PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

1. To provide graduates with the proficiency to utilize the fundamental knowledge of basic sciences, mathematics, Artificial Intelligence, data science and statistics to build systems that require management and analysis of large volume of data.
2. To enrich graduates with necessary technical skills to pursue pioneering research in the field of AI and Data Science and create disruptive and sustainable solutions for the welfare of ecosystems.
3. To enable graduates to think logically, pursue lifelong learning and collaborate with an ethical attitude in a multidisciplinary team.
4. To enable the graduates to design and model AI based solutions to critical problem domains in the real world.
5. To enrich the innovative thoughts and creative ideas of the graduates for effective contribution towards economy building.

PROGRAM OUTCOMES (POs) ENGINEERING GRADUATES WILL BE ABLE TO:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and Artificial Intelligence and Data Science basics to the solution of complex engineering problems.

2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

**Programme Specific Outcomes**

1. Graduates should be able to evolve AI based efficient domain specific processes for effective decision making in several domains such as business and governance domains.

2. Graduates should be able to arrive at actionable Fore sight, Insight, hind sight from data for solving business and engineering problems

3. Graduates should be able to create, select and apply the theoretical knowledge of AI and Data Analytics along with practical industrial tools and techniques to manage and solve wicked societal problems

4. Graduates should be capable of developing data analytics and data visualization skills, skills pertaining to knowledge acquisition, knowledge representation and knowledge engineering, and hence capable of coordinating complex projects.

5. Graduates should be able to carry out fundamental research to cater the critical needs of the society through cutting edge technologies of AI.
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**PRACTICALS**

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**TOTAL**

|                  |               |               |       |               | 30 | 18 | 12 | 24 |

### SEMESTER VIII

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**PRACTICALS**

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**TOTAL**

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**TOTAL NO. OF CREDITS: 183**

### PROFESSIONAL ELECTIVES (PE)

#### SEMESTER IV, ELECTIVE - I

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<td>Embedded Systems and Programming</td>
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### SEMESTER VIII, ELECTIVE - V

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OBJECTIVES:
- To develop the basic reading and writing skills of first year engineering and technology students.
- To help learners develop their listening skills, which will enable them listen to lectures and comprehend them by asking questions; seeking clarifications.
- To help learners develop their speaking skills and speak fluently in real contexts.
- To help learners develop vocabulary of a general kind by developing their reading skills.

UNIT I  SHARING INFORMATION RELATED TO ONESELF/FAMILY & FRIENDS  12

UNIT II  GENERAL READING AND FREE WRITING  12
Reading - comprehension-pre-reading-post reading- comprehension questions (multiple choice questions and/or short questions/ open-ended questions)-inductive reading- short narratives and descriptions from newspapers including dialogues and conversations (also used as short Listening texts)- register. Writing - paragraph writing- topic sentence- main ideas- free writing, short narrative descriptions using some suggested vocabulary and structures. Listening: telephonic conversations. Speaking - sharing information of a personal kind—greeting – taking leave. Language development – prepositions, conjunctions. Vocabulary development – guessing meanings of words in context.

UNIT III  GRAMMAR AND LANGUAGE DEVELOPMENT  12
Reading: short texts and longer passages (close reading) Writing: understanding text structure-use of reference words and discourse markers-coherence-jumbled sentences Listening – listening to longer texts and filling up the table- product description- narratives from different sources. Speaking: asking about routine actions and expressing opinions. Language development- degrees of comparison- pronouns- direct vs indirect questions. Vocabulary development – single word substitutes- adverbs.

UNIT IV  READING AND LANGUAGE DEVELOPMENT  12
Reading: comprehension-reading longer texts- reading different types of texts- magazines Writing- letter writing, informal or personal letters- e-mails-conventions of personal email. Listening- listening to dialogues or conversations and completing exercises based on them. Speaking- speaking about oneself- speaking about one’s friend. Language development- Tenses- simple present-simple past- present continuous and past continuous. Vocabulary development- synonyms- antonyms- phrasal verbs.
UNIT V EXTENDED WRITING
Reading - longer texts - close reading – Writing - brainstorming - writing short essays – developing an outline - identifying main and subordinate ideas - dialogue writing
Listening – listening to talks - conversations - Speaking – participating in conversations - short group conversations - Language development - modal verbs - present/ past perfect tense - Vocabulary development - collocations - fixed and semi-fixed expressions.

TOTAL: 60 PERIODS

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:
• Read articles of a general kind in magazines and newspapers.
• Participate effectively in informal conversations; introduce themselves and their friends and express opinions in English.
• Comprehend conversations and short talks delivered in English
• Write short essays of a general kind and personal letters and emails in English.

TEXT BOOKS:

REFERENCES:
3. Redston, Chris & Gillies Cunningham Face2Face (Pre-intermediate Student’s Book& Workbook) Cambridge University Press, New Delhi: 2005

MA8151 ENGINEERING MATHEMATICS – I

OBJECTIVES:
• The goal of this course is to achieve conceptual understanding and to retain the best traditions of traditional calculus.
• The syllabus is designed to provide the basic tools of calculus mainly for the purpose of modelling the engineering problems mathematically and obtaining solutions.
• This is a foundation course which mainly deals with topics such as single variable and multivariable calculus and plays an important role in the understanding of science, engineering, economics and computer science, among other disciplines.

UNIT I DIFFERENTIAL CALCULUS
Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules - Maxima and Minima of functions of one variable.
UNIT II FUNCTIONS OF SEVERAL VARIABLES

UNIT III INTEGRAL CALCULUS
Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals.

UNIT IV MULTIPLE INTEGRALS

UNIT V DIFFERENTIAL EQUATIONS

TOTAL: 60 PERIODS

OUTCOMES:
After completing this course, students should demonstrate competency in the following skills:

- Use both the limit definition and rules of differentiation to differentiate functions.
- Apply differentiation to solve maxima and minima problems.
- Evaluate integrals both by using Riemann sums and by using the Fundamental Theorem of Calculus.
- Apply integration to compute multiple integrals, area, volume, integrals in polar coordinates, in addition to change of order and change of variables.
- Evaluate integrals using techniques of integration, such as substitution, partial fractions and integration by parts.
- Determine convergence/divergence of improper integrals and evaluate convergent improper integrals.
- Apply various techniques in solving differential equations.

TEXT BOOKS:
2. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7th Edition, New Delhi, 2015. [For Units I & III - Sections 1.1, 2.2, 2.3, 2.5, 2.7(Tangents problems only), 2.8, 3.1 to 3.6, 3.11, 4.1, 4.3, 5.1(Area problems only), 5.2, 5.3, 5.4 (excluding net change theorem), 5.5, 7.1 - 7.4 and 7.8].

REFERENCES:
PH8151  ENGINEERING PHYSICS

OBJECTIVES:
- To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology.
- To make the students understand the importance of mechanics.
- To equip the students on the knowledge of electromagnetic waves.
- To introduce the basics of oscillations, optics and lasers.

UNIT I  PROPERTIES OF MATTER

UNIT II WAVES AND FIBER OPTICS

UNIT III THERMAL PHYSICS

UNIT IV QUANTUM PHYSICS

UNIT V CRYSTAL PHYSICS
Single crystalline, polycrystalline and amorphous materials – single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices – inter-planar distances - coordination number and packing factor for SC, BCC, FCC, HCP and diamond structures - crystal imperfections: point defects, line defects – Burger vectors, stacking faults – role of imperfections in plastic deformation - growth of single crystals: solution and melt growth techniques.

TOTAL : 45 PERIODS
OUTCOMES:
Upon completion of this course,

- The students will gain knowledge on the basics of properties of matter and its applications,
- The students will acquire knowledge on the concepts of waves and optical devices and their applications in fibre optics,
- The students will have adequate knowledge on the concepts of thermal properties of materials and their applications in expansion joints and heat exchangers,
- The students will get knowledge on advanced physics concepts of quantum theory and its applications in tunneling microscopes, and
- The students will understand the basics of crystals, their structures and different crystal growth techniques.

TEXT BOOKS:

REFERENCES:

CY8151 ENGINEERING CHEMISTRY

OBJECTIVES:
- To make the students conversant with boiler feed water requirements, related problems and water treatment techniques.
- To develop an understanding of the basic concepts of phase rule and its applications to single and two component systems and appreciate the purpose and significance of alloys.
- Preparation, properties and applications of engineering materials.
- Types of fuels, calorific value calculations, manufacture of solid, liquid and gaseous fuels.
- Principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells.

UNIT I  WATER AND ITS TREATMENT  9

UNIT II  SURFACE CHEMISTRY AND CATALYSIS  9

UNIT III ALLOYS AND PHASE RULE

UNIT IV FUELS AND COMBUSTION

UNIT V ENERGY SOURCES AND STORAGE DEVICES
Nuclear fission - controlled nuclear fission - nuclear fusion - differences between nuclear fission and fusion - nuclear chain reactions - nuclear energy - light water nuclear power plant - breeder reactor - solar energy conversion - solar cells - wind energy. Batteries, fuel cells and supercapacitors: Types of batteries – primary battery (dry cell) secondary battery (lead acid battery, lithium-ion-battery) fuel cells – H2-O2 fuel cell.

TOTAL: 45 PERIODS

OUTCOMES:
• The knowledge gained on engineering materials, fuels, energy sources and water treatment techniques will facilitate better understanding of engineering processes and applications for further learning.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To know the basics of algorithmic problem solving
- To read and write simple Python programs.
- To develop Python programs with conditionals and loops.
- To define Python functions and call them.
- To use Python data structures — lists, tuples, dictionaries.
- To do input/output with files in Python.

UNIT I ALGORITHMIC PROBLEM SOLVING 9
Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.

UNIT II DATA, EXPRESSIONS, STATEMENTS 9
Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

UNIT III CONTROL FLOW, FUNCTIONS 9
Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

UNIT IV LISTS, TUPLES, DICTIONARIES 9
Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: selection sort, insertion sort, mergesort, histogram.

UNIT V FILES, MODULES, PACKAGES 9
Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file.

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, students will be able to
- Develop algorithmic solutions to simple computational problems
- Read, write, execute by hand simple Python programs.
- Structure simple Python programs for solving problems.
- Decompose a Python program into functions.
- Represent compound data using Python lists, tuples, dictionaries.
- Read and write data from/to files in Python Programs.
TEXT BOOKS:

REFERENCES:

GE8152 ENGINEERING GRAPHICS L T P C
2 0 4 4

OBJECTIVES:
● To develop in students, graphic skills for communication of concepts, ideas and design of Engineering products.
● To expose them to existing national standards related to technical drawings.

CONCEPTS AND CONVENTIONS (Not for Examination)
Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I PLANE CURVES AND FREEHAND SKETCHING 7+12
Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves. Visualization concepts and Free Hand sketching: Visualization principles –Representation of Three Dimensional objects – Layout of views- Freehand sketching of multiple views from pictorial views of objects

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACE 6+12
Orthographic projection principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS 5+12
Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis
is inclined to one of the principal planes by rotating object method.

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 5+12

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 6+12

Principles of isometric projection – isometric scale – Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones - combination of two solid objects in simple vertical positions - Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method.

TOTAL: 90 PERIODS

OUTCOMES:
On successful completion of this course, the student will be able to:

- Familiarize with the fundamentals and standards of Engineering graphics
- Perform freehand sketching of basic geometrical constructions and multiple views of objects.
- Project orthographic projections of lines and plane surfaces.
- Draw projections and solids and development of surfaces.
- Visualize and to project isometric and perspective sections of simple solids.

TEXT BOOKS:

REFERENCES:

Publication of Bureau of Indian Standards:

Special points applicable to University Examinations on Engineering Graphics:
1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only.
4. The students will be permitted to use appropriate scale to fit solution within A3 size.
5. The examination will be conducted in appropriate sessions on the same day.

GE8161 PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY L T P C 0 0 4 2

OBJECTIVES:
- To write, test, and debug simple Python programs.
- To implement Python programs with conditionals and loops.
- Use functions for structuring Python programs.
- Represent compound data using Python lists, tuples, dictionaries.
- Read and write data from/to files in Python.

LIST OF PROGRAMS:
1. Compute the GCD of two numbers.
2. Find the square root of a number (Newton’s method)
3. Exponentiation (power of a number)
4. Find the maximum of a list of numbers
5. Linear search and Binary search
6. Selection sort, Insertion sort
7. Merge sort
8. First n prime numbers
9. Multiply matrices
10. Programs that take command line arguments (word count)
11. Find the most frequent words in a text read from a file
12. Simulate elliptical orbits in Pygame
13. Simulate bouncing ball using Pygame

PLATFORM NEEDED
Python 3 interpreter for Windows/Linux

TOTAL: 60 PERIODS

OUTCOMES:
Upon completion of the course, students will be able to:
- Write, test, and debug simple Python programs.
- Implement Python programs with conditionals and loops.
- Develop Python programs step-wise by defining functions and calling them.
- Use Python lists, tuples, dictionaries for representing compound data.
- Read and write data from/to files in Python.
OBJECTIVES:
● To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics, properties of matter and liquids.

LIST OF EXPERIMENTS: PHYSICS LABORATORY (Any 5 Experiments)
1. Determination of rigidity modulus – Torsion pendulum
2. Determination of Young’s modulus by non-uniform bending method
3. (a) Determination of wavelength, and particle size using Laser
   (b) Determination of acceptance angle in an optical fiber.
5. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer
6. Determination of wavelength of mercury spectrum – spectrometer grating
7. Determination of band gap of a semiconductor
8. Determination of thickness of a thin wire – Air wedge method

TOTAL: 30 PERIODS

OUTCOMES:
Upon completion of the course, the students will be able to
● Apply principles of elasticity, optics and thermal properties for engineering applications.

CHEMISTRY LABORATORY: (Any seven experiments to be conducted)

OBJECTIVES:
● To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.
● To acquaint the students with the determination of molecular weight of a polymer by viscometry.

1. Estimation of HCl using Na₂CO₃ as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler’s method.
4. Determination of chloride content of water sample by argentometric method.
5. Estimation of copper content of the given solution by Iodometry.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Estimation of iron content of the given solution using potentiometer.
9. Estimation of iron content of the water sample using spectrophotometer (1, 10-Phenanthroline / thiocyanate method).
10. Estimation of sodium and potassium present in water using flame photometer.
12. Pseudo first order kinetics-ester hydrolysis.
14. Determination of CMC.
15. Phase change in a solid.
16. Conductometric titration of strong acid vs strong base.

OUTCOMES:
- The students will be outfitted with hands-on knowledge in the quantitative chemical analysis of water quality related parameters.

TOTAL: 30 PERIODS

TEXTBOOK:

HS8251
TECHNICAL ENGLISH
L T P C
4 0 0 4

OBJECTIVES:
The Course prepares second semester engineering and Technology students to:

- Develop strategies and skills to enhance their ability to read and comprehend engineering and technology texts.
- Foster their ability to write convincing job applications and effective reports.
- Develop their speaking skills to make technical presentations, participate in group discussions.
- Strengthen their listening skill which will help them comprehend lectures and talks in their areas of specialization.

UNIT I
INTRODUCTION TECHNICAL ENGLISH

Listening- Listening to talks mostly of a scientific/technical nature and completing information-gap exercises.
Speaking – Asking for and giving directions.
Reading – reading short technical texts from journals, newspapers.
Writing – purpose statements – extended definitions – issue writing instructions – checklists-recommendations.
Vocabulary Development – technical vocabulary.
Language Development – subject verb agreement - compound words.

UNIT II
READING AND STUDY SKILLS

Listening- Listening to longer technical talks and completing exercises based on them.
Speaking – describing a process.
Reading – reading longer technical texts – identifying the various transitions in a text.
Paragraphing.
Writing – interpreting charts, graphs.
Vocabulary Development – vocabulary used in formal letters/emails and reports.
Language Development – impersonal passive voice, numerical adjectives.

UNIT III
TECHNICAL WRITING AND GRAMMAR

Listening- Listening to classroom lectures/talks on engineering/technology.
Speaking – introduction to technical presentations.
Reading – longer texts both general and technical, practice in speed reading.
Writing – describing a process, use of sequence words.
Vocabulary Development – sequence words – Misspelled words.
Language Development – embedded sentences.

UNIT IV
REPORT WRITING

Listening- Listening to documentaries and making notes.
Speaking – mechanics of presentations.
Reading – reading for detailed comprehension.
Writing – email etiquette.
job

UNIT V GROUP DISCUSSION AND JOB APPLICATIONS
12
Listening- TED/Ink talks; Speaking –participating in a group discussion -Reading– reading and understanding technical articles Writing– Writing reports- minutes of a meeting- accident and survey-Vocabulary Development- verbal analogies Language Development- reported speech.

TOTAL :60 PERIODS

OUTCOMES:
At the end of the course learners will be able to:
● Read technical texts and write area- specific texts effortlessly.
● Listen and comprehend lectures and talks in their area of specialisation successfully.
● Speak appropriately and effectively in varied formal and informal contexts.
● Write reports and winning job applications.

TEXT BOOKS:

REFERENCES:

Students can be asked to read Tagore, ChetanBhagat and for supplementary reading.

MA8252 LINEAR ALGEBRA

COURSE OBJECTIVES :
● To test the consistency and solve system of linear equations
● To find the basis and dimension of vector space
● To obtain the matrix of linear transformation and its eigenvalues and eigenvectors
● To find orthonormal basis of inner product space and find least square approximation
● To find eigenvalues of a matrix using numerical techniques and perform matrix decomposition.
UNIT - I MATRICES AND SYSTEM OF LINEAR EQUATIONS 12

UNIT - II VECTOR SPACES 12
Real and Complex fields - Vector spaces over Real and Complex fields - Subspace - Linear space - Linear independence and dependence - Basis and dimension.

UNIT - III LINEAR TRANSFORMATION 12
Linear transformation - Rank space and null space - Rank and nullity - Dimension theorem - Matrix representation of linear transformation - Eigenvalues and eigenvectors of linear transformation.

UNIT - IV INNER PRODUCT SPACES 12
Inner product and norms - Properties - Orthogonal, Orthonormal vectors - Gram Schmidt orthonormalization process - Least square approximation.

UNIT - V EIGEN VALUE PROBLEMS AND MATRIX DECOMPOSITION 12

TOTAL : 60 PERIODS

COURSE OUTCOMES:
After the completion of the course the student will be able to
1. Test the consistency and solve system of linear equations
2. Find the basis and dimension of vector space
3. Obtain the matrix of linear transformation and its eigenvalues and eigenvectors
4. Find orthonormal basis of inner product space and find least square approximation
5. Find eigenvalues of a matrix using numerical techniques and perform matrix decomposition

TEXT BOOKS:

REFERENCES:
OBJECTIVES:

- To understand the concepts of ADTs
- To design linear data structures – lists, stacks, and queues
- To understand sorting, searching and hashing algorithms
- To apply Tree and Graph structures

UNIT I ABSTRACT DATA TYPES
Abstract Data Types (ADTs) – ADTs and classes – introduction to OOP – classes in Python – inheritance – namespaces – shallow and deep copying
Introduction to analysis of algorithms – asymptotic notations – recursion – analyzing recursive algorithms

UNIT II LINEAR STRUCTURES

UNIT III SORTING AND SEARCHING

UNIT IV TREE STRUCTURES

UNIT V GRAPH STRUCTURES
Graph ADT – representations of graph – graph traversals – DAG – topological ordering – shortest paths – minimum spanning trees

TOTAL: 45 HOURS

OUTCOMES:
At the end of the course, the student should be able to:
- explain abstract data types
- design, implement, and analyse linear data structures, such as lists, queues, and stacks, according to the needs of different applications
- design, implement, and analyse efficient tree structures to meet requirements such as searching, indexing, and sorting
- model problems as graph problems and implement efficient graph algorithms to solve them

TEXT BOOK:

REFERENCES:
GE8291 ENVIRONMENTAL SCIENCE AND ENGINEERING  L T P C
3 0 0 3

OBJECTIVES:

- To study the nature and facts about environment.
- To finding and implementing scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth’s interior and surface.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT I  ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY  14
Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds; Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II  ENVIRONMENTAL POLLUTION  8
Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – solid waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides. Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III  NATURAL RESOURCES  10
Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems –
Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT


UNIT V HUMAN POPULATION AND THE ENVIRONMENT


TOTAL: 45 PERIODS

OUTCOMES:

- Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.
- Public awareness of environmental is at infant stage.
- Ignorance and incomplete knowledge has lead to misconceptions
- Development and improvement in std. of living has lead to serious environmental disasters

TEXTBOOKS:


REFERENCES:

OBJECTIVES:

- To understand the fundamentals of electronic circuit constructions.
- To learn the fundamental laws, theorems of electrical circuits and also to analyze them
- To study the basic principles of electrical machines and their performance
- To study the different energy sources, protective devices and their field applications
- To understand the principles and operation of measuring instruments and transducers

UNIT I   ELECTRICAL CIRCUITS ANALYSIS 9
Ohms Law, Kirchhoff’s Law-Instantaneous power- series and parallel circuit analysis with resistive, capacitive and inductive network - nodal analysis, mesh analysis- network theorems - Thevenins theorem, Norton theorem, maximum power transfer theorem and superposition theorem, three phase supply-Instantaneous, Reactive and apparent power-star delta conversion.

UNIT II   ELECTRICAL MACHINES 9
DC and AC ROTATING MACHINES:Types, Construction, principle, Emf and torque equation, application Speed Control- Basics of Stepper Motor – Brushless DC motors- Transformers-Introduction- types and construction, working principle of Ideal transformer-Emf equation- All day efficiency calculation.

UNIT III   UTILIZATION OF ELECTRICAL POWER 9

UNIT IV  ELECTRONIC CIRCUITS 9

UNIT V  ELECTRICAL MEASUREMENT 9
Characteristic of measurement-errors in measurement, torque in indicating instruments- moving coil and moving iron meters, Energy meter and watt meter. Transducers- classification-thermo electric, RTD, Strain gauge, LVDT, LDR and piezoelectric. Oscilloscope-CRO.

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, the students will be able to:

- Discuss the essentials of electric circuits and analysis.
- Discuss the basic operation of electric machines and transformers
- Introduction of renewable sources and common domestic loads.
- Introduction to measurement and metering for electric circuits.

TEXT BOOKS:

REFERENCES:

AD8252 DIGITAL PRINCIPLES AND COMPUTER ORGANIZATION L T P C
3 0 2 4

UNIT I DIGITAL FUNDAMENTALS

UNIT II COMBINATIONAL AND SEQUENTIAL CIRCUITS

UNIT III COMPUTER FUNDAMENTALS

UNIT IV PROCESSOR
Instruction Execution – Building a Data Path – Designing a Control Unit – Hardwired Control, Microprogrammed Control – Pipelining – Data Hazard – Control Hazards.

UNIT V MEMORY AND I/O

PRACTICAL EXERCISES (30 hrs)
1. Verification of Boolean theorems using logic gates.
2. Design and implementation of combinational circuits using gates for arbitrary functions.
3. Implementation of 4-bit binary adder/subtractor circuits.
4. Implementation of code converters.
5. Implementation of BCD adder, encoder and decoder circuits.
7. Implementation of any one of the synchronous counters.
8. Implementation of a Universal Shift register.

**TEXT BOOK:**

**REFERENCES:**

**GROUP A (CIVIL & MECHANICAL)**

**BUILDINGS:**
(a) Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

**PLUMBING WORKS:**
(a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
(b) Study of pipe connections requirements for pumps and turbines.
(c) Preparation of plumbing line sketches for water supply and sewage works.
(d) Hands-on-exercise:
    Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
(e) Demonstration of plumbing requirements of high-rise buildings.

**CARPENTRY USING POWER TOOLS ONLY:**
(a) Study of the joints in roofs, doors, windows and furniture.
(b) Hands-on-exercise:
    Wood work, joints by sawing, planing and cutting.
II MECHANICAL ENGINEERING PRACTICE

WELDING:
(a) Preparation of butt joints, lap joints and T-joints by Shielded metal arc welding.
(b) Gas welding practice

BASIC MACHINING:
(a) Simple Turning and Taper turning
(b) Drilling Practice

SHEET METAL WORK:
(a) Forming & Bending:
(b) Model making – Trays and funnels.
(c) Different type of joints.

MACHINE ASSEMBLY PRACTICE:
(a) Study of centrifugal pump
(b) Study of air conditioner

DEMONSTRATION ON:
(a) Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise – Production of hexagonal headed bolt.
(b) Foundry operations like mould preparation for gear and step cone pulley.
(c) Fitting – Exercises – Preparation of square fitting and V-fitting models.

GROUP B (ELECTRICAL & ELECTRONICS)

III ELECTRICAL ENGINEERING PRACTICE
1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair case wiring
5. Measurement of energy using single phase energy meter.

IV ELECTRONICS ENGINEERING PRACTICE
1. Study of Electronic components and equipments – Resistor, colour coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CR.
2. Study of logic gates AND, OR, EX-OR and NOT.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

TOTAL: 60 PERIODS
OUTCOMES:
On successful completion of this course, the student will be able to
- Fabricate carpentry components and pipe connections including plumbing works.
- Use welding equipments to join the structures.
- Carry out the basic machining operations.
- Make the models using sheet metal works.
- Illustrate on centrifugal pump, Air conditioner, operations of smithy, foundary and fittings.
- Carry out basic home electrical works and appliances.
- Measure the electrical quantities.
- Elaborate on the components, gates, soldering practices.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

CIVIL
1. Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings. 15 Sets.
2. Carpentry vice (fitted to work bench) 15 Nos.
4. Models of industrial trusses, door joints, furniture joints 5 each.
5. Power Tools: (a) Rotary Hammer 2 Nos.
   (b) Demolition Hammer 2 Nos.
   (c) Circular Saw 2 Nos.
   (d) Planer 2 Nos.
   (e) Hand Drilling Machine 2 Nos.
   (f) Jigsaw 2 Nos.

MECHANICAL
1. Arc welding transformer with cables and holders 5 Nos.
2. Welding booth with exhaust facility 5 Nos.
3. Welding accessories like welding shield, chipping hammer, wire brush, etc. 5 Sets.
4. Oxygen and acetylene gas cylinders, blow pipe and other welding outfit. 2 Nos.
5. Centre lathe 2 Nos.
6. Hearth furnace, anvil and smithy tools 2 Sets.
7. Moulding table, foundry tools 2 Sets.
9. Study-purpose items: centrifugal pump, air-conditioner One each.

ELECTRICAL
1. Assorted electrical components for house wiring 15 Sets.
2. Electrical measuring instruments 10 Sets.
3. Study purpose items: Iron box, fan and regulator, emergency lamp 1 each.
4. Megger (250V/500V) 1 No.
5. Power Tools: (a) Range Finder 2 Nos.
   (b) Digital Live-wire detector 2 Nos.
AD8261         DATA STRUCTURES DESIGN LABORATORY         L T P C

OBJECTIVES:
- To implement ADTs in Python
- To design and implement linear data structures – lists, stacks, and queues
- To implement sorting, searching and hashing algorithms
- To solve problems using tree and graph structures

1. Implement simple ADTs as Python classes
2. Implement recursive algorithms in Python
3. Implement List ADT using Python arrays
4. Linked list implementations of List
5. Implementation of Stack and Queue ADTs
6. Applications of List, Stack and Queue ADTs
7. Implementation of sorting and searching algorithms
8. Implementation of Hash tables
9. Tree representation and traversal algorithms
10. Implementation of Binary Search Trees
11. Implementation of Heaps
12. Graph representation and Traversal algorithms
13. Implementation of single source shortest path algorithm
14. Implementation of minimum spanning tree algorithms

OUTCOMES:
At the end of the course, the student should be able to:
- implement ADTs as Python classes
- design, implement, and analyse linear data structures, such as lists, queues, and stacks, according to the needs of different applications
- design, implement, and analyse efficient tree structures to meet requirements such as searching, indexing, and sorting
- model problems as graph problems and implement efficient graph algorithms to solve them

TEXT BOOK:

REFERENCES:

TOTAL: 60 PERIODS
MA8351 DISCRETE MATHEMATICS L T P C 4 0 0 4

OBJECTIVES:
- To extend student’s logical and mathematical maturity and ability to deal with abstraction.
- To introduce most of the basic terminologies used in computer science courses and application of ideas to solve practical problems.
- To understand the basic concepts of combinatorics and graph theory.
- To familiarize the applications of algebraic structures.
- To understand the concepts and significance of lattices and boolean algebra which are widely used in computer science and engineering.

UNIT I LOGIC AND PROOFS 12

UNIT II COMBINATORICS 12

UNIT III GRAPHS 12
Graphs and graph models – Graph terminology and special types of graphs – Matrix representation of graphs and graph isomorphism – Connectivity – Euler and Hamilton paths.

UNIT IV ALGEBRAIC STRUCTURES 12

UNIT V LATTICES AND BOOLEAN ALGEBRA 12

TOTAL: 60 PERIODS

OUTCOMES:
At the end of the course, students would:
- Have knowledge of the concepts needed to test the logic of a program.
- Have an understanding in identifying structures on many levels.
- Be aware of a class of functions which transform a finite set into another finite set which relates to input and output functions in computer science.
- Be aware of the counting principles.
Be exposed to concepts and properties of algebraic structures such as groups, rings and fields.

TEXTBOOKS:

REFERENCES:

AD8301 INTRODUCTION TO OPERATING SYSTEMS

COURSE OBJECTIVES
- To understand the structure and functions of OS
- To learn about Processes, Threads and Scheduling algorithms
- To understand the principles of concurrency and Deadlocks
- To learn various memory management schemes
- To study I/O management and File systems.

UNIT I OPERATING SYSTEMS OVERVIEW
Computer System Overview: Basic elements – Instruction execution – Interrupts – Memory hierarchy – Cache memory – Direct memory access – Multiprocessor and multicore organization; Operating System Overview: Objectives and functions – Evolution of operating system; Computer system organization; Operating System Structure and Operations: System calls – System programs; Operating-System Design and Implementation; Operating-System Debugging

UNIT II PROCESS MANAGEMENT

UNIT III MEMORY MANAGEMENT
Main Memory: Contiguous memory allocation – Segmentation – Paging – 32 and 64 bit architecture Examples; Virtual Memory: Demand paging – Page replacement algorithms – Allocation of Frames – Thrashing.

UNIT IV STORAGE MANAGEMENT
UNIT V  
CASE STUDY  

TOTAL: 45 PERIODS

SUGGESTIVE EXPERIMENTS:
1. Implement the various CPU Scheduling Algorithms
2. Implement Semaphores
3. Implement Bankers Algorithm for Deadlock Avoidance
4. Develop an application using Threads
5. Implement the following Memory Allocation Methods for variable sized partition: a) First Fit b) Worst Fit c) Best Fit
6. Implement Paging Technique of Memory Management
7. Implement the following Page Replacement Algorithms a) FIFO b) LRU c) LFU
8. Implement the following File Allocation Strategies a) Sequential b) Indexed c) Linked
9. Implement Shared memory and IPC

PRACTICAL: 30 PERIODS  
TOTAL: 75 PERIODS

COURSE OUTCOMES
Upon completion of the course, students will be able to:
- Outline the basic services and functionalities of operating systems
- Analyse various scheduling algorithms, and understand the different deadlock, prevention and avoidance schemes
- Illustrate the different memory management schemes
- Outline the functionality of file systems
- Compare and contrast Linux, Windows and mobile operating systems

TEXT BOOKS

REFERENCES

HARDWARE:
1. Standalone Desktops with Linux OS

SOFTWARE:
1. Python
COURSE OBJECTIVES

- Will gain knowledge in the basic concepts of Data Analysis
- To acquire skills in data preparatory and preprocessing steps
- To understand the mathematical skills in statistics
- To learn the tools and packages in Python for data science
- To gain understanding in classification and Regression Model
- To acquire knowledge in data interpretation and visualization techniques

UNIT I INTRODUCTION
Need for data science – benefits and uses – facets of data – data science process – setting the research goal – retrieving data – cleansing, integrating, and transforming data – exploratory data analysis – build the models – presenting and building applications

UNIT II DESCRIBING DATA I

UNIT III PYTHON FOR DATA HANDLING

UNIT IV DESCRIBING DATA II

UNIT V PYTHON FOR DATA VISUALIZATION

COURSE OUTCOMES
At the end of the course Students will be able to:
- Apply the skills of data inspecting and cleansing.
- Determine the relationship between data dependencies using statistics
- Can handle data using primary tools used for data science in Python
- Represent the useful information using mathematical skills
- Can apply the knowledge for data describing and visualization using tools.

TOTAL:45 PERIODS
TEXT BOOKS

REFERENCES

CS8392 OBJECT ORIENTED PROGRAMMING L T P C
3 0 0 3

OBJECTIVES:
- To understand Object Oriented Programming concepts and basic characteristics of Java
- To know the principles of packages, inheritance and interfaces
- To define exceptions and use I/O streams
- To develop a java application with threads and generics classes
- To design and build simple Graphical User Interfaces

UNIT I INTRODUCTION TO OOP AND JAVA FUNDAMENTALS 10

UNIT II INHERITANCE AND INTERFACES 9
Inheritance – Super classes- sub classes –Protected members – constructors in sub classes- the Object class – abstract classes and methods final methods and classes – Interfaces – defining an interface, implementing interface, differences between classes and interfaces and extending interfaces - Object cloning -inner classes, Array Lists - Strings

UNIT III EXCEPTION HANDLING AND I/O 9
Exceptions - exception hierarchy - throwing and catching exceptions – built-in exceptions, creating own exceptions, Stack Trace Elements. Input / Output Basics – Streams – Byte streams and Character streams – Reading and Writing Console – Reading and Writing Files

UNIT IV MULTITHREADING AND GENERIC PROGRAMMING 8
Differences between multi-threading and multitasking, thread life cycle, creating threads, synchronizing threads, Inter-thread communication, daemon threads, thread groups. Generic Programming – Generic classes – generic methods – Bounded Types – Restrictions and Limitations.
UNIT V  EVENT DRIVEN PROGRAMMING


OUTCOMES:
Upon completion of the course, students will be able to:
- Develop Java programs using OOP principles
- Develop Java programs with the concepts inheritance and interfaces
- Build Java applications using exceptions and I/O streams
- Develop Java applications with threads and generics classes
- Develop interactive Java programs using swings

TEXT BOOKS:

REFERENCES:

AD8351  DESIGN AND ANALYSIS OF ALGORITHMS  L T P C
3 0 2 4

COURSE OBJECTIVES
- To understand and apply the algorithm analysis techniques.
- To critically analyze the efficiency of alternative algorithmic solutions for the same problem
- To understand and implement different algorithm design techniques.
- To understand the limitations of Algorithmic power

UNIT I  INTRODUCTION AND ANALYSIS

UNIT II  DIVIDE-AND-CONQUER AND GREEDY STRATEGIES
Divide and Conquer strategy -- Mergesort -- Quicksort -- Multiplication of large integers and Strassen's matrix multiplication – closest pairs
Greedy strategy – Huffman coding – shortest paths algorithms – minimum-cost spanning tree algorithms –disjoint sets

UNIT III  DYNAMIC PROGRAMMING AND STATE-SPACE APPROACH
State-space approach – exhaustive search: DFS, BFS, Iterative deepening
UNIT IV BACKTRACKING, ITERATIVE IMPROVEMENT, AND BRANCH & BOUND


UNIT V INTRACTABILITY

Introduction to intractability -- Polynomial reductions -- SAT and 3-SAT – NP-complete and NP-Hard problems -- Approximation algorithms: Traveling salesman problem -- Knapsack problem – Introduction to randomized and parallel algorithms

THEORY PERIODS: 45

SUGGESTIVE EXERCISES

1. Implementation of iterative and recursive algorithms for the given problem
2. Empirical analysis of algorithms
3. Implementation of divide-and-conquer sorting algorithms
4. Implementation of closest-pairs algorithm
5. Implementation of Huffman coding
6. Implementation of Dijkstra’s and Prim’s algorithms
7. Implementation of disjoint sets and Kruskal’s algorithm
8. Implementation of dynamic programming algorithm for knapsack problem
9. Implementation of backtracking to solve n-Queens and Hamilton circuits problems
10. Implementation of iterative improvement strategy for stable marriage and maxflow problems
11. Implementation of Branch and Bound technique to solve knapsack and TSP problems
12. Implementation of approximation algorithms for knapsack and TSP problems

PRACTICAL PERIODS: 30

TOTAL PERIODS: 75

OUTCOMES:

At the end of the course, the students should be able to:

- Design algorithms for various computing problems.
- Analyze the time and space complexity of algorithms.
- Critically analyze the different algorithm design techniques for a given problem.
- Modify existing algorithms to improve efficiency
- Ability to implement techniques in solving real time problems

TEXT BOOKS


REFERENCES

COURSE OBJECTIVES

- Understand the Python Programming packages Python, Numpy, Scipy, Matplotlib, Pandas, statmodels, seaborn, plotly, bokeh Language.
- To prepare data for data analysis through understanding its distribution.
- Exposure on data processing using NUMPY and PANDAS
- To acquire knowledge in plotting using visualization tools.
- To understand and implement classification and Regression Model.

Tools: Python, Numpy, Scipy, Matplotlib, Pandas, statmodels, seaborn, plotly, bokeh

1. Working with Numpy arrays
2. Working with Pandas data frames
3. Basic plots using Matplotlib
4. Frequency distributions
5. Averages
6. Variability
7. Normal curves
8. Correlation and scatter plots
9. Correlation coefficient
10. Regression

TOTAL: 60 PERIODS

COURSE OUTCOMES

Upon completion of the course, the students will be able to
- Develop relevant programming abilities.
- Demonstrate knowledge of statistical data analysis techniques
- Exhibit proficiency to build and assess data-based models.
- Demonstrate skill in Data management & processing tasks using Python
- Apply data science concepts and methods to solve problems in real-world contexts and will communicate these solutions effectively

REFERENCES:

3. Data Science From Scratch: First Principles with Python, Second Edition by Joel Grus, 2019

CS8383 OBJECT ORIENTED PROGRAMMING LABORATORY

OBJECTIVES

- To build software development skills using java programming for real-world applications.
- To understand and apply the concepts of classes, packages, interfaces, arraylist, exception handling and file processing.
- To develop applications using generic programming and event handling.
LIST OF EXPERIMENTS
1. Develop a Java application to generate Electricity bill. Create a class with the following members: Consumer no., consumer name, previous month reading, current month reading, type of EB connection (i.e domestic or commercial). Compute the bill amount using the following tariff.
   If the type of the EB connection is domestic, calculate the amount to be paid as follows:
   - First 100 units - Rs. 1 per unit
   - 101-200 units - Rs. 2.50 per unit
   - 201 -500 units - Rs. 4 per unit
   - > 501 units - Rs. 6 per unit
   If the type of the EB connection is commercial, calculate the amount to be paid as follows:
   - First 100 units - Rs. 2 per unit
   - 101-200 units - Rs. 4.50 per unit
   - 201 -500 units - Rs. 6 per unit
   - > 501 units - Rs. 7 per unit

2. Develop a java application to implement currency converter (Dollar to INR, EURO to INR, Yen to INR and vice versa), distance converter (meter to KM, miles to KM and vice versa) , time converter (hours to minutes, seconds and vice versa) using packages.

3. Develop a java application with Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club fund. Generate pay slips for the employees with their gross and net salary.

4. Design a Java interface for ADT Stack. Implement this interface using array. Provide necessary exception handling in both the implementations.

5. Write a program to perform string operations using ArrayList. Write functions for the following
   a. Append - add at end
   b. Insert – add at particular index
   c. Search
   d. List all string starts with given letter

6. Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named print Area(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.

7. Write a Java program to implement user defined exception handling.

8. Write a Java program that reads a file name from the user, displays information about whether the file exists, whether the file is readable, or writable, the type of file and the length of the file in bytes.

9. Write a java program that implements a multi-threaded application that has three threads. First thread generates a random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.

10. Write a java program to find the maximum value from the given type of elements using a generic function.
11. Design a calculator using event-driven programming paradigm of Java with the following options.
   a) Decimal manipulations
   b) Scientific manipulations
12. Develop a mini project for any application using Java concepts.

OUTCOMES
Upon completion of the course, the students will be able to
- Develop and implement Java programs for simple applications that make use of classes, packages and interfaces.
- Develop and implement Java programs with arraylist, exception handling and multithreading.
- Design applications using file processing, generic programming and event handling.

TOTAL : 60 PERIODS

HS8381 INTERPERSONAL SKILLS/LISTENING&SPEAKING

OBJECTIVES:
The Course will enable learners to:
- Equip students with the English language skills required for the successful undertaking of academic studies with primary emphasis on academic speaking and listening skills.
- Provide guidance and practice in basic general and classroom conversation and to engage in specific academic speaking activities.
- Improve general and academic listening skills
- Make effective presentation

UNIT I
Listening as a key skill- its importance- speaking - give personal information - ask for personal information - express ability - enquire about ability - ask for clarification Improving pronunciation - pronunciation basics taking lecture notes - preparing to listen to a lecture - articulate a complete idea as opposed to producing fragmented utterances.

UNIT II
Listen to a process information- give information, as part of a simple explanation - conversation starters: small talk - stressing syllables and speaking clearly - intonation patterns - compare and contrast information and ideas from multiple sources- converse with reasonable accuracy over a wide range of everyday topics.

UNIT III
Lexical chunking for accuracy and fluency- factors influence fluency, deliver a five-minute informal talk - greet - respond to greetings - describe health and symptoms - invite and offer - accept - decline - take leave - listen for and follow the gist- listen for detail
UNIT IV
Being an active listener: giving verbal and non-verbal feedback - participating in a group discussion - summarizing academic readings and lectures conversational speech listening to and participating in conversations - persuade.

UNIT V
Formal and informal talk - listen to follow and respond to explanations, directions and instructions in academic and business contexts - strategies for presentations and interactive communication - group/pair presentations - negotiate disagreement in group work.

TOTAL : 30 PERIODS

OUTCOMES:
At the end of the course Learners will be able to:
- Listen and respond appropriately.
- Participate in group discussions
- Make effective presentations
- Participate confidently and appropriately in conversations both formal and informal

TEXT BOOKS:

REFERENCES:

MA8391 PROBABILITY AND STATISTICS L T P C
4 0 0 4

OBJECTIVES:
- This course aims at providing the required skill to apply the statistical tools in engineering problems.
- To introduce the basic concepts of probability and random variables.
- To introduce the basic concepts of two dimensional random variables.
- To familiarize the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
- To introduce the basic concepts of classifications of design of experiments which plays very important roles in the field of agriculture and statistical quality control.

UNIT I PROBABILITY AND RANDOM VARIABLES 12
UNIT II  TWO - DIMENSIONAL RANDOM VARIABLES  12
Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT III  TESTING OF HYPOTHESIS  12
Sampling distributions - Estimation of parameters - Statistical hypothesis - Large sample tests based on Normal distribution for single mean and difference of means -Tests based on t, Chi-square and F distributions for mean, variance and proportion - Contingency table (test for independent) - Goodness of fit.

UNIT IV  DESIGN OF EXPERIMENTS  12
One way and Two way classifications - Completely randomized design – Randomized block design – Latin square design - $2^2$ factorial design.

UNIT V  STATISTICAL QUALITY CONTROL  12
Control charts for measurements (X and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits - Acceptance sampling.

TOTAL:  60 PERIODS

OUTCOMES:
Upon successful completion of the course, students will be able to:

- Understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon.
- Understand the basic concepts of one and two dimensional random variables and apply in engineering applications.
- Apply the concept of testing of hypothesis for small and large samples in real life problems.
- Apply the basic concepts of classifications of design of experiments in the field of agriculture and statistical quality control.
- Have the notion of sampling distributions and statistical techniques used in engineering and management problems.

TEXT BOOKS:

REFERENCES:
COURSE OBJECTIVES:
- To introduce database development life cycle and conceptual modelling
- To learn SQL for data definition, manipulation and querying a database
- To learn relational database design using conceptual mapping and normalization
- To learn transaction concepts and serializability of schedules
- To learn data model and querying in object-relational and No-SQL databases

UNIT I CONCEPTUAL DATA MODELING 8

UNIT II RELATIONAL MODEL AND SQL 10
Relational model concepts -- Integrity constraints -- SQL Data manipulation – SQL Data definition – Views -- SQL programming.

UNIT III RELATIONAL DATABASE DESIGN AND NORMALIZATION 10

UNIT IV TRANSACTION MANAGEMENT 8

UNIT V OBJECT RELATIONAL AND NO-SQL DATABASES 9

TOTAL : 45 PERIODS

COURSE OUTCOMES
After the completion of this course, students will be able to:
- Understand the database development life cycle and apply conceptual modeling
- Apply SQL and programming in SQL to create, manipulate and query the database
- Apply the conceptual-to-relational mapping and normalization to design relational database
- Determine the serializability of any non-serial schedule using concurrency techniques
- Apply the data model and querying in Object-relational and No-SQL databases.

TEXT BOOKS:
REFERENCES:

AD8402 ARTIFICIAL INTELLIGENCE I

OBJECTIVES:
The objective of this course is to enable the students to
- Understand the basic concepts of intelligent agents
- Develop general-purpose problem solving agents, logical reasoning agents, and agents that reason under uncertainty
- Employ AI techniques to solve some of today’s real world problems.

UNIT I INTELLIGENT AGENTS
Introduction to AI – Agents and Environments – Concept of rationality – Nature of environments – Structure of agents
Problem solving agents – search algorithms – uninformed search strategies

UNIT II PROBLEM SOLVING
Heuristic search strategies – heuristic functions
Local search and optimization problems – local search in continuous space – search with non-deterministic actions – search in partially observable environments – online search agents and unknown environments

UNIT III GAME PLAYING AND CSP
Constraint satisfaction problems – constraint propagation – backtracking search for CSP – local search for CSP – structure of CSP

UNIT IV LOGICAL AGENTS
Knowledge-based agents – propositional logic – propositional theorem proving – propositional model checking – agents based on propositional logic
First-order logic – syntax and semantics – knowledge representation and engineering – inferences in first-order logic – forward chaining – backward chaining -- resolution
UNIT V KNOWLEDGE REPRESENTATION AND PLANNING

Ontological engineering – categories and objects – events – mental objects and modal logic – reasoning systems for categories – reasoning with default information
Classical planning – algorithms for classical planning – heuristics for planning – hierarchical planning – non-deterministic domains – time, schedule, and resources -- analysis

COURSE OUTCOMES:
On successful completion of this course, the students will be able to
1. Explain autonomous agents that make effective decisions in fully informed, partially observable, and adversarial settings
2. Choose appropriate algorithms for solving given AI problems
3. Design and implement logical reasoning agents
4. Design and implement agents that can reason under uncertainty

TOTAL : 45 PERIODS

TEXT BOOK:

REFERENCES:
(http://nptel.ac.in/)
5. Artificial Intelligence by Example: Develop machine intelligence from scratch using real artificial intelligence use cases - by Dennis Rothman, 2018

AD8403 DATA ANALYTICS L T P C
3 0 0 3

COURSE OBJECTIVES
• To study the basic inferential statistics and sampling distribution.
• To understand the concept of estimation of parameters using fundamental tests and testing of hypotheses.
• To understand the techniques of analysis of variance.
• To gain knowledge in predictive analytics techniques.
• To perform a case study with any available sample data sets.

UNIT I INFERENTIAL STATISTICS I
Populations – samples – random sampling – probability and statistics
Sampling distribution – creating a sampling distribution – mean of all sample means – standard error of the mean – other sampling distributions

UNIT II INFERENTIAL STATISTICS II
Why hypothesis tests? – Strong or weak decisions – one-tailed and two-tailed tests – case studies
Influence of sample size – power and sample size
Estimation – point estimate – confidence interval – level of confidence – effect of sample size

UNIT III T-TEST
9
- t-test for one sample – sampling distribution of t – t-test procedure – degrees of freedom – estimating the standard error – case studies
- t-test for two related samples

UNIT IV ANALYSIS OF VARIANCE
9
- F-test – ANOVA – estimating effect size – multiple comparisons – case studies
- Analysis of variance with repeated measures
- Two-factor experiments – three f-tests – two-factor ANOVA – other types of ANOVA
- Introduction to chi-square tests

UNIT V PREDICTIVE ANALYTICS
9
- Linear least squares – implementation – goodness of fit – testing a linear model – weighted resampling
- Time series analysis – moving averages – missing values – serial correlation – autocorrelation
- Introduction to survival analysis

TOTAL: 45 PERIODS

COURSE OUTCOME
- Understand the concept of sampling
- Apply the knowledge to derive hypotheses for given data
- Demonstrate the skills to perform various tests in the given data
- Ability to derive inference using Predictive Analytics
- Perform statistical analytics on a data set

TEXT BOOKS

REFERENCES
COURSE OBJECTIVES:
- To understand the database development life cycle
- To learn database design using conceptual modelling, Normalization
- To implement database using Data definition, Querying using SQL manipulation and SQL programming
- To implement database applications using IDE/RAD tools
- To learn querying Object-relational databases

SUGGESTIVE EXPERIMENTS
1. Database Development Life cycle:
   - Problem definition and Requirement analysis
   - Scope and Constraints
2. Database design using Conceptual modeling (ER-EER) – top-down approach
   - Mapping conceptual to relational database and validate using Normalization
3. Implement the database using SQL Data definition with constraints, Views
4. Query the database using SQL Manipulation
5. Querying/Managing the database using SQL Programming
   - Stored Procedures/Functions
   - Constraints and security using Triggers
6. Database design using Normalization – bottom-up approach
7. Develop database applications using IDE/RAD tools (Eg., NetBeans,VisualStudio)
8. Database design using EER-to-ODB mapping / UML class diagrams
9. Object features of SQL-UDTs and sub-types, Tables using UDTs, Inheritance, Method definition
10. Querying the Object-relational database using Objet Query language

COURSE OUTCOMES
After the completion of this course, students will be able to:
- Understand the database development life cycle
- Design relational database using conceptual-to-relational mapping, Normalization
- Apply SQL for creation, manipulation and retrieval of data
- Develop a database applications for real-time problems
- Design and query object-relational databases

TOTAL : 60 PERIODS

HARDWARE:
- Standalone Desktops

SOFTWARE:
- PostgreSQL

AD8412 DATA ANALYTICS LABORATORY

COURSE OBJECTIVES
- To study and write simple programs using the basic packages for handling data
- To do various sampling and T,Z,Anova test in various samples
- To perform case study and design a system
- To demonstrate Time Series Analysis in any real time application
Tools: Python, Numpy, Scipy, Matplotlib, Pandas, statmodels, seaborn, plotly, bokeh

Suggested Exercises:
1. Random Sampling
2. Z-test case study
3. T-test case studies
4. ANOVA case studies
5. Regression
6. Logistic Regression
7. Time series Analysis

COURSE OUTCOME

- After the completion of this course, students will be able to:
- To become skilled to use various packages in Python
- Demonstrate the understanding of data distribution with various samples
- Ability to Implement T-Test, Anova and Z-Test on sample data sets
- Understanding of Mathematical models in real world problems.
- Conduct time series analysis and draw conclusion.

TOTAL : 60 PERIODS

REFERENCES:

HARDWARE:
- Standalone Desktops with Linux OS

SOFTWARE:
- Python with statistical Packages

AD8413 ARTIFICIAL INTELLIGENCE – I LABORATORY

COURSE OBJECTIVES

- To design and implement different techniques to develop simple autonomous agents that make effective decisions in fully informed, and partially observable, settings.
- To apply appropriate algorithms for solving given AI problems.
- To Design and implement logical reasoning agents.
- To Design and implement agents that can reason under uncertainty.
- To understand the Implementation of these reasoning systems using either backward or forward inference mechanisms

LIST OF EXPERIMENTS:
1. Develop PEAS descriptions for given AI tasks
2. Implement basic search strategies for selected AI applications
3. Implement A* and memory bounded A* algorithms
4. Implement genetic algorithms for AI tasks
5. Implement simulated annealing algorithms for AI tasks
6. Implement alpha-beta tree search
7. Implement backtracking algorithms for CSP
8. Implement local search algorithms for CSP
9. Implement propositional logic inferences for AI tasks
10. Implement resolution based first order logic inferences for AI tasks
11. Implement classical planning algorithms
12. Mini-Project

TOTAL: 60 PERIODS

COURSE OUTCOMES

After the completion of this course, students will be able to:

- Implement simple PEAS descriptions for given AI tasks
- Develop programs to implement simulated annealing and genetic algorithms
- Demonstrate the ability to solve problems using searching and backtracking
- Ability to Implement simple reasoning systems using either backward or forward inference mechanisms
- Will be able to choose and implement a suitable technique for a given AI task

SOFTWARE:
- C++ or Java Software

OBJECTIVES:

- Strengthen the reading skills of students of engineering.
- Enhance their writing skills with specific reference to technical writing.
- Develop students’ critical thinking skills.
- Provide more opportunities to develop their project and proposal writing skills.

UNIT I

Reading – Strategies for effective reading- Use glosses and footnotes to aid reading comprehension - Read and recognize different text types - Predicting content using photos and title
Writing - Plan before writing - Develop a paragraph: topic sentence, supporting sentences, concluding sentence – Write a descriptive paragraph

UNIT II

Reading – Read for details- Use of graphic organizers to review and aid comprehension Writing - State reasons and examples to support ideas in writing - Write a paragraph with reasons and examples - Write an opinion paragraph

UNIT III

Reading – Understanding pronoun reference and use of connectors in a passage- Speed reading techniques Writing - Elements of a good essay- Types of essays - Descriptive-narrative - Issue-based - Argumentative-analytical

UNIT IV

Reading – Genre and Organization of Ideas Writing - Email writing - Visumes – Job application - Project writing - Writing convincing proposals
UNIT V

Reading: Critical reading and thinking- understanding how the text positions the reader- identify
Writing: Statement of Purpose- letter of recommendation- Vision statement

TOTAL: 30 PERIODS

OUTCOMES:
At the end of the course Learners will be able to:
- Write different types of essays.
- Write winning job applications.
- Read and evaluate texts critically.
- Display critical thinking in various professional contexts.

TEXT BOOKS:

REFERENCES:

AD8501

OPTIMIZATION TECHNIQUES

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OBJECTIVES:
The objective of this course is to enable the student to
- Formulate and solve linear programming problems (LPP)
- Evaluate Integer Programming Problems, Transportation and Assignment Problems.
- Obtain solution to network problems using CPM and PERT techniques.
- Able to optimize the function subject to the constraints.
- Identify and solve problems under Markovian queuing models.

UNIT I  LINEAR MODELS
Introduction of Operations Research - mathematical formulation of LPP- Graphical Methods to solve LPP- Simplex Method- Big M method, Two-Phase method
UNIT II INTEGER PROGRAMMING AND TRANSPORTATION PROBLEMS

Integer programming: Branch and bound method- Transportation and Assignment problems - Travelling salesman problem.

UNIT III PROJECT SCHEDULING

Project network -Diagram representation – Floats - Critical path method (CPM) – PERT- Cost considerations in PERT and CPM

UNIT IV CLASSICAL OPTIMISATION THEORY


UNIT V QUEUING MODELS

Introduction, Queuing Theory, Operating characteristics of a Queuing system, Constituents of a Queuing system, Service facility, Queue discipline, Single channel models, multiple service channels.

TOTAL PERIODS: 60

COURSE OUTCOMES:

On successful completion of this course, the student will be able to

- Formulate and solve linear programming problems (LPP)
- Evaluate Integer Programming Problems, Transportation and Assignment Problems.
- Obtain solution to network problems using CPM and PERT techniques.
- Able to optimize the function subject to the constraints.
- Identify and solve problems under Markovian queuing models

TEXT BOOK:


REFERENCES:


CW8691 COMPUTER NETWORKS

OBJECTIVES:

- To understand the protocol layering and physical level communication
- To analyze the performance of a network
- To understand the various components required to build different networks
- To learn the functions of network layer and the various routing protocols
- To familiarize the functions and protocols of the Transport layer
UNIT I INTRODUCTION AND PHYSICAL LAYER

UNIT II DATA-LINK LAYER & MEDIA ACCESS

UNIT III NETWORK LAYER

UNIT IV TRANSPORT LAYER

UNIT V APPLICATION LAYER
WWW and HTTP – FTP – Email –Telnet –SSH – DNS – SNMP.

LIST OF EXPERIMENTS:
1. Learn to use commands like tcpdump, netstat, ifconfig, nslookup and traceroute. Capture ping and trace route PDUs using a network protocol analyzer and examine.
2. Write a HTTP web client program to download a web page using TCP sockets.
3. Applications using TCP sockets like:
   a) Echo client and echo server
   b) Chat
   c) File Transfer
4. Simulation of DNS using UDP sockets.
5. Write a code simulating ARP /RARP protocols.
6. Study of Network simulator (NS) and Simulation of Congestion Control Algorithms using NS.
7. Study of TCP/UDP performance using Simulation tool.
8. Simulation of Distance Vector/ Link State Routing algorithm.
10. Simulation of an error correction code (like CRC).

SOFTWARE:
• C/C++/JAVA/Equivalent compiler
• Network Simulator like NS2/OPNET/Wireshark

OUTCOMES:
Upon completion of the course, the students should be able to:

• Comprehend the basic layers and its functions in computer networks.
• Evaluate the performance of a network.
• Understand the basics of how data flows from one node to another.
• Analyze and design routing algorithms.
• Design protocols for various functions in the network.
• Understand the working of various application layer protocols.

PRACTICALS  30 PERIODS
THEORY  45 PERIODS
TOTAL  75 PERIODS

TEXT BOOK:

REFERENCES:

AD8502 DATA EXPLORATION AND VISUALIZATION

OBJECTIVES:
• To understand the basics of Data Explorations
• To understand the basic concepts of Data visualization
• To study the linear and non-linear ways of Data visualization
• To explore the data visualization using R language
• To apply various data visualization techniques for a variety of tasks

UNIT I INTRODUCTION TO DATA EXPLORATION

UNIT II INTRODUCING TWO VARIABLE AND THIRD VARIABLE

UNIT III BASICS OF DATA VISUALIZATION
The Seven Stages of Visualizing Data - Getting Started with Processing - Mapping - Time Series - Connections and Correlations - Scatterplot Maps - Trees, Hierarchies, and Recursion - Networks and Graphs – Acquiring Data – Parsing Data
UNIT IV  DATA EXPLORATION AND DATA VISUALIZATION IN R
Introduction to R and RStudio - The Basics of Data Exploration - Loading Data into R - Transforming Data - Creating Tidy Data

UNIT V  TECHNIQUES AND APPLICATIONS OF DATA EXPLORATION AND VISUALIZATION IN R
Basic Data Exploration Techniques - Basic Data Visualization Techniques - Visualizing Geographic Data with ggmap - R Markdown - Case Study – Wildfire Activity in the Western United States - Case Study – Single Family Residential Home and Rental Values

LIST OF EXPERIMENTS:
1. Install standalone R.
2. Use R tool to explore various commands for descriptive data analytics using benchmark datasets.
3. Explore various variable and row filters in R for cleaning data.
4. Use R commands for probability distributions and probability statistics.
5. Formulate real business problems scenarios to hypothesis and solve using R statistical testing features.
6. Apply various plot features in R on sample data sets and visualize.
7. Write and execute word count, word search and pattern search problems from large text files.
8. Explore various data preprocessing options using benchmark data sets.

SOFTWARE:
• R-Studio

PRACTICALS  30 PERIODS
THEORY  45 PERIODS
TOTAL  75 PERIODS

OUTCOMES:
• Understand the basics of Data Exploration
• Use Univariate and Multivariate Analysis for Data Exploration
• Explain various Data Visualization methods
• Apply the concept of Data Visualization on various datasets
• Apply the data visualization techniques using R language

TEXT BOOKS
2. Visualizing Data: Exploring and Explaining Data with the processing Environment, O Reily Publications, 2007
3. Eric Pimpler, Data Visualization and Exploration with R, Geo Spatial Training Service, 2017
5. Claus.O.Wilke, Fundamentals of Data Visualization, A primer on making informative and compelling Figures, O’Reily Publications, 2019
OBJECTIVES:
1. To understand the Analytics Life Cycle.
2. To comprehend the process of acquiring Business Intelligence.
3. To understand various types of analytics for Business Forecasting.
4. To model the supply chain management for Analytics.
5. To apply analytics for different functions of a business.

UNIT I INTRODUCTION TO BUSINESS ANALYTICS

UNIT II BUSINESS INTELLIGENCE

UNIT III BUSINESS FORECASTING
Introduction to Business Forecasting and Predictive analytics - Logic and Data Driven Models – Data Mining and Predictive Analysis Modeling – Machine Learning for Predictive analytics.

UNIT IV HR & SUPPLY CHAIN ANALYTICS
Human Resources – Planning and Recruitment – Training and Development - Supply chain network - Planning Demand, Inventory and Supply – Logistics – Analytics applications in HR & Supply Chain.

UNIT V MARKETING & SALES ANALYTICS

TOTAL: 45 PERIODS

COURSE OUTCOMES:
- Explain the real world business problems and model with analytical solutions.
- Identify the business processes for extracting Business Intelligence.
- Apply predictive analytics for business fore-casting.
- Apply analytics for supply chain and logistics management.
- Use analytics for marketing and sales.

REFERENCES:
1. R. Evans James, Business Analytics, 2017.
OBJECTIVES:
- To understand the basics of Machine Learning (ML)
- To understand the methods of Machine Learning
- To know about the implementation aspects of machine learning
- To understand the concepts of Data Analytics and Machine Learning
- To understand and implement usecases of ML

UNIT I  MACHINE LEARNING BASICS  8

UNIT II  MACHINE LEARNING METHODS  11

UNIT III  MACHINE LEARNING IN PRACTICE  9

UNIT IV  MACHINE LEARNING AND DATA ANALYTICS  9

UNIT V  APPLICATIONS OF MACHINE LEARNING  8
Image Recognition – Speech Recognition – Email spam and Malware Filtering – Online fraud detection – Medical Diagnosis.

TOTAL: 45 PERIODS

OUTCOMES:
- Understand the basics of ML
- Explain various ZMachine Learning methods
- Demonstrate various ML techniques using standard packages.
- Explore knowledge on Machine learning and Data Analytics
- Apply ML to various real time examples

TEXT BOOKS:
1. Ameet V Joshi, Machine Learning and Artificial Intelligence, Springer Publications, 2020

REFERENCES:
OBJECTIVES:
- To get practical knowledge on implementing machine learning algorithms in real time problem for getting solutions
- To implement supervised learning and their applications
- To understand unsupervised learning like clustering and EM algorithms
- To understand the theoretical and practical aspects of probabilistic graphical models.

LIST OF EXPERIMENTS:
1. Implement the concept of decision trees with suitable data set from real world problem and classify the data set to produce new sample.
2. Detecting Spam mails using Support vector machine
3. Implement facial recognition application with artificial neural network
4. Study and implement amazon toolkit: Sagemaker
5. Implement character recognition using Multilayer Perceptron
6. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.
7. Implement sentiment analysis using random forest optimization algorithm
8. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
9. Choose best machine learning algorithm to implement online fraud detection
10. Mini-project: students work in team on any socially relevant problem that needs a machine learning based solution, and evaluate the model performance.

TOTAL : 60 PERIODS

OUTCOMES:
- Understand the implementation procedures for the machine learning algorithms.
- Design Java/Python programs for various Learning algorithms.
- Apply appropriate Machine Learning algorithms to data sets
- Identify and apply Machine Learning algorithms to solve real world problems.

REFERENCES

SOFTWARE:
- Python/Java with ML packages

MINI PROJECT ON DATA SCIENCE PIPELINE

OBJECTIVES:
- The students are expected to develop a mini project for solving real world problems with the concepts and tools they are familiar with.
- To use the Python packages for performing analytics.
- To learn using analytical tools for real world problems.
- The students are expected to use different platforms and tools that support data analysis, machine learning, deep learning, Apache Spark, R, Weka, Tensor Flow.

**LIST OF EXPERIMENTS:**
1. Use Twitter data for Sentiment Analysis
2. Mail classification for Spam Detection
3. Use of ML algorithms for Stock market Prediction
4. Designing a Recommendation System
5. Using Apache Spark for Time Series Forecasting
6. Implementation of Disease Prediction System
7. Usage of Image Segmentation
8. Design a Face recognition System
9. Use Natural Language Processing for short text Summarization

**TOTAL: 60 PERIODS**

**OUTCOMES:**
- Install analytical tools and configure distributed file system.
- Have skills in developing and executing analytical procedures in various distributed frameworks and databases.
- Develop, implement and deploy simple applications on very large datasets.
- Implement simple to complex data modeling in NoSQL databases.
- Implement real world applications by using suitable analytical framework and tools.

**REFERENCES:**
1. www.kaggle.com
5. Data Science From Scratch: First Principles with Python, Second Edition by Joel Grus, 2019

**AD8601**

**ARTIFICIAL INTELLIGENCE II**

**OBJECTIVES:**
- To know the underlying structure behind intelligence mathematically.
- To know the logical implications in probabilistic Reasoning.
- To know the automated learning techniques.
- To explore the techniques in Reinforcement Learning.
- To explore artificial intelligence techniques for Robotics.

**UNIT I**

**PROBABILISTIC REASONING I**

Acting under uncertainty – Bayesian inference – naïve bayes models
UNIT II PROBABILISTIC REASONING II  9
Probabilistic reasoning over time – time and uncertainty – inference in temporal models – Hidden
Markov Models – Kalman filters – Dynamic Bayesian networks
Probabilistic programming

UNIT III DECISIONS UNDER UNCERTainty  9
Basis of utility theory – utility functions – Multiattribute utility functions – decision networks –
value of information – unknown preferences
Sequential decision problems – MDPs – Bandit problems – partially observable MDPs
Multiagent environments – non-cooperative game theory – cooperative game theory – making
collective decisions

UNIT IV LEARNING PROBABILISTIC MODELS  9
Statistical learning theory – maximum-likelihood parameter learning – naïve bayes models –
generative and descriptive models – continuous models – Bayesian parameter learning –
Bayesian linear regression – learning Bayesian net structures – density estimation
EM Algorithm – unsupervised clustering – Gaussian mixture models – learning Bayes net
parameters – learning HMM – learning Bayes net structures with hidden variables

UNIT V REINFORCEMENT LEARNING AND ROBOTICS  9
Learning from rewards – passive reinforcement learning – active reinforcement learning –
generalization in reinforcement learning – policy search – inverse reinforcement learning –
applications
Robots – robotic perception – planning movements – reinforcement learning in robotics – robotic
frameworks -- applications of robotics
Philosophy, ethics, and safety of AI – the future of AI

TOTAL:45 PERIODS

OUTCOMES:
On completion of the course, the students will be able to:

- Explain the probabilistic reasoning using Bayesian inference
- Apply appropriate Probabilistic reasoning techniques for solving uncertainty problems
- Explain use of game theory for decision making.
- Explain and apply probabilistic models for various use cases
- Apply AI techniques for robotics

TEXT BOOK


REFERENCES

   (http://nptel.ac.in/)
OBJECTIVES:

- To understand the basics of Number Theory and Security
- To understand and analyze the principles of different encryption techniques
- To understand the security threats and attacks
- To understand and evaluate the need for the different security aspects in real time applications
- To learn the different applications of information security

UNIT I FUNDAMENTALS OF SECURITY

UNIT II ENCRYPTION TECHNIQUES AND KEY MANAGEMENT

UNIT III AUTHENTICATION, INTEGRITY AND ACCESS CONTROL

UNIT IV SECURITY

UNIT V SECURITY APPLICATIONS
OUTCOMES:
- Understand the fundamentals of security and the significance of number theory in computer security
- Learn the public key cryptographic standards and authentication scheme
- Able to apply the security frameworks for real time applications
- Understand the security threats and attacks in IoT, Cloud.
- Able to develop appropriate security algorithms understanding the possible threats

TOTAL:45 PERIODS

TEXT BOOKS:

REFERENCES:

IT8501 WEB TECHNOLOGY

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OBJECTIVES:
- To understand about client-server communication and protocols used during communication.
- To design interactive web pages using Scripting languages.
- To learn server side programming using servlets and JSP.
- To develop web pages using XML/XSLT.

UNIT I WEB SITE BASICS AND HTML

UNIT II CSS AND CLIENT SIDE SCRIPTING

UNIT III SERVER SIDE SCRIPTING
Host Objects: Browsers and the DOM-Introduction to the Document Object Model DOM History and Levels-Intrinsic Event Handling-Modifying Element Style-The Document Tree-DOM Event Handling-

UNIT IV JSP AND XML

UNIT V AJAX AND WEB SERVICES

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Design simple web pages using markup languages like HTML and XHTML.
- Create dynamic web pages using DHTML and java script that is easy to navigate and use.
- Program server side web pages that have to process request from client side web pages.
- Represent web data using XML and develop web pages using JSP.
- Understand various web services and how these web services interact.

TEXT BOOK:

REFERENCES

IT8511 WEB TECHNOLOGY LABORATORY

OBJECTIVES:
- To design interactive web pages using Scripting languages.
- To learn server side programming using servlets and JSP.
- To develop web pages using XML/XSLT.
LIST OF EXPERIMENTS:
1. Create a web page with the following using HTML.
   i) To embed an image map in a web page.
   ii) To fix the hot spots.
   iii) Show all the related information when the hot spots are clicked
2. Create a web page with all types of Cascading style sheets.
3. Client Side Scripts for Validating Web Form Controls using DHTML.
4. Installation of Apache Tomcat web server.
5. Write programs in Java using Servlets:
   To invoke servlets from HTML forms.
   Session Tracking.
6. Write programs in Java to create three-tier applications using JSP and Databases
   • For conducting on-line examination.
   • For displaying student mark list. Assume that student information is available in a
data base which has been stored in a database server.
7. Programs using XML – Schema – XSLT/XSL.
8. Programs using DOM and SAX parsers.
9. Programs using AJAX.
10. Consider a case where we have two web Services- an airline service and a travel agent and
    the travel agent is searching for an airline. Implement this scenario using Web Services and
    Data base.

TOTAL: 60 PERIODS

OUTCOMES:
Upon Completion of the course, the students will be able to:
• Design simple web pages using markup languages like HTML and XHTML.
• Create dynamic web pages using DHTML and java script that is easy to navigate and use.
• Program server side web pages that have to process request from client side web pages.
• Represent web data using XML and develop web pages using JSP.
• Understand various web services and how these web services interact.

SOFTWARE REQUIRED:
• Dream Weaver or Equivalent, MySQL or Equivalent, Apache Server, WAMP/XAMPP

AD8611 ARTIFICIAL INTELLIGENCE – II LABORATORY

OBJECTIVES:
• To impart knowledge about Artificial Intelligence.
• To understand the main abstractions and reasoning for intelligent systems.
• To understand the use of Artificial Intelligence in various applications

LIST OF EXPERIMENTS:
1. To implement Bayesian Belief networks
2. Approximate inferences in Bayesian network
3. To implement decision problems for various real-world applications
4. To learn various Bayesian parameters
5. Implementation of Hidden Markov Models
6. Implement EM algorithm for HMM
7. Implement the Reinforcement learning for various reward based applications
8. Mini-Project

OUTCOMES:
- Solve basic AI based problems.
- Implement the concept of Bayesian Network.
- Apply AI techniques to real-world problems to develop intelligent systems
- Implement HMM for real-world application.
- Use Reinforcement Learning to implement various intelligent systems.

SOFTWARE:
- Python/Java with Machine Learning packages.

REFERENCES:
1. aimacode · GitHub (https://github.com/aimacode)

HS8581 PROFESSIONAL COMMUNICATION

OBJECTIVES:
- Enhance the Employability and Career Skills of students
- Orient the students towards grooming as a professional
- Make them Employable Graduates
- Develop their confidence and help them attend interviews successfully.

UNIT I
Introduction to Soft Skills-- Hard skills & soft skills - employability and career Skills—Grooming as a professional with values—Time Management—General awareness of Current Affairs

UNIT II
Self-Introduction-organizing the material - Introducing oneself to the audience – introducing the topic – answering questions – individual presentation practice— presenting the visuals effectively – 5 minute presentations

UNIT III
Introduction to Group Discussion— Participating in group discussions – understanding group dynamics - brainstorming the topic — questioning and clarifying —GD strategies- activities to improve GD skills

UNIT IV
Interview etiquette – dress code – body language – attending job interviews— telephone/skype interview -one to one interview &panel interview – FAQs related to job interviews
UNIT V
Recognizing differences between groups and teams- managing time-managing stress- networking professionally- respecting social protocols-understanding career management-developing a long-term career plan-making career changes

TOTAL: 30 PERIODS

OUTCOMES:
At the end of the course Learners will be able to:
• Make effective presentations
• Participate confidently in Group Discussions.
• Attend job interviews and be successful in them.
• Develop adequate Soft Skills required for the workplace

RECOMMENDED SOFTWARE
1. Open Source Software
2. Win English

REFERENCES:

AD8612 SOCIALLY RELEVANT PROJECT

TOTAL: 60 PERIODS

OUTCOMES:
• The students are expected to use different platforms and tools like SAS, Python, R, Scala.
• Big Data: Hadoop Ecosystem (Hive, Pig, Sqoop, Flume), Big Data Lakes, No SQL, Apache
Spark, Spark MLLib, HPCC, Strom.

- Business Intelligence: SQL, Microsoft Power BI, SAP BI, Tableau, Oracle Fusion,

REFERENCES:
1. https://www.jeremyjordan.me/ml-projects-guide/
2. Problems listed in Smart India Hackathon: www.sih.gov.in

AD8701 DEEP LEARNING
L T P C
3 0 0 3

OBJECTIVES:
1. To understand the basics of deep neural networks
2. To understand CNN of architectures of deep neural networks
3. To understand the concepts of Artificial Neural Networks
4. To learn the basics of Data science in Deep learning
5. To learn about applications of deep learning in AI and Data Science

UNIT I DEEP NETWORKS BASICS
9

UNIT II CONVOLUTIONAL NEURAL NETWORKS
9

UNIT III DEEP LEARNING ALGORITHMS FOR AI
9

UNIT IV DATA SCIENCE AND DEEP LEARNING
9
Data science fundamentals and responsibilities of a data scientist - life cycle of data science – Data science tools - Data modeling, and featurization - How to work with data variables and data science tools - How to visualize the data - How to work with machine learning algorithms and Artificial Neural Networks

UNIT V APPLICATIONS OF DEEP LEARNING
9
Detection in chest X-ray images -object detection and classification -RGB and depth image fusion - NLP tasks - dimensionality estimation - time series forecasting - building electric power grid for controllable energy resources - guiding charities in maximizing donations and robotic control in industrial environments.

TOTAL:45 PERIODS
OUTCOMES:
CO1: Explain the basics in deep neural networks (K2)
CO2: Apply Convolution Neural Network for image processing (K3)
CO3: Explain the basics of Artificial Intelligence using deep learning (K2)
CO4: Apply deep learning algorithms for data science
CO5: Apply deep learning algorithms for variety applications

TEXT BOOKS:

AD8702 TEXT ANALYTICS

OBJECTIVES:
1: To understand the methods for keyword extraction from documents.
2: To learn clustering methods for grouping of documents.
3: To explore the methods for classification of documents and E-mails.
4: To explore text visualization techniques and anomaly detection.
5: To learn about Events and trends in text streams

UNIT I TEXT EXTRACTION
Introduction- Rapid automatic keyword extraction: candidate keywords, keyword scores, adjoining keywords, extracted keywords-Benchmark evaluation: precision and recall, efficiency, stoplist generation, Evaluation on new articles.

UNIT II DOCUMENT CLUSTERING
Multilingual document clustering: Multilingual LSA, Tucker1 method, PARAFAC2 method, LSA with term alignments, LMSA, LMSA with term alignments; Constrained clustering with k-means type algorithms.

UNIT III CONTENT BASED CLASSIFICATION
Classification algorithms for Document Classification, Content-based spam email classification, Utilizing nonnegative matrix factorization for email classification problems.

UNIT IV ANOMALY AND TREND DETECTION
Text visualization techniques: Visualization in text analysis, Tag clouds, tag clouds, authorship and change tracking, Data Exploration and the search for noval patterns, sentiment tracking, visual analytics and FutureLens, scenario discovery.
adaptive threshold setting for novelty mining: Introduction, adaptive threshold for anomaly detection, Experimental study.
UNIT V  TEXT STREAMS


TOTAL: 45 PERIODS

OUTCOMES:
After the completion of this course, students will be able to:

CO1: Design text extraction techniques
CO2: Devise clustering techniques for text mining
CO3: Design classification techniques for text mining
CO4: Apply visualization techniques and perform anomaly & trend detection
CO5: Perform Event operations in Text streams

REFERENCES

AD8703  BASICS OF COMPUTER VISION

OBJECTIVES:
1: To review image processing techniques for computer vision.
2: To understand various features and recognition techniques
3: To learn about histogram and binary vision
4: Apply three-dimensional image analysis techniques
5: Study real world applications of computer vision algorithms

UNIT I  INTRODUCTION

UNIT II  FEATURE EXTRACTION AND FEATURE SEGMENTATION
Feature Extraction - Edges - Canny, LOG, DOG; Line detectors (Hough Transform), Corners - Harris and Hessian Affine, Orientation Histogram, SIFT, SURF, HOG, GLOH, Scale-Space
Analysis- Image Pyramids and Gaussian derivative filters, Gabor Filters and DWT.
Image Segmentation - Region Growing, Edge Based approaches to segmentation, Graph-Cut, Mean-Shift, MRFs, Texture Segmentation.

UNIT III IMAGES, HISTOGRAMS, BINARY VISION

UNIT IV 3D VISION AND MOTION

UNIT V APPLICATIONS
Overview of Diverse Computer Vision Applications: Document Image Analysis, Biometrics, Object Recognition, Tracking, Medical Image Analysis, Content-Based Image Retrieval, Video Data Processing, Virtual Reality and Augmented Reality.

OUTCOMES:
- Explain low level processing of image and transformation techniques applied to images.
- Explain the feature extraction, segmentation and object recognition methods.
- Apply Histogram transform for detection of geometric shapes like line, ellipse and objects.
- Illustrate 3D vision process and motion estimation techniques.
- Apply vision techniques to real time applications.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
1. To understand about big data.
2. To learn and use NoSQL big data management.
3. To learn map reduce analytics using Hadoop and related tools.
4. To work with map reduce applications
5. To understand the usage of Hadoop related tools for Big Data Analytics

UNIT I UNDERSTANDING BIG DATA

UNIT II NOSQL DATA MANAGEMENT

UNIT III BASICS OF HADOOP

UNIT IV MAPREDUCE APPLICATIONS

UNIT V HADOOP RELATED TOOLS

OUTCOMES:
After the completion of this course, students will be able to:
- Describe big data and use cases from selected business domains.
- Explain NoSQL big data management.
- Install, configure, and run Hadoop and HDFS.
- Perform map-reduce analytics using Hadoop.
- Use Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data analytics.

TOTAL: 45 PERIODS
LIST OF EXPERIMENTS:  PRACTICALS:15

PERIODS
1. Downloading and installing Hadoop; Understanding different Hadoop modes. Startup scripts, Configuration files.
2. Hadoop Implementation of file management tasks, such as Adding files and directories, retrieving files and Deleting files
3. Implement of Matrix Multiplication with Hadoop Map Reduce
4. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.
5. Installation of Hive along with practice examples.
6. Installation of HBase, Installing thrift along with Practice examples
7. Patrice importing and exporting data from various data bases.

Software Requirements:
Hadoop, Java, Hive and HBase.

TOTAL:75 PERIODS

TEXT BOOKS:

REFERENCES:

AD8705  AI AND ROBOTICS  L T P C  3 0 2 4

OBJECTIVES:
1. To study the Robot Locomotion and types of robots.
2. To explore the kinematic models and constraints
3. To Learn sensors of robots and image processing for robotics.
4. To understand the methods for mobile robot Localization
5. To study the Path planning and Navigation of Robots.

UNIT I  ROBOT LOCOMOTION  9

UNIT II  MOBILE ROBOT KINEMATICS  9

UNIT III  ROBOT PERCEPTION  9
Sensors for mobile robots – computer vision for robots – image processing for robotics – place recognition – range data.
UNIT IV  MOBILE ROBOT LOCALIZATION  9

UNIT V  ROBOT PLANNING AND NAVIGATION  9
Planning and navigation – planning and reacting – path planning – obstacle avoidance – navigation architectures.

OUTCOMES:
After the completion of this course, students will be able to:
  CO1: Explain the types of Robots
  CO2: Narrate the kinematics of Robots
  CO3: Implement image processing algorithms
  CO4: Devise Localization algorithms
  CO5: Devise Path planning methods for navigation

LIST OF EXPERIMENTS:  PRACTICALS:15
PERIODS
  1. Line tracing bot
  2. Gesture controlled bot
  3. 4(Four) DOF Robotic Arm
  5. RF Controlled or WiFi controlled Navigation bot
  6. Pick and place bot with Object Detection
  7. Wall Following bot
  8. Maze solving Robot
  9. Forward and reverse kinematics based experiment using open source platforms
 10. Computer Visio based robotic tasks execution

Software Requirements:
Open Source Software

TEXT BOOKS:

AD8711  DEEP LEARNING LABORATORY  L T P C
        0 0 4 2

OBJECTIVES:
  1: To learn deep neural networks and apply for simple problems
  2: To Learn and apply Convolution Neural Network for image processing
  3: To Learn and apply Recurrent Neural Network and its variants for text analysis
  4: To augment data using generative models
5: To explore real world applications with deep neural networks

LIST OF EXPERIMENTS:
1. Solving XOR problem using Multilayer perceptron
2. Implement character and Digit Recognition using ANN.
3. Implement the analysis of X-ray image using autoencoders
4. Implement Speech Recognition using NLP
5. Develop a code to design object detection and classification for traffic analysis using CNN
6. Implement online fraud detection of share market data using any one of the data analytics tools.
7. Implement image augmentation using deep RBM.
8. Implement Sentiment Analysis using LSTM.

Hardware/Software Requirements

Software:
- Understanding on Working of Colab and Transfer Learning Networks
- High end GPU Systems (Huge Computation)

OUTCOMES:
CO1: Apply deep neural network for simple problems
CO2: Apply Convolution Neural Network for image processing
CO3: Apply Recurrent Neural Network and its variants for text analysis
CO4: Apply generative models for data augmentation
CO5: Develop a real world application using suitable deep neural networks

TOTAL:60 PERIODS

REFERENCES
UNIT II  8086 SYSTEM BUS STRUCTURE

UNIT III  I/O INTERFACING

UNIT IV  MICROCONTROLLER
Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming.

UNIT V  INTERFACING MICROCONTROLLER
Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation - Comparison of Microprocessor, Microcontroller, PIC and ARM processors

OUTCOMES:
At the end of the course, the students should be able to:

- Understand and execute programs based on 8086 microprocessor.
- Design Memory Interfacing circuits.
- Design and interface I/O circuits.
- Design and implement 8051 microcontroller based systems.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:
1. Doughlas V.Hall, “Microprocessors and Interfacing, Programming and Hardware", TMH, 2012
OBJECTIVES:
1: To acquire knowledge on software process management
2: To acquire managerial skills for software project development.
3: To understand software economics
4: To acquire knowledge about real time software development scenarios.

UNIT I SOFTWARE PROCESS

UNIT II SOFTWARE ECONOMICS AND LIFECYCLE

UNIT III SOFTWARE PROCESSES PLANNING

UNIT IV PROJECT MANAGEMENT AND METRICS
Project Organizations Line-of- business organizations, project organizations, evolution of organizations, process automation. Project Control and process instrumentation The seven-core metrics, management indicators, quality indicators, life-cycle expectations, Pragmatic software metrics, metrics automation.

UNIT V UNIT TITLE

OUTCOMES:
CO1: Understand the software process phases in the cycle of software development.
CO2: Gain knowledge of software economics, project organization, project control and process instrumentation
CO3: Analyze the major and minor milestones, artifacts and metrics from management and technical perspective.
CO4: Design and develop software product using conventional and modern principles of software project management
CO5: Analyze the real time software development processes.

TOTAL:45 PERIODS

TEXT BOOKS:
1. Managing the Software Process, Watts S. Humphrey, Pearson Education
2. Software Project Management, Walker Royce, Pearson Education
REFERENCES:
4. Head First PMP, Jennifer Greene & Andrew Stellman, O'Reilly, 2007

AD8002 HEALTH CARE ANALYTICS

OBJECTIVES:
1: Understand the health data formats, health care policy and standards
2: Learn the significance and need of data analysis and data visualization
3: Understand the health data management frameworks
4: Learn the use of machine learning and deep learning algorithms in healthcare
5: Apply healthcare analytics for critical care applications

UNIT I INTRODUCTION TO HEALTHCARE ANALYSIS

UNIT II ANALYTICS ON MACHINE LEARNING

UNIT III HEALTH CARE MANAGEMENT

UNIT IV HEALTHCARE AND DEEP LEARNING

UNIT V CASE STUDIES
OUTCOMES:
CO1: Use machine learning and deep learning algorithms for health data analysis
CO2: Apply the data management techniques for healthcare data
CO3: Evaluate the need of healthcare data analysis in e-healthcare, telemedicine and other critical care applications
CO4: Design health data analytics for real time applications
CO5: Design emergency care system using health data analysis

TOTAL: 45 PERIODS

REFERENCES:

AD8003 MOBILE APPLICATIONS DEVELOPMENT

OBJECTIVES:
1. Understand system requirements for mobile applications
2. Generate suitable design using specific mobile development frameworks
3. Generate mobile application design
4. Implement the design using specific mobile development frameworks
5. Deploy the mobile applications in marketplace for distribution

UNIT I INTRODUCTION TO MOBILE APPLICATIONS

UNIT II ANDROID USER INTERFACE DESIGN

UNIT III ANDROID DATA STORAGE
Content Providers – Uri - CRUD access –Browser – CallLog – Contacts – Media Store - Data Access and Storage - Shared Preferences - Storage External - Network Connection - SQLite Databases

UNIT IV ANDROID NATIVE CAPABILITIES
Camera – Audio - Sensors and Bluetooth - Playing audio/video - Media recording - Sensors - Listening to sensor readings – Bluetooth - Android Communications – GPS - Working with
Location Manager, Working with Google Maps extensions - Maps via intent - Map Activity - Location based Services - Location Updates - Location Providers - Selecting a Location Provider - Finding Location

UNIT V  IOS DESIGN
 iPhone Craze – iOS Features – iOS Tools - iOS Project – Objective C Basics – Building iOS App – Actions and Outlets – Delegates - User Interface Elements – Accelerometer – Location Handling - SQLite Database

OUTCOMES:
 CO1: Describe the requirements for mobile applications
 CO2: Design user interface for mobile applications
 CO3: Store mobile data of android applications
 CO4: Evaluate native capabilities of android applications
 CO5: Design iOS applications with tools

TOTAL: 45 PERIODS

REFERENCES:

AD8004  PARALLEL COMPUTING  L  T  P  C
          3  0  0  3

OBJECTIVES:
1: To understand different parallelism techniques.
2: To know parallel architecture.
3: To learn about parallel algorithm design
4: Understand parallel programming
5: Learn about the interpretation of parallel programming

UNIT I  INTRODUCTION
 Historical progression leading to current state – types of parallelism including temporal, data and functional. Instructional level parallelism – pipelined processors – super scalar processors – VLIW processors – multithreaded processors – proposed future processors including trace, multiscalar and super flow – case studies

UNIT II  PARALLEL ARCHITECTURES

UNIT III  PARALLEL ALGORITHMS PLATFORM
UNIT IV PARALLEL PROGRAMMING DESIGN


UNIT V COMPILER TRANSFORMATIONS AND PERFORMANCE EVALUATION


OUTCOMES:

- CO1: Understand different parallel computing technique
- CO2: Learn parallel computing architecture
- CO3: Learn to design parallel algorithms
- CO4: Understand how to develop parallel program
- CO5: Know compiler interpretation of parallel programming

TOTAL: 45 PERIODS

TEXT BOOKS:


REFERENCES:


AD 8005 EMBEDDED SYSTEMS AND PROGRAMMING L T P C
3 0 0 3

OBJECTIVES:

- To understand the architecture of embedded processors, microcontrollers and peripheral devices
- To learn programming the embedded processor in assembly
- To understand the challenges in developing operating systems for embedded systems
- To learn programming the embedded systems in high level language such as C
- To understand the Real time operating systems

UNIT I INTRODUCTION TO EMBEDDED SYSTEM

Components of Embedded System – Classification - Characteristic of embedded system-Microprocessors & Micro controllers- Introduction to embedded processors - Embedded software architectures: Simple control loop - Interrupt controlled system - Cooperative multitasking - Preemptive multitasking or multi-threading - Micro kernels and kernels - Monolithic kernels - Exotic custom operating systems.
UNIT II  EMBEDDED HARDWARE ARCHITECTURE

ARM 2 TDMI core based 32 Bit microcontrollers and family of processors, Register, Memory and Data transfer, Arithmetic and Logic instructions, Assembly Language, I/O operations interrupt structure, ARM cache. ARMBus, Embedded systems with ARM.

UNIT III  REAL TIME OPERATING SYSTEMS


UNIT IV  SOFTWARE DEVELOPMENT


UNIT V  STUDY OF MICRO C/OS-II

RTOS System Level Functions – Task Service Functions Time Delay Functions – Memory Allocation Related Functions – Semaphore Related Functions Mailbox Related Functions – Queue Related Functions – Case Studies of Programming with RTOS.

OUTCOMES:

CO1: Understand the embedded systems
CO2: Learn the embedded systems Architecture
CO3: Understand the embedded systems programming
CO4: Learn about the real time operating systems
CO5: Understand the concept on micro C

TOTAL: 45 PERIODS

TEXT BOOKS:


REFERENCES:


CW8591  SOFTWARE ARCHITECTURE  L T P C

OBJECTIVES:

- Understand the fundamentals of software architecture.
- Study the various software development methodologies.
- Learn the importance of architectural documentation and evaluation.
- Learn the various software architecture design components.
- Relate software architecture and software quality.
UNIT I
INTRODUCTION

UNIT II
DESIGN METHODOLOGIES
Structured design - Design practices-Stepwise refinement – Incremental design- Structured system analysis and design –Jackson structured programming – Jackson system Development.

UNIT III
ARCHITECTURAL DESCRIPTION DOCUMENTATION AND EVALUATION

UNIT IV
ARCHITECTURE DESIGN
Typical architectural design-Dataflow-Independent components-Call and return – Using styles in design – Architectural design space-Design space of architectural elements – Design space of architectural styles.

UNIT V
IMPLEMENTATION AND CONFORMANCE TO ARCHITECTURE

OUTCOMES:
Upon Completion of the course, the students should be able to:

- Develop Software applications starting from software architecture and design.
- Learn and evaluate existing software architectures.
- Realize importance of architectural documentation and document them.
- Employ various software architecture design components.
- Design methods for improving software quality from the perspective of software architecture.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

AD8006 ENGINEERING PREDICTIVE ANALYTICS

OBJECTIVES:
- To explain terminology, technology and applications of predictive analysis.
- To apply data preparation techniques and generate appropriate association rules.
- To discuss various descriptive models, their merits, demerits and application.
- To describe various predictive modelling methods.
- To introduce the text mining tools, technologies and case study which is used in day-to-day analytics cycle.

UNIT I INTRODUCTION TO PREDICTIVE ANALYTICS
Overview of Predictive Analytics- Setting Up the Problem - Data Understanding- Single Variable- Data Visualization in One Dimension- Data Visualization, Two or Higher Dimensions- The Value of Statistical Significance- Pulling It All Together into a Data Audit.

UNIT II DATA PREPARATION AND ASSOCIATION RULES

UNIT III MODELLING

UNIT IV PREDICTIVE MODELLING

UNIT V TEXT MINING

TOTAL: 45 PERIODS

OUTCOMES:
At the end of this course, the students will be able to:
CO1: Explain terminology, technology and applications of predictive analysis.
CO2: Apply data preparation techniques to effectively interpret big data.
CO3: Discuss various descriptive models, their merits, demerits and application.
CO4: Describe principles of predictive analytics and apply them to achieve real, pragmatic
CO5: Illustrate the features and applications of text mining.

REFERENCES:
4. Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani. An Introduction to Statistical Learning with Applications in R Springer 2013

CS8603 DISTRIBUTED SYSTEMS

OBJECTIVES:
- To understand the foundations of distributed systems.
- To learn issues related to clock Synchronization and the need for global state in distributed systems.
- To learn distributed mutual exclusion and deadlock detection algorithms.
- To understand the significance of agreement, fault tolerance and recovery protocols in Distributed Systems.
- To learn the characteristics of peer-to-peer and distributed shared memory systems.

UNIT I Introduction

UNIT II MESSAGE ORDERING & SNAPSHOTS
Message ordering and group communication: Message ordering paradigms –Asynchronous execution with synchronous communication –Synchronous program order on an asynchronous system –Group communication – Causal order (CO) - Total order. Global state and snapshot recording algorithms: Introduction –System model and definitions –Snapshot algorithms for FIFO channels

UNIT III DISTRIBUTED MUTEX & DEADLOCK
Distributed mutual exclusion algorithms: Introduction – Preliminaries – Lamport’s algorithm –


**UNIT IV RECOVERY & CONSENSUS**

**Checkpointing and rollback recovery**: Introduction – Background and definitions – Issues in failure recovery – Checkpoint-based recovery – Log-based rollback recovery – Coordinated checkpointing algorithm – Algorithm for asynchronous checkpointing and recovery. **Consensus and agreement algorithms**: Problem definition – Overview of results – Agreement in a failure-free system – Agreement in synchronous systems with failures.

**UNIT V P2P & DISTRIBUTED SHARED MEMORY**

**Peer-to-peer computing and overlay graphs**: Introduction – Data indexing and overlays – Chord – Content addressable networks – Tapestry. **Distributed shared memory**: Abstraction and advantages – Memory consistency models – Shared memory Mutual Exclusion.

**OUTCOMES:**

At the end of this course, the students will be able to:

- Elucidate the foundations and issues of distributed systems
- Understand the various synchronization issues and global state for distributed systems.
- Understand the Mutual Exclusion and Deadlock detection algorithms in distributed systems
- Describe the agreement protocols and fault tolerance mechanisms in distributed systems.
- Describe the features of peer-to-peer and distributed shared memory systems

**TEXT BOOKS:**


**REFERENCES:**

OBJECTIVES:
- To provide students with a theoretical as well as practical understanding of agile software development practices and how small teams can apply them to create high-quality software.
- To provide a good understanding of software design and a set of software technologies and APIs.
- To do a detailed examination and demonstration of Agile development and testing techniques.
- To understand the benefits and pitfalls of working in an Agile team.
- To understand Agile development and testing.

UNIT I AGILE METHODOLOGY 9

UNIT II AGILE PROCESSES 9

UNIT III AGILITY AND KNOWLEDGE MANAGEMENT 9

UNIT IV AGILITY AND REQUIREMENTS ENGINEERING 9

UNIT V AGILITY AND QUALITY ASSURANCE 9

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, the students will be able to:
- Realize the importance of interacting with business stakeholders in determining the requirements for a software system
- Perform iterative software development processes: how to plan them, how to execute them.
- Point out the impact of social aspects on software development success.
Develop techniques and tools for improving team collaboration and software quality.
Perform Software process improvement as an ongoing task for development teams.
Show how agile approaches can be scaled up to the enterprise level.

TEXT BOOKS:

REFERENCES:

CS8081  INTERNET OF THINGS  L T P C
3  0  0  3

OBJECTIVES:
- To understand Smart Objects and IoT Architectures
- To learn about various IOT-related protocols
- To build simple IoT Systems using Arduino and Raspberry Pi.
- To understand data analytics and cloud in the context of IoT
- To develop IoT infrastructure for popular applications

UNIT I  FUNDAMENTALS OF IoT

UNIT II  IoT PROTOCOLS
IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN – Network Layer: IP versions, Constrained Nodes and Constrained Networks – Optimizing IP for IoT: From 6LoWPAN to 6Lo,
Routing over Low Power and Lossy Networks – Application Transport Methods: Supervisory Control and Data Acquisition – Application Layer Protocols: CoAP and MQTT

UNIT III  DESIGN AND DEVELOPMENT
Design Methodology - Embedded computing logic - Microcontroller, System on Chips - IoT system building blocks - Arduino - Board details, IDE programming - Raspberry Pi - Interfaces and Raspberry Pi with Python Programming.

UNIT IV  DATA ANALYTICS AND SUPPORTING SERVICES
UNIT V           CASE STUDIES/INDUSTRIAL APPLICATIONS

Cisco IoT system - IBM Watson IoT platform – Manufacturing - Converged Plantwide Ethernet Model (CPwE) – Power Utility Industry – GridBlocks Reference Model - Smart and Connected Cities: Layered architecture, Smart Lighting, Smart Parking Architecture and Smart Traffic Control

TOTAL : 45 PERIODS

OUTCOMES:

Upon completion of the course, the student should be able to:

- Explain the concept of IoT.
- Analyze various protocols for IoT.
- Design a PoC of an IoT system using Rasperry Pi/Arduino
- Apply data analytics and use cloud offerings related to IoT.
- Analyze applications of IoT in real time scenario

TEXTBOOK:

REFERENCES:


   https://www.arduino.cc/

AD8007 SOFTWARE TESTING AND QUALITY ASSURANCE

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OBJECTIVES:

- To understand the basics of testing, planning, designing and managing test cases.
- To study the various types of test in the life cycle of the software product.
- To build design concepts for system testing and execution.
- To learn the software quality assurance, metrics, defect prevention techniques
- To learn the techniques for quality assurance and applying for applications.
UNIT I  SOFTWARE TESTING - CONCEPTS, ISSUES, AND TECHNIQUES  9
Quality Revolution, Verification and Validation, Failure, Error, Fault, and Defect, Objectives of Testing, Testing Activities, Test Case Selection White-Box and Black, test Planning and design, Test Tools and Automation, Power of Test. Test Team Organization and Management-Test Groups, Software Quality Assurance Group, System Test Team Hierarchy, Team Building

UNIT II  SYSTEM TESTING  9

UNIT III  SYSTEM TEST CATEGORIES  10

UNIT IV  SOFTWARE QUALITY  8

UNIT V  SOFTWARE QUALITY ASSURANCE  9

TOTAL: 45 PERIODS

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:
• Perform functional and non-functional tests in the life cycle of the software product.
• Understand system testing and test execution process.
• Identify defect prevention techniques and software quality assurance metrics.
• Apply techniques of quality assurance for typical applications.

TEXT BOOKS:
2. Software Quality Assurance - From Theory to Implementation, Daniel Galin, Pearson Education Ltd UK, 2004

REFERENCES:
2. Software Quality Assurance, Milind Limaye, TMH ,New Delhi, 2011

CS8791  CLOUD COMPUTING  L T P C
3 0 0 3

OBJECTIVES:
- To understand the concept of cloud computing.
- To appreciate the evolution of cloud from the existing technologies.
- To have knowledge on the various issues in cloud computing.
- To be familiar with the lead players in cloud.
- To appreciate the emergence of cloud as the next generation computing paradigm.

UNIT I  INTRODUCTION  9

UNIT II  CLOUD ENABLING TECHNOLOGIES  9

UNIT III  CLOUD ARCHITECTURE, SERVICES AND STORAGE  9

UNIT IV  RESOURCE MANAGEMENT AND SECURITY IN CLOUD  9

UNIT V  CLOUD TECHNOLOGIES AND ADVANCEMENTS  9
OUTCOMES:
On Completion of the course, the students should be able to:

- Articulate the main concepts, key technologies, strengths and limitations of cloud computing.
- Learn the key and enabling technologies that help in the development of cloud.
- Develop the ability to understand and use the architecture of compute and storage cloud, service and delivery models.
- Explain the core issues of cloud computing such as resource management and security.
- Be able to install and use current cloud technologies.
- Evaluate and choose the appropriate technologies, algorithms and approaches for implementation and use of cloud.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

CS8085 SOCIAL NETWORK ANALYSIS

OBJECTIVES:
- To understand the concept of semantic web and related applications.
- To learn knowledge representation using ontology.
- To understand human behaviour in social web and related communities.
- To learn visualization of social networks.

UNIT I INTRODUCTION

UNIT II MODELLING, AGGREGATING AND KNOWLEDGE REPRESENTATION
Ontology and their role in the Semantic Web: Ontology-based knowledge Representation - Ontology languages for the Semantic Web: Resource Description Framework - Web Ontology Language - Modelling and aggregating social network data: State-of-the-art in network data representation - Ontological representation of social individuals - Ontological representation of
social relationships - Aggregating and reasoning with social network data - Advanced representations.

UNIT III EXTRATION AND MINING COMMUNITIES IN WEB SOCIAL NETWORKS

UNIT IV PREDICTING HUMAN BEHAVIOIR AND PRIVACY ISSUES

UNIT V VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS

OUTCOMES:
Upon completion of the course, the students should be able to:
- Develop semantic web related applications.
- Represent knowledge using ontology.
- Predict human behaviour in social web and related communities.
- Visualize social networks.

TOTAL PERIODS: 45

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
1. To understand the types of web services, resources, APIs and their architectures
2. To analyze the web service / API design patterns
3. To understand the design principles and best practices
4. To develop, deploy RESTful web service APIs in JAVA
5. To understand the security concerns.

UNIT I  INTRODUCTION
Web Services - Building Blocks, Types; Service Oriented architectures - resource oriented architectures, API architectures, Micro services and architectures, HATEOAS, REST, URI, Code on Demand.

UNIT II  RESOURCES AND DESIGN PATTERNS
Resources - Identification, Resource Relations, Representations, Parameters, types, methods, Requirements for APIs, Architectural Patterns. Basic and Advanced RESTful API patterns.

UNIT III  RESTFUL API DESIGN PRINCIPLES

UNIT IV  DEVELOPMENT AND DEPLOYMENT
Frameworks, Standard Languages, API Description Languages, Handover points, Development and Deployment of RESTful web service applications in Java, microservice API, Best Practices.

UNIT V  PERFORMANCE AND SECURITY

OUTCOMES:
At the end of the course, the student should be able to:
- Use a suitable architecture for a given design problem
- Analyze the types of resources and suitable design patterns for development and deployment
- Create and Analyze front-end and Back end designs
- Deploy RESTful API web services using JAVA
- Implement security best practices for preventing security attacks

TEXT BOOK:
REFERENCES:

AD8009 OPERATIONS AND SUPPLY CHAIN MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:
- To provide an insight on the operations, quality management and sampling tools and fundamentals of supply chain networks, tools and techniques

UNIT I INTRODUCTION TO OPERATIONS AND SUPPLY CHAIN MANAGEMENT

UNIT II QUALITY MANAGEMENT

UNIT III NETWORK DESIGN AND TRANSPORTATION

UNIT IV SOURCING AND COORDINATION
Role of sourcing supply chain - supplier selection assessment and contracts- Design collaboration -sourcing planning and analysis - supply chain co-ordination - Bull whip effect – Effect of lack of co-ordination in supply chain and obstacles – Building strategic partnerships and trust within a supply chain.

UNIT V SUPPLY CHAIN AND INFORMATION TECHNOLOGY
The role IT in supply chain- The supply chain IT frame work - Customer Relationship Management – Internal supply chain management – supplier relationship management – future of IT in supply chain – E-Business in supply chain.

TOTAL:45 PERIODS

OUTCOMES:
- To know about the operations and fundamentals of supply chain
- To understand the quality management tools and sampling process
- To understand the design factors and various design options of distribution networks in industries and the role of transportation and warehousing
- To understand the various sourcing decisions in supply chain
• To understand the supply chain management in IT industries

TEXT BOOKS:

REFERENCES:
2. Srinivasan G.S, Quantitative models in Operations and Supply Chain Management, PHI, 2010

AD8010 SPEECH PROCESSING AND ANALYTICS L T P C
3 0 0 3

OBJECTIVES:
1. To understand the need for morphological processing and their representation
2. To know about the various techniques used for speech synthesis and recognition
3. To appreciate the syntax analysis and parsing that is essential for natural language processing
4. To learn about the various representations of semantics and discourse
5. To have knowledge about the applications of natural language processing

UNIT I SPEECH PROCESSING

UNIT II SPEECH ANALYSIS
Features, Feature Extraction and Pattern Comparison Techniques: Speech distortion measures – mathematical and perceptual – Log Spectral Distance, Cepstral Distances, Weighted Cepstral Distances and Filtering, Likelihood Distortions, Spectral Distortion using a Warped Frequency Scale, LPC, PLP and MFCC Coefficients, Time Alignment and Normalization – Dynamic Time Warping, Multiple Time – Alignment Paths

UNIT III SPEECH MODELING

UNIT IV SPEECH RECOGNITION
Large Vocabulary Continuous Speech Recognition: Architecture of a large vocabulary
continuous speech recognition system – acoustics and language models – n-grams, context dependent sub-word units; Applications and present status.

UNIT V SPEECH SYNTHESIS

Text-to-Speech Synthesis: Concatenative and waveform synthesis methods, sub-word units for TTS, intelligibility and naturalness – role of prosody. Applications and present status.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of this course, the students will be able to:

- Identify the different linguistic components of natural language
- Design a morphological analyser for a given natural language
- Decide on the appropriate parsing techniques necessary for a given language and application
- Design new tagset and a tagger for a given natural language
- Design applications involving natural language

REFERENCES:


AD8011 CYBER SECURITY

OBJECTIVES:

1. To study the basics of Cyber security.
2. To know about the security aspects operating systems and networks.
3. To explore Cryptography, IDS and IPS
4. To study the privacy principles and policies.
5. To know about the Security management and incidents.

UNIT I INTRODUCTION TO CYBER SECURITY

UNIT II SECURITY IN OPERATING SYSTEM & NETWORKS

UNIT III DEFENCES: SECURITY COUNTER MEASURES

UNIT IV PRIVACY IN CYBERSPACE

UNIT V MANAGEMENT AND INCIDENTS

OUTCOMES:
After the completion of this course, students will be able to:
- CO1: Explain the basic concepts of computer security
- CO2: Devise methods for Security in operating system & networks
- CO3: Differentiate the various security counter measures.
- CO4: Devise Privacy principles and policies
- CO5: Manage the Cyber space.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
1. To understand the role of optimization techniques and its importance in engineering.
2. To introduce the concept of nonlinear optimization methods.
3. To realize the application of non-traditional optimization algorithms.
4. To choose appropriate optimization method and solve real world problems.

UNIT I
CLASSICAL OPTIMIZATION TECHNIQUES

UNIT II
NON-LINEAR PROGRAMMING: ONE-DIMENSIONAL MINIMIZATION
Unimodal function, Unrestricted search, Exhaustive search, Dichotomous search, Interval halving method, Fibonacci method, Golden section method, Direct root methods.

UNIT III
NON-LINEAR PROGRAMMING: UNCONSTRAINED OPTIMIZATION TECHNIQUES
Direct Search Methods: Random search methods, Grid search method, Univariate method, Hookes and Jeeves' method, Powell’s method
Indirect Search Methods: Steepest descent method, Fletcher-Reeves method, Newton’s method.

UNIT IV
NON-LINEAR PROGRAMMING: CONSTRAINED OPTIMIZATION TECHNIQUES

UNIT V
ADVANCED NON-LINEAR OPTIMIZATION

TOTAL: 45 PERIODS

OUTCOMES:
At the end of this course, the students will be able to:

- Comprehend the need and applications of the optimization methods.
- Understand basic theoretical principles for formulation of optimization models and its solution.
- Learn the unified and exact mathematical basis as well as the general principles of various soft computing techniques.
- Apply detailed theoretical and practical aspects of intelligent modelling, optimization and control of non-linear systems.

REFERENCES:
AD8013  
ETHICS OF ARTIFICIAL INTELLIGENCE  
L T P C  
3 0 0 3  

OBJECTIVES:  
1: To understand the need for ensuring ethics in AI  
2: To understand ethical issues with the development of AI agents  
3: To apply the ethical considerations in different AI applications  
4: To evaluate the relation of ethics with nature  
5: To overcome the risk for Human rights and other fundamental values.  

UNIT I  INTRODUCTION TO ETHICS OF AI  
Role of Artificial Intelligence in Human Life, Understanding Ethics, Why Ethics in AI? Ethical Considerations of AI, Current Initiatives in AI and Ethics, Ethical Issues with our relationship with artificial Entities  

UNIT II  FRAMEWORK AND MODELS  
AI Governance by Human-right centered design, Normative models, Role of professional norms, Teaching Machines to be Moral  

UNIT III  CONCEPTS AND ISSUES  
Accountability in Computer Systems, Transparency, Responsibility and AI. Race and Gender, AI as a moral right-holder  

UNIT IV  PERSPECTIVES AND APPROACHES  
Perspectives on Ethics of AI, Integrating ethical values and economic value, Automating origination, AI a Binary approach, Machine learning values, Artificial Moral Agents  

UNIT V  CASES AND APPLICATION  
Ethics of Artificial Intelligence in Transport, Ethical AI in Military, Biomedical research, Patient Care, Public Health, Robot Teaching, Pedagogy, Policy, Smart City Ethics  

OUTCOMES:  
CO1: Understand the ethical issues in the development of AI agents  
CO2: Learn the ethical considerations of AI with perspectives on ethical values  
CO3: Apply the ethical policies in AI based applications and Robot development  
CO4: To implement the AI concepts to societal problems by adapting the legal concepts by securing fundamental rights.  
CO5: This study will help to overcome the evil genesis in the concepts of AI.  

TOTAL: 45 PERIODS  

REFERENCES  
AD8014  ENGINEERING ECONOMICS  L T P C
3 0 0 3

OBJECTIVES:
1: To Learn the fundamental of Economics.
2: To Understand different methods of depreciation use for calculation
3: To know the various method of comparison used in economic
4: To Understand how funds are managed in an organization.
5: Different methods of production and marketing adopted in an industry.

UNIT I  MICRO AND MACRO ECONOMICS AND ITS APPLICATIONS
Introduction – Micro Economics – Macro Economics – Economic decisions and Technical
Decisions – Demand and Supply Concepts – Elasticity of Demand – Cost of Products – Price
of products – Break-Even Analysis – Nature of Functioning of Money –Notional Income – GNP
and Savings – Inflation and Deflation Concepts

UNIT II  METHODS OF DEPRECIATION
Straight line method of Depreciation- Declining Balance Method of Depreciation-Sum of the
Years Digits Method of Depreciation-Sinking Fund Method of Depreciation- Service-output
Method of Depreciation.

UNIT III  METHODS OF COMPARISON OF ALTERNATIVES
Introduction – Elementary Economic Analysis – Interest Formulas and their Applications
Comparisons – Present Worth Method – Future Worth Method – Annual Equivalent Method –
Rate of Return Method.

UNIT IV  FINANCIAL MANAGEMENT
Sources of finance, internal and external-preparation of balance sheet and profit and loss
statements, Types of accounting and significance of each type, interest formulas and their
applications.

UNIT V  PRODUCTION & MARKETING MANAGEMENT
Types of Production; process of planning, scheduling, Routing, material control; product
concept concepts of productivity, Core concepts of Marketing- Needs, Wants, Demand-
Marketing Vs Selling- Products and Markets- Pricing and its related factors- Channels of
Distribution- Promotion- Advertising- Market Research- Sales Forecasting.

OUTCOMES:
CO1: The basic concepts of economics are learned
CO2: Understand the various types depreciation used
CO3: Learn the different comparison technique used in industries.
CO4: The fund flow in the industries are learned
CO5: Understand the different Production and Marketing techniques used in the industries.

TOTAL:45 PERIODS

TEXT BOOKS
1. O.P. Khanna, ‘Industrial Engineering and Management’, Dhanpat Rai and Sons, 2018

REFERENCES

AD8081 COGNITIVE SCIENCE AND ANALYTICS

OBJECTIVES:
- To explain cognitive computing and design principles.
- To distinguish between NLP and cognitive computing.
- To apply advanced analytics to cognitive computing.
- To discuss application of cognitive computing in business.
- To illustrate various applications of cognitive computing.

UNIT I FOUNDATION & DESIGN PRINCIPLES
9
Foundation of Cognitive Computing: cognitive computing as a new generation, the uses of cognitive systems, system cognitive, gaining insights from data, Artificial Intelligence as the foundation of cognitive computing, understanding cognition.
Design Principles for Cognitive Systems: Components of a cognitive system, building the corpus, bringing data into cognitive system, machine learning, hypotheses generation and scoring, presentation and visualization services.

UNIT II NLP IN COGNITIVE SYSTEM
9
Natural Language Processing in support of a Cognitive System: Role of NLP in a cognitive system, semantic web, Applying Natural language technologies to Business problems.
Representing knowledge in Taxonomies and Ontologies: Representing knowledge, Defining Taxonomies and Ontologies, knowledge representation, models for knowledge representation, implementation considerations.

UNIT III BIG DATA Vs COGNITIVE COMPUTING
9
Applying Advanced Analytics to cognitive computing: Advanced analytics is on a path to cognitive computing, Key capabilities in advanced analytics, Using advanced analytics to create value, Impact of open source tools on advanced analytics.
UNIT IV  COGNITIVE COMPUTING IN BUSINESS  9
The Business Implications of Cognitive Computing: Preparing for change, advantages of new disruptive models, knowledge meaning to business, difference with a cognitive systems approach, meshing data together differently, using business knowledge to plan for the future, answering business questions in new ways, building business specific solutions, making cognitive computing a reality, cognitive application changing the market- IBM Watson as a cognitive systems.

UNIT V  APPLICATIONS  9
The process of building a cognitive application: Emerging cognitive platform, defining the objective, defining the domain, understanding the intended users and their attributes, questions and exploring insights, training and testing- Building a cognitive health care application- Smarter cities-Cognitive Computing in Government.

OUTCOMES:
At the end of this course, the students will be able to:
CO1: Explain cognitive computing and design principles.
CO2: Distinguish between NLP and cognitive computing.
CO3: Apply advanced analytics to cognitive computing.
CO4: Discuss application of cognitive computing in business.
CO5: Illustrate various applications of cognitive computing.

REFERENCES:

MG8591  PRINCIPLES OF MANAGEMENT  L T P C
3 0 0 3

OBJECTIVES:
- To enable the students to study the evolution of Management, to study the functions and principles of management and to learn the application of the principles in an organization.
UNIT I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS 9

UNIT II PLANNING 9

UNIT III ORGANISING 9

UNIT IV DIRECTING 9

UNIT V CONTROLLING 9
System and process of controlling – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.

TOTAL: 45 PERIODS

OUTCOMES:
• Upon completion of the course, students will be able to have clear understanding of managerial functions like planning, organizing, staffing, leading & controlling and have same basic knowledge on international aspect of management

TEXTBOOKS:

REFERENCES:
### AD8015  BIO-INSPIRED OPTIMIZATION TECHNIQUES

#### OBJECTIVES:
- To understand fundamental topics in bio-inspired optimization techniques
- To Learn the collective systems such as ACO, PSO, and BCO
- To develop skills in biologically inspired algorithm design with an emphasis on solving real world problems
- To understand the most appropriate types of algorithms for different data analysis problems and to introduce some of the most appropriate implementation strategies.
- To implement the Bio-inspired technique with other traditional algorithms.

#### UNIT I  INTRODUCTION


#### UNIT II  SWARM INTELLIGENCE


#### UNIT III  NATURAL TO ARTIFICIAL SYSTEMS


#### UNIT IV  SWARM ROBOTICS


#### UNIT V  CASE STUDIES


#### OUTCOMES:
- **CO1**: Familiarity with the basics of several biologically inspired optimization techniques.
- **CO2**: Familiarity with the basics of several biologically inspired computing paradigms.
- **CO3**: Ability to select an appropriate bio-inspired computing method and implement for any application and data set.
CO4: Theoretical understanding of the differences between the major bio-inspired computing methods.

CO5: Learn Other Swarm Intelligence algorithms and implement the Bio-inspired technique with other traditional algorithms.

TOTAL PERIODS: 45

TEXT BOOK

REFERENCES

AD8016 INFORMATION EXTRACTION AND RETRIEVAL

OBJECTIVES:
1: To understand the different ways for extraction of multimedia data
2: To learn and analyze the information retrieval techniques
3: To apply the information retrieval algorithms for real time applications
4: To understand and evaluate the applications of information retrieval techniques
5: To understand the role of information retrieval systems in web applications

UNIT I INTRODUCTION TO INFORMATION EXTRACTION

UNIT II TEXT EXTRACTION

UNIT III INFORMATION RETRIEVAL SYSTEMS

104
UNIT IV  ALGORITHMS ON INFORMATION RETRIEVAL

UNIT V  APPLICATIONS

OUTCOMES:
• Able to apply the information extraction techniques for real time applications
• Design systems based on the concepts of information retrieval
• Apply data specific information extraction and retrieval
• Create web applications by understanding the information extraction and retrieval techniques
• Use the concepts of information classification and clustering in wide range of other applications

TOTAL PERIODS:45

TEXT BOOKS:

REFERENCES: