.Ajay, "Insight into data mining Theory and Practice", Prentice Hall of India, 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

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

	CO-PO Affinity Map													
PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	1		3	2	1		1				0	0	0	3
CO2	1	1	2	1	0						0	0	0	3
CO3	0	1	1	1	1						0	0	0	2
CO4	0	1	1	1	1						0	0	0	2
CO5	1	1	1	1	1						0	0	0	2

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.

Control flow statements: conditional statement, loop statement. Msgbox&Inputbox. Workingwith Forms: Loading, showing and hiding forms, GUI Programming with Windows Form:Common Controls, scroll bar, Timer, ListView, TreeView, toolbar, StatusBar. Properties,Methods and events. OpenFileDilog, SaveFileDialog, FontDialog, ColorDialog, PrintDialog.Link Label. Designing menu. Object oriented Programming: Classes & objects, fieldsProperties, Methods & Events, constructor, inheritance. Access Specifiers: Public Private,Projected.

Database programming with ADO.NET – Overview of ADO, from ADO to ADO.NET,Accessing Data using Server Explorer. Creating Connection, Command, Data

Adapter andData Set with OLEDB and SQLDB. Display Data on data bound controls, display data ondata 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)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	1		2	2	2							2	2	1
CO2	3		3	1	1							2	3	2

CO3			1	1									1	
CO4	2		2	2	2							2	2	2

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)

2. Testing in 30+ Open-Source Tools, Rahul Shende, Shroff Publishers & Distributor Pvt. Ltd, ISBN 13: 9789350231005 (page numbers from 15 to 117)

2. http://seleniumhq.org/

3. http://sourceforge.net/projects/sah

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++.

4. Understanding Friend functions, Function & Operator Overloading, Virtual functions.

5. Implement Object Oriented Programs using exceptional handling concepts

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	P07	P08	P09	P10	PSO1	PSO2	PSO3	PSO4
CO 1	3	1					1							1
CO 2	1	2					1				1			1
CO 3	2						1							2
CO 4	2	1					1							2
CO 5	2	1					1				1			3

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

A. E.Balaguruswamy, "Object Oriented Programming with C++", Fourth Edition, Tata McGraw-Hill, 2008.
B. Herbert Schildt,"The Complete reference C++ ",Fourth Edition,Tata McGraw Hill,2003.

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 simulationetc.

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

Linear Programming Problems: Introduction to Operations Research, necessity of Operations Research in modern management- models in Operations Research, Introduction to Linear Programming Problems, Formulation of Linear Programming Problems, solutions to Linear Programming Problems based on graphical method, solutions based on simplex algorithm.

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:

1) Hamadi A. Taha, "Operations Research - An Introduction", Seventh Edition, Pearson Education, 2014.
2) KantiSwarup, P.K. Gupta and Man Mohan, "Operations Research", NinthEdition,Sultan Chand and Sons, 2001

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
Eigenvalues and Eigenvectros: Jacobi Method for symmetric matrices, Power method for arbitrary matrices.
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

Solutions of Ordinary Differential Equations: Initial Value problems, single step methods, Taylor series method, Second, Third and Fourth order Runge-Kutta methods.
Sections: 6.1,6.3, 6.4

Unit V

Solutions of Partial Differential equations: Elliptic partial Differential equations, Parabolic partial differential equations, Hyperbolic partial differential equations.
Sections: 12.1, 12.2, 12.3

TEXTBOOKS:

1) M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical methods for scientific and Engineering computation, New Age International Publishers, 2007, 5th edition.

2) R.L. Burden, J. D. Faires, Numerical Analysis, Richard Stratton, 2011, 9th edition.

REFERENCES:

1. S.D. Conte and Carl de Boor, 'Elementary Numerical Analysis; An Algorithmic Approach'. International series in Pune and Applied Mathematics, McGraw Hill Book Co., 1980.
2. Kandasamy P, Thilagavathi.K and Gunavathi. K. 'Numerical Methods'- S. Chand and Company Ltd., New Delhi- Revised Edition 2007.

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:

E Kreyszig, Advanced Engineering Mathematics, John Wiley and Sons, 2002, Eighth Edition.

REFERENCES:

1) Larry C. Andrews and Bhimson. K. Shivamoggi, The Integral Transforms for Engineers, Spie Press, Washington, 1999.
2) J. L. Schiff, The Laplace Transform, Springer, 1999.
3) Stanley J Farlow,' Partial Differential Equations for Scientists and Engineers' Dover Book on Mathematics, 1993

21MAT434 **APPLIED STATISTICS** **3-0-0 3**

OBJECTIVES: To enable students to

- Understand the concept of statistical inference of two samples
- Apply statistical techniques in quality control

Unit I

Tests of Hypothesis for a Single Sample: Hypothesis Testing, Tests on a Population Proportion- Tests on the Mean of a Normal Distribution with Variance known and unknown, Tests on the variance –Test for Goodness of fit, Contingency table tests.
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

Design of Experiments of Single Factor: Introduction, Completely Randomized Single Factor Experiment, computation of sum of squares, Random effect models, Randomized complete block design, computation of sum of squares.
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:

1) Douglas C. Montgomery and George C. Runger, Applied Statistics and Probability for Engineers, John Wiley and Sons Inc., 2005

REFERENCES:

1) Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers and Keying Ye, Probability and Statistics for Engineers and Scientists, 8th Edition, Pearson Education Asia, 2007

2) Ravichandran, J. Probability and Statistics for engineers, First Reprint Edition, Wiley India, 2012.

21MAT435 NUMBER THEORY 3-0-0 3

OBJECTIVES: To enable students to

- Understand the concept of divisibility, congruencies and arithmetical funcitons
- 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:
James Strayer, 'Elementary Number Theory', Waveland Press, 1994/2002, ISBN 1-57766-224-5

REFERENCES:

1) Tom M. Apostol,' Introduction to Analytic Number Theory', Springer, Under Graduate Studies in Mathematics, 1976.

2) Kenneth Rosen, Elementary Number Theory and its Applications, 5th Edition, McGraw Hill.
3) I. Niven, H. Zuckerman, H. Montgomery, An Introduction to the Theory of Numbers, 5th Edition, Wiley.
4) Burton, David M. Elementary Number Theory. Allyn and Bacon, 1976.

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, orthogonalityof Bessel'sFunctions, 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 [Qn(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
Part II: 9.8-9.9, 9.22-9.25.

TEXTBOOKS:

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

REFERENCES:

1) I. N. Sneddon - Special Functions of mathematical Physics & Chemistry, 3 Oliver & Boyd, London.
2) N. N. Lebedev - Special Functions and Their Applications, PHI.
3) Special Functions, R. Askey and R. Roy, Cambridge.

ELECTIVES – PHYSICS

21PHY331MEDICAL 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:

Mechanics of the body: Skeleton, forces, and body stability. Muscles and dynamics of body movement. Physics of Loco-motors Systems: joints and movements, Stability and Equilibrium. Energy household of the body: Energy balance in the body, Energy consumption of the body, Heat losses of the body, Thermal Regulation. Pressure system of body: Physics of breathing, Physics of cardiovascular system.

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

matter Compton & photoelectric effect, Rem & Sievert, linear attenuation coefficient. Radiation Detectors: Thimble chamber, condenser chambers, Geiger Muller counter, Scintillation counters and Solid State detectors, ionisation chamber, Dosimeters, survey methods, area monitors, TLD, Semiconductor detectors.

UNIT V:

Radiation And Radiation Protection: Principles of radiation protection,protective materials-radiation effects, somatic, genetic stochastic and deterministic effect. Personal monitoring devices: TLD film badge, pocket dosimeter, OSL dosimeter. Radiation dosimeter. Natural radioactivity, Biological effects of radiation, Radiation monitors. Steps to reduce radiation to Patient, Staff and Public. Dose Limits for Occupational workers and Public. AERB: Existence and Purpose.

Mapping of CO's and PO's

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	2	1	3	2	2	2				1	2	2	
CO2	3	2	1	3	2	2	2				1	2	2	
CO3	3	2	1	3	2	2	2				1	2	2	
CO4	3	2	1	3	2	2	2				1	2	2	
CO5	3	2	1	3	2	2	2				1	2	2	

TEXT BOOKS:

1)Basic Radiological Physics Dr. K. Thayalan - Jayapee Brothers Medical Publishing Pvt. Ltd. New Delhi (2003)

2) Physics of Radiation Therapy: F M Khan - Williams and Wilkins, Third edition (2003)

3) Advanced Practical Physics for students, B.L. Flint & H.T. Worship, 1971, Asia Publishing House.

REFERENCES:

1) Christensen's Physics of Diagnostic Radiology: Curry, Dowdey and Murry - Lippincot Williams and Wilkins (1990)
2) The essential physics of Medical Imaging: Bushberg, Seibert, Leidholdt and 36 Boone Lippincot Williams and Wilkins, Second Edition (2002)
3) The Physics of Radiology-H E Johns and Cunningham.
4) Handbook of Physics in Diagnostic Imaging: Roshan S. Livingstone: B. I. Publications Pvt Ltd.
5) A Text Book of Practical Physics, InduPrakash and Ramakrishna, 11th Edition, 2011, KitabMahal, New Delhi.

21PHY332RENEWABLE 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 :

Fossil fuels and Alternate Sources of energy: Fossil fuels and Nuclear Energy, their limitation, need of renewable energy, non-conventional energy sources. An overview of developments in Offshore Wind Energy, Tidal Energy, Wave energy systems, Ocean Thermal Energy Conversion, solar energy, biomass, biochemical conversion, biogas generation, geothermal energy tidal energy, Hydroelectricity.

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.

UNIT III:

Wind Energy harvesting: Fundamentals of Wind energy, Wind Turbines and different electrical machines in wind turbines, Power electronic interfaces, and grid interconnection topologies.

Ocean Energy: Ocean Energy Potential against Wind and Solar, Wave Characteristics and Statistics, Wave Energy Devices.

Tide characteristics and Statistics, Tide Energy Technologies, Ocean Thermal Energy, Osmotic Power, Ocean Bio-mass.

UNIT IV:

Geothermal Energy: Geothermal Resources, Geothermal Technologies.

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

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	2	1	3	2	2	2				1	2	2	
CO2	3	2	1	3	2	2	2				1	2	2	
CO3	3	2	1	3	2	2	2				1	2	2	
CO4	3	2	1	3	2	2	2				1	2	2	
CO5	3	2	1	3	2	2	2				1	2	2	

REFERENCES:

1)Non-conventional energy sources - G.D Rai - Khanna Publishers, New Delhi
2) Solar energy - M P Agarwal - S Chand and Co. Ltd.
3) Solar energy - Suhas P Sukhative Tata McGraw - Hill Publishing Company Ltd.
4) Godfrey Boyle, "Renewable Energy, Power for a sustainable future", 2004, Oxford University Press, in association with The Open University.
5) Dr. P Jayakumar, Solar Energy: Resource Assessment Handbook, 2009

6) J.Balfour, M.Shaw and S. Jarosek, Photovoltaics, Lawrence J Goodrich (USA).
7) http://en.wikipedia.org/wiki/Renewable_energy

21PHY333INTRODUCTION 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:

Synthesis of nanoparticles: Classification of fabrication methods – top-to-bottom and bottom-to-top approaches, physical and chemical methods of preparation: CVD, controlled precipitation, sol-gel method, PLD etc; Confinement of particles – low dimensional structures - quantum wells, wires and dots.

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.

Mapping of CO's and PO's

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	2	3	3	3	2	3				3	3	3	
CO2	3	2	3	3	3	2	3				3	3	3	
CO3	3	2	3	3	3	2	3				3	3	3	
CO4	3	2	3	3	3	2	3				3	3	3	
CO5	3	2	3	3	3	2	3				3	3	3	

REFERENCES:

1. Charles P Poole Jr. & Frank J Owens, Introduction to Nanotechnology, 1E, Wiley, 2007
2. W.R Fawner (Ed.), Nanotechnology and Nano electronics, Springer, 2006
3. M Hosokawa, et al, Nanoparticle Technology Handbook, Elsevier Publishers, 2007

4. S.V. Gaponenko, P.L Knight & A. Miller, Optical Properties of Semiconductor Nanocrystals, CUP, 1E, 2005
5. T Pradeep, Nano: The Essentials, TMH, 1E, 2007

21PHY334 PHYSICS OF THE ATMOSPHERE 3-0-0 3

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

1. Andrews DG: An introduction to atmospheric physics, 2E, CUP, 2010
2. Salby ML: Physics of the Atmosphere and Climate, CUP, 2012
3. Holton JR: An introduction to Dynamic Meteorology, 4E, AP, 2004
4. Wallace JM & Hobbs PV: Atmospheric Science-An introductory Survey, 2E, AP, 2006
5.Chandrasekar A: Basics of Atmospheric Science, PHI, 2010

Mapping of CO's and PO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	3	3	1	3	3	1	2				3	3	3	
CO2	3	3	1	3	3	1	2				3	3	3	
CO3	3	3	1	3	3	1	2				3	3	3	
CO4	3	3	1	3	3	1	2				3	3	3	
CO5	3	3	1	3	3	1	2				3	3	3	

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:

Introduction: Laws of Physics and Chemistry, introduction to crystallography, Introduction to chromatography, electrophoresis Physico-Chemical Techniques to studyBiomolecules: hydration of macromolecules, diffusion of osmosis, sedimentation, ultracentrifuge, rotational dissuasion, light scattering, small angle X-ray scattering, Mass spectrometry.

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 H_2O_2, , 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:

Energy Pathways in Biology: free energy, couple reactions, group transfer potential, Pyridinenucleotides, photosynthesis, energy conversion pathways, membrane transport. Biomechanics: strained muscles, mechanical properties of muscles, cardiovascular-system.

UNIT V:

Neurobiophysics: nervous system, physics of membrane potentials, sensory mechanisms. Origin and evolution of life: prebiotic earth, theories of origin and evolution of life, laboratory experiments on formation of small molecules.

TEXTBOOKS:

1. "Cell and Molecular Biology-Concepts and Experiments" by G.Karp, 2nd ed. John Wiley & Sons, Inc. Singapore, 1999.
2. "Principles of Physical Biochemistry" by K.vanHolde, W.C. Johnson, and P.S.Ho. *Prentice Hall, 1998.*

Mapping of CO's and PO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	3	1	3	3	3	1	1				3	2	3	
CO2	3	1	3	3	3	1	1				3	2	3	
CO3	3	1	3	3	3	1	1				3	2	3	
CO4	3	1	3	3	3	1	1				3	2	3	

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:

Space plasma physics – single particle motion, plasma state, Fluid description, MHD & Kinetic theory, Applications.

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.

REFERENCES:

1) Hannu E.J. Koskinen, Physics-of Space Storms, Springer, 2011.
2) Molwin, M., An Introduction to Space Weather, CUP, 2008.
3) Kivelson& Russell, Introduction to Space Physics, CUP, 1995.

Mapping of CO's and PO's

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	1	1	2	2	2	3				2	3	1	
CO2	3	1	1	2	2	2	3				2	3	1	
CO3	3	1	1	2	2	2	3				2	3	1	
CO4	3	1	1	2	2	2	3				2	3	1	
CO5	3	1	1	2	2	2	3				2	3	1	

21PHY340Modern Physics 3 0 0 3

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

Basic concept of Classical Mechanics: Mechanics of particle, Mechanics of System of Particles, constraints, Holonomic and Non holonomic constraints, Virtual work, Alembert's Principle, Lagrange's equations, Simple Application of Lagrange's formulation- Linear Harmonic Oscillator, simple Pendulum.

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

De Broglie's Wave and Uncertainty Principle: Inadequacy of classical mechanics, two slit experiment, superposition Principle, Wave particle dualism for light and matter, De Broglie's Wave, De Broglie's model of the atom, wave Velocity and group velocity, Heisenberg uncertainty Principle. Application of uncertainty Principle – (1) Energy and radius of Bohr First Orbit (2) Why electron cannot present in the nucleus.

Unit-4

Schrodinger Equation and its Application: Concept of Wave function "Ψ", Schrodinger 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:-

- Classical Mechanics – Herbert Goldstein, Charles P. Poole, John L. Safko – 2001 3rd edition
- Classical Mechanics – J.C. Upadhayaya – 1st edition 1999
- Perspective of Modern Physics – Bezier 6th edition 2003
- Quantum Mechanics – Robert Eisberg – 1985 2nd edition
- Modern Physics – J. B. Rajam – 2004
- Quantum Mechanics – B. S. Rajput – 2016 13th edition
- Elements of Quantum Mechanics – Kamal Singh-S.P. Singh – 2005 1st edition.
- Introduction to Quantum Mechanics - David J. Griffiths – 1994

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	3	3	1	2				3	3	3	
CO2	3	2	3	3	3	1	2				3	3	3	
CO3	3	2	3	3	3	1	2				3	3	3	
CO4	3	2	3	3	3	1	2				3	3	3	

21PHY339SEMICONDUCTOR PHYSICS 3 0 0 3

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:
Optical Transport: Electron - hole pair generation and recombination: band to band (direct and indirect band gap transitions) and intra band (impurity related) transitions, free - carrier & phonon transitions. Excitons: Origin, electronic levels and properties Radiative and nonradiative recombination (Shockley - Read - Hall and Auger) processes. Carrier transport - continuity equations. Optical constants: Kramers - Kronig relations.

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:

1. "The Physics of Semiconductors" by Kevin F Brennan, Cambridge Univ.Press (1999).
2. "Fundamentals of Semiconductors" by Peter Y Yu and Manuel Cardona,Springer(1996).
3. "Introduction to Solid State Physics" by Charles Kittel, 6 th Ed., Willey (1991).
4. "Semiconductor Physics and Devices" by D.A. Neamen, 3rd Ed.,Tata McGraw-Hill,(2002).
5. "Semiconductor Optoelectronics (Physics and Technology)", Jasprit Singh, McGrawhill,(1995).

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	3	3	1	2				3	3	3	
CO2	3	2	3	3	3	1	2				3	3	3	
CO3	3	2	3	3	3	1	2				3	3	3	
CO4	3	2	3	3	3	1	2				3	3	3	

ELECTIVES – COMPUTER SCIENCE

21CSA431SOFTWARE ENGINEERING3-0-0 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:

CO1	Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
CO2	Students get an overall idea about SRS and different Process Models.
CO3	Decide on a process model for a developing a software project
CO4	An overall idea about Testing strategies, different methods and Testability concept is provided to the students.
CO5	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.

CO – PO Mappings

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PS01	PS02	PS03	PS04
18CSA361 CO1	2	-	1	1	1	-	-	-	-	-	-	-	-	1
18CSA361 CO2	2	-	1	2	1	1	-	1	-	-	-	-	-	3

18CSA361 CO3	3	-	3	2	2	2	-	-	-	-	-	-	-	3
18CSA361 CO4	3	-	2	1	2	-	-	-	-	2	-	-	-	2
18CSA361CO5	2	-	3	1	1	3	-	-	-	-	-	-	-	2

UNIT I:

Introduction – Software - Software Crisis - Software Myths – Process and Product - Software

characteristics- SDLC Introduction

UNIT II:

Software requirements specification – Approaches – Paradigms – Build and Fix - Waterfall –

Prototyping – Spiral – Concurrent – RAD – Incremental – Agile Introduction.

UNIT III:

Analysis Modeling - Elements of Analysis Model - Data Modeling - ERD – DFD - Data

Dictionary. Introduction to Design concepts - Design Architecture, Design characteristics,

Description, Principles. Object oriented diagrams - Class diagrams - Use Case Diagrams – State transition diagrams – Object diagrams – Interaction diagrams.

UNIT IV:

Software Testing Fundamentals - Objectives of Testing - Testing Principles – Testability –Testing Process and Methods – Introduction to Testing Strategies.

UNIT V:

Software Maintenance - Reverse Engineering and Reengineering

TEXT BOOK:

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

REFERENCE:

1) *Shooman, "Software Engineering", Tata McGraw-Hill Publishing Company, Pvt. Ltd, 1987*

21CSA432THEORY 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 undesirabilityof various problems.

CO 1	To understand the theory and practice of theory of computation, languages
CO 2	To learn finite state machines used in computers
CO 3	To learn context free grammars, parsing techniques.
CO 4	To understand thePushdown Automata
CO 5	To learn about Turing Machines (TM) used in decidability and NP Problems

	CO-PO Affinity Map													
PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	1	0	3	2	1	0	1				0	0	0	2
CO2	1	0	2	1	1	0	1				0	1	1	2
CO3	0	0	1	1	1	0	1				0	1	0	2
CO4	0	0	1	1	1	0	1				0	1	1	2
CO5	1	0	1	1	1	0	1				0	1	1	2

UNIT I:
Introduction to Theory of Computation, Languages and Strings, Computation, Finite StateMachines (FSM): Formal Definition of a DFA, Deterministic Finite Automata, Regularlanguages, 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 andRegular 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), GreibachNormal 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 LinearBounded automata: Decidability: Definition of an algorithm, decidability,

decidable languages,undecidable languages, halting problem of TM, -Complexity: Growth rate of functions, theclasses of P and NP.

TEXT BOOKS:

1) Elaine Rich, Automata, Computability and Complexity, 1st Edition, Pearson Education,2012/2013
2) K L P Mishra, N Chandrasekaran , 3rd Edition, Theory of Computer Science, PhI, 2012.

REFERENCES:

1) John E Hopcroft, Rajeev Motwani, Jeffery D Ullman, Introduction to Automata Theory,Languages, and Computation, 3rd Edition, Pearson Education, 2013
2) Michael Sipser : Introduction to the Theory of Computation, 3rd edition, Cengage learning,2013
3) John C Martin, Introduction to Languages and The Theory of Computation, 3rd Edition, Tata
3) McGraw –Hill Publishing Company Limited, 2013
4) Peter Linz, "An Introduction to Formal Languages and Automata", 3rd Edition, NarosaPublishers, 1998
5) Basavaraj S. Anami, Karibasappa K G, Formal Languages and Automata theory, Wiley India,2012

21CSA434COMPILER 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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	1	1	2	1	-	-	-	-	-	-		1	2	
CO2	1	-	1	-	-	-	-	-	1	-			1	
CO3	-	-	1	1	1	-	-	-	-	-				1
CO4	1	-	-	1	-	-	-	1	-	1		1	3	

Syllabus

UNIT I :

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

UNIT II

Lexical Anlysis: Role of Lexical Analyzer-Lexical Errors-Expressing Tokens by RegularExpressions-Converting Regular Expression to DFA- Minimization of DFA-Language forSpecifying Lexical Analyzers-LEX-Design of a simple lexical analyzer for a programmingLanguage.

UNIT III

Syntax Analysis: Need and Role of the Parser-Context Free Grammars -Top Down Parsing-General Strategies Recursive descent parsing, Predictive Parser-LL(1) Parser, Shift ReduceParser-LR, Parser-LR (0)Item-Construction of SLR Parsing table.

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

Code Optimization and Code Generation: Introduction to code optimization, principalSources of Optimization-DAG- Optimization of Basic Blocks- Global Data Flow Analysis-Issues in Design of a Code Generator - A Simple Code Generator Algorithm.

TEXT BOOK:

1) Compilers-Principles, Techniques and Tools by Alfred V Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman. Pearson, 2nd edition, 2007

REFERENCES:

1) David Galles, "Modern Compiler Design", Pearson Education Asia, 2007
2) Steven S. Muchnick, "Advanced Compiler Design & Implementation", Morgan Kaufmann
2) Pulishers, 2000.
3) C. N. Fisher and R. J. LeBlanc "Crafting a Compiler with C", Pearson Educatio

21CSA435DISTRIBUTED 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

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

CO-PO Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	2	-	2	-	-	-	1	1	-	-	-	-	-	3
CO2	3	-	1	-	-	-	1	1	-	-	-	-	-	2
CO3	3	-	2	-	-	-	2	1	-	-	-	-	-	2
CO4	1	-	1	-	-	-	1	2	-	-	-	-	-	2

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

UNIT II:
Distributed systems: Pros and Cons of distributed processing –Distributed databases – thechallenges 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 databaseslevels of transparency-distributed database design-the R* project techniques problem ofheterogeneous distributed databases

TEXT BOOKS:

[1]. John a. Sharp, "An introduction to distributed and parallel processing" Blackwell Scientific Publication
[2]. Uyless D. Black, "Data communication and distributed networks"
[3]. Joel M.Crichllow "introduction to distributed & parallel computing
[4]. Stefans Ceri, Ginseppe Pelagatti "Distributed database Principles and systems" McGraw Hill

21CSA436Data 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)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	1	1	2	2	2	1	2	-	-	-	-	2	2	1
CO2	3	2	3	1	1	1	1	1	-	-	-	2	3	2
CO3	2	1	1	1	-	-	-	-	-	-	-	-	1	

CO4	2	1	2	2	2	-	-	-	-	-	-	2	2	2

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:

Data Warehousing: Basic Concepts-Data Warehouse Modeling- OLAP and OLTP Systems -Data Cube and OLAP Operations–Data Warehouse Design and Usage-Business Analysis Framework for Data Warehouse Design- OLAP to Multidimensional Data Mining.

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.

2. K.P.Soman, Shyam Diwakar and V.Ajay, “Insight into data mining Theory and Practice”,

Prentice Hall of India, 2006.

3. William H Inmon “Building the Data Warehouse”, Wiley, Fourth Edition 2005.

21CSA437ARTIFICIAL INTELLIGENCE 3 0 0 3

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

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PSO 1	PSO 2	PSO 3	PSO 4
CO1	3	2	3	3	3	1	2	-	-	-	-	2	2	3
CO2	3	1	3	3	3	-	1	-	-	1	-	2	1	3
CO3	3	2	3	3	3	-	2	-	1	1	-	3	3	3
CO4	3	3	3	3	3	-	1	1	1	-	1	2	3	3

Unit – 1

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

Unit 2

Heuristic Search Techniques - Generate – and – Test – Hill Climbing – Best-First Search – Problem Reduction – Constraint Satisfaction - Means - Ends Analysis. Knowledge Representation issues – Representations and Mapping - Approaches to knowledge Representation – Issues in knowledge Representation – The Frame Problem. Using Predicate Logic – Representing simple facts in Logic.

Unit 3

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

Unit 4

Game Playing - The Minimax Search Procedure.Understanding – What is Understanding? What makes Understanding hard?Common Sense – Qualitative Physics – Commonsense ontology - Expert Systems – Representing and Using Domain knowledge.

TEXTBOOKS:

1. *Artificial Intelligence (Second Edition) – Elaine Rich, Kevin knight (Tata McGraw-Hill)*
2. *A Guide to Expert Systems – Donald A. Waterman (Addison-Wesley)*

REFERENCES:

1. *Principles of Artificial Intelligence – Nils J. Nilsson (Narosa Publishing House)*
2. *Introduction to Artificial Intelligence – Eugene Charnaik, Drew McDermott (Pearson Education Asia)*

21CSA438Data Analytics 3 0 0 3

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)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	1	2	2	2	2	1	1	1	-	-	-	2	2	1
CO2	3	2	3	1	1	-	-	-	-	-	-	2	3	2
CO3	1	2	1	1	1	2	1	-	-	-	-		1	
CO4	2	2	2	2	2	1	-	-	-	-	-	2	2	2

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

Hypothesis testing – confidence interval and errors – t-test – chi-square test – goodness of fit – test for independence – ANOVA – introduction to design of experiments- - random samples- sample statistics and population statistics

Unit III

Regression analysis – regression models – method-of least squares –data reduction – Time Series Analysis – AR models – ARMA models – ARIMA models – Basics of nonlinear TSA

Unit IV

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

Textbooks / References

4. Basic skills in Statistics: A Guide for Healthcare Professionals. Cook, A., Netuveli, G. and Sheikh, A.ClassPublishing (London) (2004).
5. Basic Statistics: Understanding conventional methods and modern insights. Wilcox, R. R. Oxford UniversityPress (2009).
6. Basic Statistics for the behavioural sciences. 6th edition. Heiman, G. W. Wadsworth (2011).
7. Introduction to Time Series and Forecasting (Springer Texts in Statistics) 2nd Edition. Brockwell, P. J. & Richard, A. D (1991).
8. Introduction to Engineering Statistics and Six Sigma. Allen, T. T. Springer – Verlag (London) (2006).
9. Statistical Design and Analysis of Experiments: With Applications to Engineering and Science. 2nd Edition.Mason, R. L., Gunst, R. F. and Hess, J. L. Wiley-Interscience (2003).
10. Time Series: Theory and Methods (Springer Series in Statistics) 2nd edition. Brockwell, P. J. & Richard, A. D (1991).

21CSA439IMAGE PROCESSING 3 0 0 3

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

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3	PSO 4
1	2	-	1	1	1	-	-	-	-	-	-	-	-	1
2	2	2	2	2	1	1	-	1	-	-	-	-	-	2
3	1	1	3	2	2	2	-	-	-	-	-	-	-	3
4	1	2	2	2	1	3	-	-	-	2	-	-	-	2

5	2	-	3	1	1	1	-	-	-	-	-	-	-	2

CO – PO Mappings:

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

Image Enhancement in spatial domain Basic Gray Level Transformation functions – Image Negatives, Log Transformations, Power-Law Transformations. Piecewise-Linear Transformation Functions: Contrast Stretching, Gray Level Slicing, Bit Plane Slicing, Histogram Processing–

Equalization. Basics of Spatial Filtering – Smoothing, Smoothing Linear Filters, Ordered Statistic Filters, Sharpening: Laplacian, Unsharp Masking and High Boost Filtering.

UNIT III

Image Enhancement in Frequency Domain Basics of Filtering in Frequency Domain, Filters - Smoothing Frequency Domain Filters : Ideal Low Pass Filter, Gaussian Low Pass Filter, Butterworth Low Pass Filter, Sharpening Frequency Domain Filters: Ideal High Pass Filter, Gaussian High Pass Filter, Butterworth High Pass Filter, Homomorphic Filtering.

UNIT IV

Image Segmentation: Pixel-Based Approach- Multi-Level Thresholding, Local Thresholding, Threshold Detection Method, Region-Based Approach- Region Growing Based Segmentation, Region Splitting, Region Merging, Split and Merge, Edge Detection - Edge Operators, Line Detection, Corner Detection.

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:

1. A K. Jain, Fundamentals of digital image processing, Prentice Hall of India, 1989.

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

REFERENCE:

2. Al Bovik, The Essential Guide to Image Processing, Academic Press, 2009.
3. Milan Sonka, Vaclav Hlavac and Roger Boyle, Image Processing, Analysis, and MachineVision, Thomson Learning, 2008.
4. S Jayaraman, S Esakkirajan and T Veerakumar, Digital Image Procesing, McGraw HillEducation, 2009.

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

CO1	Understand general concepts of Internet of Things
CO2	Recognize various devices, sensors and applications
CO3	Apply design concept to IoT solutions
CO4	Analyze various M2M and IoT architectures
CO5	Evaluate design issues in IoT applications
CO6	Create IoT solutions using sensors, actuators and Devices

CO-PO Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	2	-	2	-	-	-	2	1	-	-	-	1	-	2
CO2	3	-	1	-	-	-	2	1	-	-	-	2	-	2
CO3	3	-	2	-	-	-	2	1	-	-	-	2	-	2
CO4	1	-	1	-	-	-	1	2	-	-	-	1	-	2
CO5	2	-	2	-	-	-	-	-	-	-	-	1	-	1
CO6	2	-	3	-	-	-	2	1	-	-	-	2	-	2

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.

Developing IoT solutions: Introduction to Python, Introduction to different IoT tools, Introduction to Arduino and Raspberry Pi Implementation of IoT with Arduino and Raspberry, Cloud Computing, Fog Computing, Connected Vehicles, Data Aggregation for the IoT in Smart Cities, Privacy and Security Issues in IoT

TEXT BOOKS:

[1]. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.

[2]. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-onApproach)", 1st Edition, VPT, 2014

[3]. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013

[4]. Cuno Pfister, Getting Started with the Internet of Things, O"Reilly Media, 2011, ISBN: 978-1-4493- 9357-1