ANDHRA UNIVERSITY
DEPARTMENT OF COMPUTER SCIENCE AND SYSTEM ENGINEERING
SCHEME AND SYLLABI
(With effect from 2021-22)

Programme Educational Objectives

PEO1: Apply Concepts of Computer Science blended with mathematics and engineering to model computing systems.
PEO2: Based on requirement specifications, Design, implement, test and maintain software systems.
PEO3: Communicate effectively with team members, engage in applying technologies and lead teams in industry.
PEO4: Assess the Systems from quality, security, privacy, cost, utility, etiquette and ethics view point.
PEO5: Adapt to changing professional and societal needs by engage in lifelong learning, and career enhancement.

Programme Outcomes

PO1**:** Able to apply knowledge of computing, mathematics, & engineering principles.
PO2: Able to identify, formulate, and solve complex computer science & engineering problems.
PO3: Able to design, implement, and evaluate a computer-based system, component, process or program to meet desired needs with appropriate considerations such as economic / environmental.
PO4: Able to design and conduct experiments, as well as to analyze and interpret data in computer science & engineering.
PO5: Able to use the techniques, skills, and modern engineering & computational tools necessary for computer science & engineering practices.
PO6: Understand the impact of contextual knowledge on social and cultural issues.
PO7**:** Understand contemporary issues related to social & environmental context for sustainable development of engineering solutions.
PO8: Understand professional & ethical responsibility.
PO9**:** Able to function effectively as an individual, as a member or leader in diverse & multidisciplinary teams.
PO10: Able to communicate effectively with teams.
PO11: Understand engineering & management principles to manage projects.
PO12: Recognize the need for, with an ability to engage in lifelong learning.

Programme Specific Outcomes

PSO1: An ability to design hardware and software in emerging technology environments like embedded products and secure systems with new ideas.
PSO2: An ability to demonstrate basic knowledge of Database System, Software Engineering, Computer Networking and Operating System for software applications.
PSO3: An ability to design & develop program, algorithms and complete projects using open source tools and efficient data structures.

B.Tech & B.Tech + M.Tech
(Computer Science & Engineering)

I Year –I Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				

CS1101	BS	Mathematics –I	4	0	30	70	100	3
CS1102	BS	Chemistry	4	0	30	70	100	3
CS1103	HSS	English	4	0	30	70	100	3
CS1104	ES	Computer Programming & Numerical Methods	4	0	30	70	100	3
CS1105	ES	Discrete Mathematical Structures	4	0	30	70	100	3
CS1106	HSS	English Language Lab	0	3	50	50	100	1.5
CS1107	BS	Chemistry Lab	0	3	50	50	100	1.5
CS1108	ES	Computer Programming & Numerical Methods Lab	0	3	50	50	100	1.5
Total Credits								**19.5**

I Year-II Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
CS1201	BS	Mathematics–II	4	0	30	70	100	3
CS1202	BS	Physics	4	0	30	70	100	3
CS1203	ES	Engineering Graphics	2	3	30	70	100	3
CS1204	ES	Data Structures	4	0	30	70	100	3
CS1205	ES	Digital Logic Design	4	0	30	70	100	3
CS1206	ES	Workshop Lab	0	3	50	50	100	1.5
CS1207	BS	Physics Lab	0	3	50	50	100	1.5
CS1208	ES	Data Structures Lab	0	3	50	50	100	1.5
Total Credits								**19.5**

B.Tech & B.Tech + M.Tech
(Computer Science & Engineering)

II Year - I Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
CS2101	BS	Probability, Statistics And Queuing Theory	4	0	30	70	100	3
CS2102	PC	Computer Organization and Architecture	4	0	30	70	100	3
CS2103	PC	Elements of Electronics Engineering	4	0	30	70	100	3
CS2104	PC	Operating Systems	4	0	30	70	100	3
CS2105	PC	Object Oriented Programming Through Java	4	0	30	70	100	3

CS2106	PC	Computer Organization & Architecture Lab	0	3	30	70	100	1.5
CS2107	PC	Object Oriented Programming Through Java Lab	0	3	50	50	100	1.5
CS2108	PC	Operating Systems Lab	0	3	50	50	100	1.5
CS2109	SC	Intellectual Property Rights	1	2	50	50	100	2
CS2110	MC	Environmental Science	0	0	-	100	100	0
Total credits								**21.5**

II Year - II Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
CS2201	ES	Microprocessors	4	0	30	70	100	3
CS2202	PC	Design and Analysis of Algorithms	4	0	30	70	100	3
CS2203	PC	Database Management Systems	4	0	30	70	100	3
CS2204	PC	Formal Languages & Automata Theory	4	0	30	70	100	3
CS2205	HSS	Managerial Economics	4	0	30	70	100	3
CS2206	PC	Algorithms Lab through CPP.	0	3	50	50	100	1.5
CS2207	PC	Database Management Systems Lab	0	3	50	50	100	1.5
CS2208	SC	Java Technologies	1	2	50	50	100	2
CS2209	MC	Professional Ethics& Universal Human Values	0	0	0	100	100	0
CS2210	MC	NCC/NSS	0	2	-	-	-	0
Total credits								**20**
Summer Internship(Community Service)								

B.Tech & B.Tech + M.Tech
(Computer Science & Engineering)

III Year - I Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
CS3101	PC	Data Communications & Computer Networks	4	0	30	70	100	3
CS3102	PC	Artificial Intelligence	4	0	30	70	100	3
CS3103	PC	Compiler Design	4	0	30	70	100	3
CS3104	PE	Professional Electives - I	4	0	30	70	100	3
CS3105	OE	Open Electives - I	4	0	30	70	100	3
CS3106	PC	Data Communications &	0	3	50	50	100	1.5

		Computer Networks Lab						
CS3107	PC	Python Programming Lab	0	3	50	50	100	1.5
CS3108	SC	Soft Skills	1	2	50	50	100	2
CS3109	INT	Internship - I	0	0	50	50	100	2
Summer Internship 2 Months (Mandatory) after 2nd year (to be evaluated during III Year I Semester)								
							Total Credits	**22**

III Year - II Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
CS3201	PC	Object Oriented Software Engineering	4	0	30	70	100	3
CS3202	PC	Data Warehousing & Data Mining	4	0	30	70	100	3
CS3203	PC	Cryptography & Network Security	4	0	30	70	100	3
CS3204	PE	Professional Elective - II	4	0	30	70	100	3
CS3205	OE	Open Elective - II	4	0	30	70	100	3
CS3206	PC	Object Oriented Software Engineering Lab	0	3	50	50	100	1.5
CS3207	PC	Knowledge Engineering Lab	0	3	50	50	100	1.5
CS3208	PC	Cryptography & Network Security Lab	0	3	50	50	100	1.5
CS3209	SC	Embedded Systems	1	2	50	50	100	2
Industrial / Research Internship 2 months								
							Total Credits	**21.5**

B.Tech & B.Tech + M.Tech
(Computer Science & Engineering)

IV Year - I Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
CS4101	PE	Professional Elective– III	4	0	30	70	100	3
CS4102	PE	Professional Elective - IV	4	0	30	70	100	3
CS4103	PE	Professional Elective - V	4	0	30	70	100	3
CS4104	OE	Open Elective– III	4	0	30	70	100	3
CS4105	OE	Open Elective - IV	4	0	30	70	100	3
CS4106	HSSE	HSS Elective	4	0	30	70	100	3
CS4107	SC	Deep Learning	1	2	50	50	100	2
CS4108	INT	Internship -II	0	0	50	50	100	2
Industrial / Research Internship 2 months(Mandatory) after 3rd year (to be evaluated during IV Year I Semester)								
							Total Credits	**22**

B.Tech & B.Tech + M.Tech
IV Year - II Semester

Course code	Category	Course Title	Internal Marks	External Marks	Total Marks	Credits
CS4201	PROJ	Project work	100	100	200	14
Internship (6 Months)						
					Total Credits	**14**

CS-1101: MATHEMATICS-I

Course Objectives

- To transmit the knowledge of Partial differentiation.
- To know of getting maxima and minima of function of two variables and finding errors and approximations.
- To evaluate double and triple integrals, volumes of solids and area of curved surfaces.
- To expand a periodical function as Fourier series and half-range Fourier series

Course Outcomes

- Find the partial derivatives of functions of two or more variables.
- Evaluate maxima and minima, errors and approximations.
- Evaluate double and triple integrals, volumes of solids and area of curved surfaces.
- To expand a periodical function as Fourier series and half-range Fourier series.
- Have a fundamental understanding of Fourier series and be able to give Fourier expansions of a given function.

Syllabus

Partial Differentiation : Introduction - Functions of two or more variables - Partial derivatives - Homogeneous functions – Euler's theorem - Total derivative - Change of variables – Jacobins. Mean value Theorems (without proofs)

Applications of Partial Differentiation: Geometrical interpretation -Tangent plane and Normal to a surface -Taylor's theorem for functions of two variables - Errors and approximations -Total differential. Maxima and Minima of functions of two variables - Lagrange's method of undetermined multipliers - Differentiation under the integral Sign - Leibnitz's rule.

Multiple Integrals: Introduction - Double Integrals - Change of Order of Integration - Double Integrals in Polar Coordinates - Triple Integrals - Change of Variables.

Multiple Integrals-Applications: Area enclosed by plane curves - Volumes of solids - Area of a curved surface - Calculation of Mass - Center of gravity - Moment of inertia - product of inertia – principal axes- Beta Function - Gamma Function - Relation between Beta and Gamma Functions. Error Function or Probability Integral.

Fourier Series: Introduction - Euler's Formulae - Conditions for a Fourier Expansion - Functions having points of discontinuity - Change of Interval - Odd and Even Functions - Expansions of Odd or Even Periodic Functions, Half-Range Series - Parseval's Formula. Practical Harmonic analysis

Text Book

1. Scope and Treatment as in “Higher Engineering Mathematics”, by Dr. B.S. Grewal, 43rd Edition, Khanna publishers.

Reference Books

1. Graduate Engineering Mathematics by V B Kumar Vatti., I.K.International publishing house Pvt. Ltd.
2. Advanced Engineering Mathematics by Erwin Kreyszig.
3. A text book of Engineering Mathematics, by N.P. Bali and Dr. Manish Goyal, Lakshmi Publications.
4. Advanced Engineering Mathematics by H.K. Dass. S. Chand Company
5. Higher Engineering Mathematics by B.V. Ramana, Tata Mc Graw Hill Company. 6.
6. Higher Engineering Mathematics by Dr. M.K.Venkataraman.

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CS1102: CHEMISTRY

Course Objectives

- To apply the basic knowledge of Chemistry to the Engineering Discipline.
- To develop knowledge about water and its treatment for industrial and potable purposes.
- To develop understanding in the areas of Polymers, Mechanism of Corrosion of Metals and Corrosion Control Methods, Fuels, Lubricants and Nanomaterials for of conducting polymers, bio-degradable polymers and fibre reinforced plastics and apply the knowledge for solving existing challenges faced in various engineering and societal areas.

Course outcomes

- This course applies the basic concepts and principles studied in Chemistry to Engineering.
- It provides an application of chemistry to different branches of engineering
- The students will be able acquire knowledge in the areas of Water Chemistry, Polymers, Corrosion, Fuels and Lubricants and nanomaterials and suggest innovative solutions for existing challenges in these areas.

Syllabus

Water Chemistry: Sources of Water – Impurities and their influence of living systems – WHO Limits – Hardness and its Determination – Boiler Troubles and their removal – Water Softening Methods – Lime-Soda, Zeolite and Ion Exchange - Municipal Water Treatment-Break Point Chlorination – Desalination of Sea Water – Reverse Osmosis Method, Electro-dialysis.

Polymers and Plastics Polymers: Definition – Types of Polymerization (Addition & Condensation) – Mechanisms of Addition Polymerization – Radical and Ionic – Thermodynamics of Polymerization Process. Plastics: Thermosetting and Thermoplastics – Effect of Polymer Structure on Properties of Cellulose Derivatives – Vinyl Resins – Nylon (6,6), Reinforced Plastics – Conducting Polymers.

Corrosion: Corrosion: Origin and Theory – Types of Corrosion: Chemical and Electrochemical; Pitting, Inter granular, Waterline, Stress – Galvanic Series – Factors Effecting Corrosion. Corrosion Controlling Methods: Protective Coatings: Metallic Coatings, Electroplating and Electroless Plating – Chemical conversion Coatings – Phosphate, Chromate, Anodized, Organic Coatings – Paints and Special Paints.

Fuels and Lubricants: Solid Fuels: Wood and Coal, Ranking of Coal – Analysis (Proximate and Ultimate) Coke Manufacture – Otto Hoffmann's Process – Applications; Liquid Fuels: Petroleum Refining – Motor Fuels – Petrol and Diesel Oil – Knocking – Octane number – Cetane Number; Gaseous Fuels: Biogas, LPG and CNG – Characteristics – Applications; Rocket Fuels: Propellants – Classification – Characteristics Lubricants: Classification – Mechanism – Properties of Lubricating Oils – Selection of Lubricants for Engineering Applications.

Nanomaterials: Nanomaterials, Properties and application of fullerenes, fullerols, Carbon nanotubes and nanowires. Synthesis - Top-down and Bottom-up approaches - Nanocomposites - Nanoelectronics- Applications of nanomaterials in catalysis, telecommunication and medicine.

Text Books

1. Engineering Chemistry – PC Jain and M. Jain – Dhanpath Rai and Sons, New Delhi.
2. A Text book of Engineering Chemistry–S.S. Dara–S.Chand & Co. New Delhi.

Reference Books

1. Engineering Chemistry – B. K. Sharma – Krishna Prakashan – Meerut.
2. Introduction to Nanoscience - S. M. Lindsay - Oxford University Press
3. Engineering Chemistry -B.L.Tembe, Kamaluddin and M.S.Krishnan,(NPTEL).

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CS1103: ENGLISH

Course Objectives

- To make students understand the explicit and implicit meanings of a text/topic;
- To give exposure to new words and phrases, and aid to use them in different contexts;
- To apply relevant writing formats to draft essays, letters, emails and presentations; and
- To adapt oneself to a given situation and develop a functional approach to finding solutions: adaptability and problem solving.

Course Outcomes

- Students will be able to analyse a given text and discover the various aspects related to language and literature;
- Learn the various language structures, parts of speech and figures of speech;
- Develop one's reading and writing abilities for enhanced communication; and
- Learn to apply the topics in real-life situations for creative and critical use.

Syllabus

On the conduct of life: William Hazlitt

Life skills: Values and Ethics

If: Rudyard Kipling

The Brook: Alfred Tennyson

Life skills: Self-Improvement

How I Became a Public Speaker: George Bernard Shaw

The Death Trap: Saki

Life skills: Time Management

On saving Time: Seneca

Chindu Yellama

Life skills: Innovation

Muhammad Yunus

Politics and the English Language: George Orwell

Life skills: Motivation

Dancer with a White Parasol: Ranjana Dave

Grammar: Prepositions – Articles – Noun-Pronoun Agreement, Subject-Verb Agreement – Misplaced Modifiers–Clichés, Redundancies.

Vocabulary: Introduction to Word Formation – Root Words from other Languages –Prefixes and Suffixes–Synonyms, Antonyms– Common Abbreviations

Writing: Clauses and Sentences – Punctuation – Principals of Good Writing – Essay Writing – Writing a Summary

Writing: Essay Writing

Life skills: Innovation

Muhammad Yunus

Textbook

1. Language and Life: A Skills Approach Board of Editors, Orient Blackswan Publishers, India.2018.

References

1. Practical English Usage, Michael Swan. OUP. 1995.
2. Remedial English Grammar, F.T. Wood. Macmillan.2007
3. On Writing Well, William Zinsser. Harper Resource Book. 2001
4. Study Writing, Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
5. Communication Skills, Sanjay Kumar and PushpLata. Oxford University Press. 2011.
6. Exercises in Spoken English, Parts. I-III. CIEFL, Hyderabad. Oxford University Press.

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CS1104: Computer Programming & Numerical Methods

Course Objectives

- The course is designed to provide complete knowledge of C language.
- To provide students with understanding of code organization and functional hierarchical decomposition with using complex data types.
- To provide knowledge to the Students to develop logics which will help them to create programs, applications in C.
- This course aims to identify tasks in which the numerical techniques learned are applicable and apply them to write programs, and hence use computers effectively to solve the task.
- This course provides the fundamental knowledge which is useful in understanding the other programming languages.

Course Outcomes

- Identify basic elements of C programming structures like data types, expressions, control statements, various simple functions and Apply them in problem solving.
- Apply various operations on derived data types like arrays and strings in problem solving.
- Design and Implement of modular Programming and memory management using Functions, pointers.
- Apply Structure, Unions and File handling techniques to Design and Solve different engineering programs with minimal complexity.
- Apply Numerical methods to Solve the complex Engineering problems.\

Syllabus

Introduction to C: Basic structure of C program, Constants, Variables and data types, Operators and Expressions, Arithmetic Precedence and associativity, Type Conversions. Managing Input and Output Operations Formatted Input, Formatted Output.

Decision Making, Branching, Looping, Arrays & Strings: Decision making with if statement, Simple if statement, The if…else statement, Nesting of if…else statement, the else.. if ladder, switch statement, the (?:) operator, the GOTO statement., The while statement, the do statement, The for statement, Jumps in Loops ,One, Two-dimensional Arrays, Character Arrays. Declaration and initialization of Strings, reading and writing of strings, String handling functions, Table of strings.

Functions: Definition of Functions, Return Values and their Types, Function Calls, Function Declaration, Category of Functions: No Arguments and no Return Values, Arguments but no Return Values, Arguments with Return Values, No Argument but Returns a Value, Functions that Return Multiple Values. Nesting of functions, recursion, passing arrays to functions, passing strings to functions, the scope, visibility and lifetime of variables.

Pointers: Accessing the address of a variable, declaring pointer variables, initializing of pointer variables, accessing variables using pointers, chain of pointers, pointer expressions, pointers and arrays, pointers and character strings, array of pointes, pointers as function arguments, functions returning pointers, pointers to functions, pointers to structures-Program Applications.

Structure and Unions: Defining a structure, declaring structure variables, accessing structure members, structure initialization, copying and comparing structure variables, arrays of structures, arrays within structures, structures within structures, structures and functions and unions, size of structures and bit-fields- Program applications.

File handling: Defining and opening a file, closing a file, Input/ Output operations on files, Error handling during I/O operations, random access to files and Command Line Arguments- Program Applications.

Numerical Methods: Solutions of Algebraic and Transcendental Equations, Bisection Method, Newton Raphson Method. Newton's forward and backward Interpolation, Lagrange's Interpolation in unequal intervals. Numerical Integration: Trapezoidal rule, Simpson's 1/3 rules. Solutions of Ordinary First Order Differential Equations: Euler's Method, Modified Euler's Method and Runge-Kutta Method.

Text Books

1. Programming in ANSI C, E Balagurusamy, 6th Edition. McGraw Hill Education (India) Private Limited.

2. Introduction to Numerical Methods, SS Sastry, Prentice Hall

Reference Books

1. Let Us C ,YashwantKanetkar, BPB Publications, 5th Edition.

2. Computer Science, A structured programming approach using C", B.A.Forouzan and R.F.Gilberg, " 3rd Edition, Thomson, 2007.

3. The C –Programming Language' B.W. Kernighan, Dennis M. Ritchie, PHI.

4. Scientific Programming: C-Language, Algorithms and Models in Science, Luciano M. Barone (Author), EnzoMarinari (Author), Giovanni Organtini, World Scientific.

CS1105: DISCRETE MATHEMATICAL STRUCTURES

Course Objectives

- To understand mathematical arguments using logical connectives and quantifiers and verify the validity of logical flow of arguments using propositional ,predicate logic and truth tables.
- To understand about permutations and combinations.
- To understand various types of relations and discuss various properties of the relations.
- To study the graphs, graph isomorphism and spanning trees.
- To study about Boolean algebra and Finite State Machines.

Course Outcomes

At the end of the course student will be able to

- Rewrite mathematical arguments using logical connectives and quantifiers and verify the validity of logical flow of arguments using propositional, predicate logic.
- Identify and give examples of various types of relations and describe various properties of the relations.
- Ability to solve problems using permutations and combinations.
- Determine isomorphism of graphs and spanning tree of a given graph using BFS/DFS algorithms. Also determine minimal spanning tree of a given graph

Syllabus

The Foundations-Logic and Proofs: Propositional Logic, Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers Rules of Inference, Introduction to Proofs, Proof Methods and Strategy, Basic Structures-Sets, Functions, Sequences and Sums: Sets, Set Operations, Functions, Sequences and Summations.

The Fundamentals-Algorithms, the Integers and Matrices: Algorithms, The Growth of Functions, Complexity of Algorithms, The Integers and Division, Primes and Greatest Common Devisors, Integers and Algorithms, Applications of Number Theory, Matrices.

Induction and Recursion: Mathematical Induction, Strong Induction and Well-Ordering, Recursive Definitions and Structural Induction, Recursive Algorithms, Program Correctness. Counting: The Basics of Counting, The Pigeonhole Principle, Permutations and Combinations, Binomial Coefficients, Generalized Permutations and Combinations, Generating Permutations and Combinations.

Advanced Counting Techniques: Recurrence Relations, Solving Linear Recurrence Relations, Divide-and-Conquer Algorithms and Recursion Relations, Generating Functions, Inclusion-Exclusion, and Applications of Inclusion-Exclusion.

Relations: Relations and their properties, n-ary relations, applications, Representation, closure, equivalence relations, Partial orderings.

Graphs: Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Colouring.

Trees: Introduction to Trees, Applications of Trees, Tree Traversal, Spanning Trees, Minimum Spanning Trees,

Boolean Algebra: Boolean Functions, Representing Boolean Functions, Logic Gates, Minimization of Circuits

Modelling Computation: Languages and Grammars, Finite-State Machines with Output, Finite-State Machines with No Output, Language Recognition, Turing Machines.

Text Book

1. Discrete Mathematics & Its Applications with Combinatorics and Graph Theory by Kenneth H Rosen, Tata McGraw-Hill Publishing Company Ltd., New Delhi.

Reference Books

1. Discrete Mathematics for Computer Scientists & Mathematicians by Joe L. Mott, Abraham Kandel, Theodore P. Baker, Prentice-Hall, India.
2. Discrete Mathematics by Richard Johnson Baug, Pearson Education, New Delhi.
3. Discrete and Combinatorial Mathematics by Ralph. G. Grimaldi, Pearson Education, New Delhi.

CS1106: ENGLISH LANGUAGE LAB

Course Objectives

- To make students recognize the sounds of English through Audio-Visual aids;
- To help students build their confidence and help them to overcome their inhibitions and self-consciousness while speaking in English;
- To familiarize the students with stress and intonation and enable them to speak English effectively; and
- To give learners exposure to and practice in speaking in both formal and informal contexts.

Course Outcomes

- Students will be sensitized towards recognition of English sound patterns and the fluency in their speech will be enhanced;
- A study of the communicative items in the laboratory will help students become successful in the competitive world;
- Students will be able to participate in group activities like roleplays, group discussions and debates; and
- Students will be able to express themselves fluently and accurately in social as well professional context.

Syllabus

Introduction to Phonetics: The Sounds of English (Speech sound – vowels and consonants) - Stress and Intonation - Accent and Rhythm.

Listening Skills: Listening for gist and specific information - listening for Note taking, summarizing and for opinions - Listening to the speeches of eminent personalities.

Speaking Skills: Self-introduction - Conversation Skills (Introducing and taking leave) - Giving and asking for information - Role Play - Just A Minute (JAM) session - Telephone etiquette.

Reading and Writing skills: Reading Comprehension – Précis Writing - E-Mail writing - Punctuation.

Presentation skills: Verbal and non-verbal communication - Body Language - Making a Presentation

Reference Books

1. Ashraf Rizvi. Effective Technical Communication. Tata McGraw Hill Education Private Limited, New Delhi.

2. Speak Well. Orient Blackswan Publishers, Hyderabad.

3. Allan Pease. Body Language. Manjul Publishing House, New Delhi.

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CS1107: CHEMISTRY LAB

Course Objectives

- To develop the fine skills of quantitative determination of various chemical components through titrimetric analysis
- To prepare and use ion exchange/ zeolite columns for the removal of hardness of water
- To develop the skill of organic synthesis through the preparation of a polymer/drug

Course Outcomes

- The course provides quantitative determine the amount of various chemical species in solutions by titrations and conduct the quantitative determinations with accuracy
- The course provides to develop novel materials to be used as zeolite and prepare columns for removal of hardness of water
- The course provides to synthesise a polymer or a drug

Syllabus

1. Determination of Sodium Hydroxide with HCl (Na2CO3 Primary Standard)
2. Determination of Alkalinity (Carbonate and Hydroxide) of water sample
3. Determination of Fe(II)/Mohr's Salt by Permanganometry
4. Determination of Oxalic Acid by Permanganometry
5. Determination of Chromium (VI) by Mohr's Salt Solution
6. Determination of Zinc by EDTA method
7. Determination of Hardness of Water sample by EDTA method
8. Determination of Chlorine in water by Iodometric Titration
9. Ion exchange/ Zeolite column for removal of hardness of water
10. Synthesis of Polymer/drug

Reference Books

1. Vogel's Quantitative Chemical Analysis – V – Edition – Longman.
2. Experiments in Applied Chemistry (For Engineering Students) – Sinita Rattan – S. K. Kataria & Sons, New Delhi

CS1108: COMPUTER PROGRAMMING & NUMERICAL METHODS LAB

Course Objectives

- To impart writing skill of C programming to the students and solving problems.
- To write and execute programs in C to solve problems such as Modularize the problems into small modules and then convert them into programs.,
- To write and execute programs in C to solve problems such as arrays, files, strings, structures and different numerical methods.
- This reference has been prepared for the beginners to help them understand the basic to advanced concepts related to Objective-C Programming languages.

Course Outcomes

- Understand various computer components, Installation of software. C programming development environment, compiling, debugging, and linking and executing a program using the development environment.
- Analysing the complexity of problems, Modularize the problems into small modules and then convert them into programs.
- Construct programs that demonstrate effective use of C features including arrays, strings, structures, pointers and files.
- Apply and practice logical ability to solve the real-world problems.
- Apply Numerical methods to Solve the complex Engineering problems.

Syllabus

1. Write a program to read x, y coordinates of 3 points and then calculate the area of a triangle formed by them and print the coordinates of the three points and the area of the triangle. What will be the output from your program if the three given points are in a straight line?

2. Write a program, which generates 100 random integers in the range of 1 to 100. Store them in an array and then print the arrays. Write 3 versions of the program using different loop constructs. (e.g. for, while, and do while).

3. Write a set of string manipulation functions e.g. for getting a sub-string from a given position, Copying one string to another, Reversing a string, adding one string to another.

4. Write a program which determines the largest and the smallest number that can be stored in different data types like short, int, long, float, and double. What happens when you add 1 to the largest possible integer number that can be stored?

5. Write a program, which generates 100 random real numbers in the range of 10.0 to 20.0, and sort them in descending order.

6. Write a function for transposing a square matrix in place (in place means that you are not allowed to have full temporary matrix).

7. First use an editor to create a file with some integer numbers. Now write a program, which reads these numbers and determines their mean and standard deviation.

8. Given two points on the surface of the sphere, write a program to determine the smallest arc length between them.

9. Implement bisection method to find the square root of a given number to a given accuracy.

10. Implement Newton Raphson method to det. a root of polynomial equation.

11. Given table of x and corresponding f(x) values, Write a program which will determine f(x) value at an intermediate x value by using Lagrange's interpolation/

12. Write a function which will invert a matrix.

13. Implement Simpson's rule for numerical integration.

14. Write a program to solve a set of linear algebraic equations.

I Year-II Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
CS1201	BS	Mathematics–II	4	0	30	70	100	3
CS1202	BS	Physics	4	0	30	70	100	3
CS1203	ES	Engineering Graphics	2	3	30	70	100	3
CS1204	ES	Data Structures	4	0	30	70	100	3
CS1205	ES	Digital Logic Design	4	0	30	70	100	3
CS1206	ES	Workshop Lab	0	3	50	50	100	1.5
CS1207	BS	Physics Lab	0	3	50	50	100	1.5
CS1208	ES	Data Structures Lab	0	3	50	50	100	1.5
Total Credits								**19.5**

CS1201 **MATHEMATICS – II**

Course Objectives

- The way of obtaining rank, eigen values and eigen vectors of a matrix.
- To know the importance of Cayley-Hamilton theorem and getting canonical form from a given quadratic form.
- To solve the system of equations by using direct and indirect methods.
- To solve first order and higher order differential equations by various methods.
- To obtain the Laplace transforms and inverse Laplace transforms for a given functions and their applications.

Course Outcomes

- Find rank, eigen values and eigen vectors of a matrix and understand the importance of Cayley-Hamilton theorem.
- Reduce quadratic form to canonical forms and solving linear systems by direct and indirect methods.
- Demonstrate solutions to first order differential equations by various methods and solve basic applications problems related to electrical circuits, orthogonal trajectories and Newton's law of cooling
- Discriminate among the structure and procedure of solving higher order differential equations with constant and variable coefficients.
- Understand Laplace transforms and its properties and finding the solution of ordinary differential equations.

Syllabus

Linear Algebra: Rank of a matrix- Echelon form, Normal Form - Solution of Linear System of Equations - Consistency of Linear System of Equations - Direct & Indirect Methods: Gauss elimination method, LU Factorization method, Gauss Seidal Method. Complex Matrices: Hermitian, Skew-Hermitian and Unitary Matrices and their Properties.

Eigen Values and Eigen Vectors: Eigen Values and Eigen Vectors of a Matrix - Cayley-Hamilton theorem - Inverse and Powers of a Matrix using Cayley-Hamilton's theorem and its applications. Diagonalization of a Matrix - Quadratic Forms - Reduction of Quadratic Form to Canonical Form - Nature of a Quadratic Form.

Ordinary Differential Equations of First Order and its Applications: Formation of ordinary differential equations (ODEs) - Solution of an ordinary differential equation - Equations of the first order and first degree - Linear differential equation - Bernoulli's equation - Exact differential equations

- Equations reducible to exact equations - Orthogonal Trajectories - Simple Electric (LR & CR) Circuits - Newton's Law of Cooling - Law of Natural growth and decay.

Differential Equations of Higher Order: Solutions of Linear Ordinary Differential Equations with Constant Coefficients - Rules for finding the complimentary function - Rules for finding the particular integral - Method of variation of parameters - Cauchy's linear equation - Legendre's linear equation - Simultaneous linear differential equations.

Laplace Transforms: Introduction - Existence Conditions - Transforms of Elementary Functions - Properties of Laplace Transforms - Transforms of Derivatives - Transforms of Integrals - Multiplication by tn - Division by t – Evaluation of integrals by Laplace Transforms - Inverse Laplace Transform - Applications of Laplace Transforms to Ordinary Differential Equations - Simultaneous Linear Differential Equations with Constant Coefficients - Second Shifting Theorem - Laplace Transforms of Unit Step Function, Unit Impulse Function and Laplace Transforms of Periodic Functions.

Text Book

1. Scope and Treatment as in "Higher Engineering Mathematics", by Dr. B.S. Grewal, 43rd edition, Khanna publishers.

Reference Books

1. Graduate Engineering Mathematics by V B Kumar Vatti., I.K. International publishing house Pvt. Ltd.
2. Advanced Engineering Mathematics by Erwin Kreyszig.
3. A text book of Engineering Mathematics, by N.P. Bali and Dr. Manish Goyal. Lakshmi Publications.
4. Advanced Engineering Mathematics by H.K. Dass. S. Chand Company.
5. Higher Engineering Mathematics by B.V. Ramana, Tata Mc Graw Hill Company.

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CS1202 PHYSICS

Course Objectives

- To impart knowledge in basic concept of physics of Thermodynamics relevant to engineering applications.
- To grasp the concepts of physics for electromagnetism and its application to engineering. Learn production of Ultrasonics and their applications in engineering.
- To Develop understanding of interference, diffraction and polarization: connect it to a few engineering applications.
- To Learn basics of lasers and optical fibres and their use in some applications.
- To Understand concepts and principles in quantum mechanics and Nanophase Materials. Relate them to some applications.

Course Outcomes

- Understand the fundamentals of Thermodynamics and Laws of thermodynamics. Understand the working of Carnot cycle and concept of entropy.
- Gain Knowledge on the basic concepts of electric and magnetic fields. Understand the concept of the nature of magnetic materials. Gain knowledge on electromagnetic induction and its applications.
- Understand the Theory of Superposition of waves. Understand the formation of Newton's rings and the working of Michelson's interferometer. Remember the basics of diffraction, Evaluate the path difference. Analysis of Fraunhofer Diffraction due to a single slit
- Understand the interaction of matter with radiation, Characteristics of Lasers, Principle, working schemes of Laser and Principle of Optical Fibre. Realize their role in optical fibre communication.
- Understand the intuitive ideas of the Quantum physics and understand dual nature of matter. Compute Eigen values, Eigen functions, momentum of Atomic and subatomic particles using Time independent one-Dimensional Schrodinger's wave equation. Understand the fundamentals and synthesis processes of Nanophase materials.

Syllabus

Thermodynamics: Introduction, Heat and Work, First law of thermodynamics and applications, Reversible and Irreversible process, Carnot cycle and Efficiency, Second law of thermodynamics, Carnot's Theorem, Entropy, Second law in terms of entropy, Entropy and disorder, Third law of thermodynamics (statement only).

Electromagnetism: Concept of electric flux, Gauss's law - some applications, Magnetic field - Magnetic force on current, torque on current loop, The Biot-Savart's Law, B near a long wire, B for a circular Current loop, Ampere's law, B for a solenoid, Hall effect, Faraday's law of induction, Lenz's

law, Induced magnetic fields, Displacement current, Maxwell's equations (no derivation), Magnetic materials: Classification of magnetic materials and properties.

Ultrasonics: Introduction, Production of Ultrasonics – Piezoelectric and Magnetostriction methods, acoustic grating, applications of ultrasonics.

OPTICS-

Interference: Principles of superposition – Young's Experiment – Coherence - Interference in thin films (reflected light), Newton's Rings, Michelson Interferometer and its applications.

Diffraction: Introduction, Differences between interference and diffraction, Fresnel and Fraunhofer diffraction, Fraunhofer diffraction at a single slit (Qualitative and quantitative treatment).

Polarisation: Polarisation by reflection, refraction and double refraction in uniaxial crystals, Nicol prism, Quarter and Half wave plate, circular and elliptical polarization.

Lasers And Fibre Optics: Introduction, characteristics of a laser beam, spontaneous and stimulated emission of radiation, population inversion, Ruby laser, He-Ne laser, Semiconductor laser, applications of lasers Introduction to optical fibres, principle of propagation of light in optical fibres, Acceptance Angle and cone of a fibre, Numerical aperture, Modes of propagations, classification of fibres, Fibre optics in communications, Application of optical fibres.

MODERN PHYSICS

Introduction, De Broglie concept of matter waves, Heisenberg uncertainty principle, Schrodinger time independent wave equation, application to a particle in a box. Free electron theory of metals, Kronig - Penney model (qualitative treatment), Origin of energy band formation in solids, Classification of materials into conductors, semi-conductors and insulators.

Nanophase Materials: Introduction, properties, Top-down and bottom-up approaches, Synthesis - Ball milling, Chemical vapour deposition method, sol-gel methods, Applications of nano materials.

Text Books

1. Physics by David Halliday and Robert Resnick – Part I and Part II - Wiley.
2. A textbook of Engineering Physics, Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar - S. Chand
3. Engineering Physics by R.K. Gaurand S.L. Gupta–Dhanpat Rai

Reference Books

1. Modern Engineering Physics by A.S. Vadudeva
2. University Physics by Young and Freedman

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CS1203 ENGINEERING GRAPHICS

Course Objectives

- Understand the basics of Engineering Graphics and BIS conventions.
- Develop the graphical skills for communication of concepts, ideas and design of engineering products through technical drawings
- Demonstrate and practice the various profiles/curves used in engineering practice through standard procedures.
- Demonstrate and practice the orthographic projections of points, lines, planes, solids and section of solids
- Demonstrate and practice the development of surfaces of simple solids
- Familiarize the basic concept of isometric views clearly.

Course Outcomes

- Develop simple engineering drawings by considering BIS standards.
- Able to draw different engineering curves with standard Procedures
- Comprehend the basics of orthographic projections and deduce orthographic projections of points, lines, planes and solids at different orientations in real life environment.
- Visualize clearly the sections of solids.
- Apply the concepts of development of surfaces while designing/analysing any product.
- Recognize the significance of isometric drawing to relate 2D environment with 3D-environment.

Syllabus

Introduction: Lines, Lettering and Dimensioning, Geometrical Constructions, and Scales.

Curves: Conic sections: General construction of ellipse, parabola and hyperbola. Construction of involutes of circle and polygons only. Normal and tangent to curves.

Projections of Points: Principal or Reference Planes, Projections of a point situated in any one of the four quadrants.

Projections of Straight Lines: Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane.

Projections of Straight Line Inclined to Both the Reference Planes: Projections of Planes: Projection of Perpendicular planes: Perpendicular to both reference planes, perpendicular to one

reference plane and parallel to other reference plane and perpendicular to one reference plane and inclined to other reference plane. Projection of Oblique planes. Introduction to Auxiliary Planes.

Projections of Solids: Types of solids: Polyhedra and Solids of revolution. Projections of solids in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to other and axes inclined to both the reference planes.

Sections of Solids: Perpendicular and inclined section planes, Sectional views and True shape of section, Sections of solids (Prism, Pyramid, Cylinder and Cone) in simple position only.

Development of Surfaces: Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone.

Isometric Views: Isometric projection, Isometric scale and Isometric view. Isometric view of Prisms, Pyramids, cylinder, cone, and their combinations.

Text Book

Elementary Engineering Drawing by N.D.Bhatt, Charotar Publishing House.

Reference Book

Engineering Graphics by K.L. Narayana and P.Kannaiah, Tata Mc-Graw Hill

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CS1204 DATA STRUCTURES

Course objectives

- Assess how the choice of data structures and algorithm design methods impacts the performance of programs.
- Choose the appropriate data structure and algorithm design method for a specified application.
- Solve problems using data structures such as linear lists, stacks, queues, binary trees, heaps binary search trees, and graphs and writing programs for these solutions.

Course outcomes

- Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithm.
- Demonstrate different methods for traversing trees.
- Compare alternative implementations of data structures with respect to performance.
- Discuss the computational efficiency of the principal algorithms for sorting and searching

Syllabus

Introduction to Data Structures: Review of C Programming, Recursive Definition and Processes, Recursion in C, Simulation of Recursion, Efficiency of Recursion, Abstract Data Types, Meaning and Definition of Data Structures, Arrays.

Stacks: Stack as an Abstract Data Type, Primitive Operations, Implementing Stack Operations using Arrays, Infix, Postfix and Prefix: Definitions, Evaluation and Conversions.

Queues: Queue as an Abstract Data Type, Sequential Representation, Types of Queues, Operations, Implementation using Arrays.

Linked List: Operations, Implementation of Stacks, Queues and priority Queues using Linked Lists+, Circular Lists: Insertion, Deletion and Concatenation Operations, Stacks and Queues as Circular Lists, Doubly Linked Lists.

Trees: Binary Trees - Definitions and Operations, Binary Tree Representation: Node Representation, Implicit array Representation, Binary Tree Traversal, Threaded Binary Trees and their Traversal, Trees and their Applications; Tree Searching: Insertion and Deletion of a node from a Binary Search Tree, Efficiency of Binary Search Tree operations.

Searching: Basic Searching Techniques: Dictionary as an Abstract Data Type, Algorithmic Notation, Sequential Searching and its Efficiency, Binary Search, Interpolation Search.

Sorting: General Background: Efficiency, Asymptotic Notations, Efficiency of Sorting, Bubble Sort and Quick Sort and their Efficiency, Selection Sorting, Binary Tree Sort, Heap Sort, Insertion Sorts, Shell Sort, Address calculation Sort, Merge and Radix Sorts.

Graphs and Their Application: Definition of Graphs, Representation of Graphs, Transitive closure, Linked Representation of Graphs, Topological Ordering of nodes, Graph Traversal and Spanning Forests, Undirected Graphs and their Traversals, Applications of Graphs, Minimal Spanning Trees.

Textbooks

1. Data Structures Using C and C++ Yddish Langsam, Moshe J. Augenstein and Aaron M.Tanenbaum, Prentice Hall Of India (2nd Edition)
2. Data Structures, Algorithms and Applications with C++, Sahani Mc-Graw Hill.

CS1205 DIGITAL LOGIC DESIGN

Course objectives

- To introduce the basic principles for design of combinational circuit and sequential circuits.
- To learn simple digital circuits in preparation for computer engineering.

Course Outcomes

A student who successfully fulfills the course requirements will have demonstrated:

- An ability to define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation.
- An ability to understand the different Boolean algebra theorems and apply them for logic functions.
- An ability to define the Karnaugh map for a few variables and perform an algorithmic reduction of logic functions.
- An ability to define the following combinational circuits: multiplexer, de-multiplexers encoders/decoders, comparators, arithmetic-logic units; and to be able to build simple circuits.
- An ability to understand asynchronous and synchronous sequential circuits, like counters and shift registers.
- An ability to understand memories like RAM and ROM, Programmable Logic Array and Programmable Array Logic.

Syllabus

Binary Systems: Digital Systems. Binary Numbers. Number Base Conversions. Octal and Hexadecimal Numbers. Complements. Signed Binary Numbers. Binary Codes. Binary Storage and Registers. Binary Logic

Boolean Algebra and Logic Gates: Basic Definitions. Axiomatic Definition of Boolean Algebra. Basic Theorems and Properties of Boolean Algebra. Boolean Functions. Canonical and Standard Forms. Other Logic Operations. Digital Logic Gates. Integrated Circuits.

Combinational Logic Design, Gate-Level Minimization: The Map Method. Four Variable Map. Five-Variable Map. Product of Sums Simplification. Don't-Care Conditions. NAND and NOR Implementation. Other Two- Level Implementations. Exclusive-OR Function. Hardware Description Language (HDL).

Combinational Logic: Combinational Circuits. Analysis Procedure. Design Procedure. Binary Adder Subtractor. Decimal Adder. Binary Multiplier. Magnitude Comparator. Decoders. Encoders. Multiplexers. HDL For Combinational Circuits.

Sequential Logic Design, Synchronous Sequential Logic: Sequential Circuits. Latches FlipFlops. Analysis of Clocked Sequential Circuits. HDL For Sequential Circuits. State Reduct ion and Assignment. Design Procedure.

Registers ad Counters: Registers. Shift Registers. Ripple Counters. Synchronous Counters. Other Counters. HDL for Registers and Counters.

Memory and Programmable Logic: Introduction. Random-Access Memory. Memory Decoding, Error Detection and Correction. Read-Only Memory. Programmable Logic Array. Programmable Array Logic. Sequential Programmable Devices.

Text Book

1. DigitalDesign,3rdEdition,M.MorrisMano,PearsonEducation.

Reference Books

1. Digital Logic Design Principles, Norman Balabanian & Bradley Carlson, John Wiley &Sons (Asia) Pvt.Ltd.,2002

2. Fundamentals of Digital Logic with VHDL Design, Stephen Brown and ZvonkoVranesic, TataMcGraw-HillEdition,2002.

CS1206 WORKSHOP LAB

Course Objectives

- Get hands on experience with the working skills in Carpentry trade.
- Know how to work with Sheet Metal tools.
- Get familiar with the working skills of Metal Fitting operations.
- Get hands on experience with household electrical wiring.

Course Outcomes

- Can be able to work with Wood Materials in real time applications.
- Can be able to build various parts with Sheet Metal in day-to-day life.
- Can be able to apply Metal Fitting skills in various applications.
- Can be able to apply this knowledge to basic house electrical wiring and repairs.

Syllabus

Carpentry: Any three jobs from – Half lap joint, Mortise and Tenon joint, Half – lap Dovetail joint, Corner Dovetail joint, Central Bridle joint.

Sheet Metal: Any three jobs from – Square tray, Taper tray(sides), Funnel, Elbow pipe joint.

Fitting: Any three jobs from – Square, Hexagon, Rectangular fit, Circular fit and Triangular fit.

House wiring: Any three jobs from – Tube light wiring, Ceiling fan wiring, Stair-case wiring, Corridor wiring.

Reference Books

1. Elements ofworkshoptechnology,Vol.1 by S. K. and H. K. Choudary.
2. Work shop Manual / P.Kannaiah/ K.L.Narayana/ SciTech Publishers.
3. Engineering Practices Lab Manual,Jeyapoovan,SaravanaPandian,4/eVikas.

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CS1207 **PHYSICS LAB**

Course Objectives

- To enable the students to acquire skill, technique and utilization of the Instruments
- Draw the relevance between the theoretical knowledge and to imply it in a practical manner with respect to analyze various electronic circuits and its components.
- To impart the practical knowledge in basic concepts of Wave optics, Lasers and Fiber optics.
- To familiarize the handling of basic physical apparatus like Vernier callipers, screw gauge, spectrometers, travelling microscope, laser device, optical fibre, etc.

Course Outcomes

- Ability to design and conduct experiments as well as to analyze and interpret
- Ability to apply experimental skills to determine the physical quantities related to Heat, Electromagnetism and Optics
- The student will learn to draw the relevance between theoretical knowledge and the means to imply it in a practical manner by performing various relative experiments.

Syllabus

1. Determination of Radius of Curvature of a given Convex Lens By forming Newton's Rings.
2. Determination of Wavelength of Spectral Lines in the Mercury Spectrum by Normal Incidence method.
3. Study the Intensity Variation of the Magnetic Field along axis of Current Carrying Circular Coil.
4. Determination of Cauchy's Constants of a Given Material of the Prism using Spectrometer.
5. Determination of Refractive Index of Ordinary ray □o and Extraordinary □e ray.
6. Determination of Thickness Given Paper Strip by Wedge Method.
7. Calibration of Low Range Voltmeter.
8. Calibration of Low Range Ammeter.
9. Determination of Magnetic Moment and Horizontal Component of Earth's Magnetic Field.
10. Lees Method - Coefficient of thermal Conductivity of a Bad Conductor.
11. Carey Foster's Bridge – Verification of laws of Resistance and Determination Of Specific Resistance.
12. Melde's Apparatus – Frequency of electrically maintained Tuning Fork.

13. Photoelectric cell-Characteristics.
14. Planks Constants.
15. Laser- Diffraction.

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CS1208 DATA STRUCTURES LAB

Course Objectives

- To implement stacks and queues using arrays and linked lists.
- To develop programs for searching and sorting algorithms.
- To write programs using concepts of various trees.
- To implement programs using graphs.

Course Outcomes

- Student will be able to write programs to implement stacks and queues.
- Ability to implement various searching and sorting techniques.
- Ability to implement programs using trees and graphs.

Syllabus

List of Programs :

1. Write a C program for sorting a list using Bubble sort and then apply binary search.
2. Write a C program to implement the operations on single linked list.
3. Write a C program for demonstrate operations on double linked list.
4. Write a C program to implement the operations on priority queues.
5. Write a C program to implement the operations on stacks.
6. Write a C program to implement the operations on circular queues.
7. Write a C program for evaluating a given postfix expression using stack.
8. Write a C program for converting a given infix expression to postfix form using stack.
9. Write a C program for implementing the operations of a dequeue
10. Write a C program for the representation of polynomials using circular linked list and for the addition of two such polynomials
11. Write a C program to create a binary search tree and for implementing the in order, Pre order, post order traversal using recursion
12. a) Write a C program for finding the transitive closure of a digraph
    b) Write a C program for finding the shortest path from a given source to any vertex in a digraph using Dijkstra's algorithm.
13. a) Write a C program for finding the Depth First Search of a graph.
    b) Write a C program for finding the Breadth First Search of a graph

B.Tech & B.Tech + M.Tech
(Computer Science & Engineering)

II Year - I Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
CS2101	BS	Probability, Statistics And Queuing Theory	4	0	30	70	100	3
CS2102	PC	Computer Organization and Architecture	4	0	30	70	100	3
CS2103	PC	Elements of Electronics Engineering	4	0	30	70	100	3
CS2104	PC	Operating Systems	4	0	30	70	100	3
CS2105	PC	Object Oriented Programming Through Java	4	0	30	70	100	3
CS2106	PC	Computer Organization & Architecture Lab	0	3	30	70	100	1.5
CS2107	PC	Object Oriented Programming Through Java Lab	0	3	50	50	100	1.5
CS2108	PC	Operating Systems Lab	0	3	50	50	100	1.5
CS2109	SC	Intellectual Property Rights	1	2	50	50	100	2
CS2110	MC	Environmental Science	0	0	-	100	100	0
Total credits								**21.5**

CS2101: Probability, Statistics And Queuing Theory

Course objectives

- to provide foundations of probabilistic and statistical analysis
- to provide an understanding on concepts of probability, random variables, probability distributions, sampling, estimation, hypothesis testing, regression, correlation, multiple regression, hypothesis testing, sample test, queuing methods
- to explore applications of probabilistic and statistical tools to solve real world problems.

Course outcomes

After completion of the course the student should be able to:

- define and explain basic concepts in probability theory and how to translate real-world problems into probability models
- solve standard problems that include random variables, discrete and continuous probability distributions
- perform Test of Hypothesis and construct a confidence interval to estimate population parameters
- compute and interpret the results of Correlation Analysis, Multivariate Regression, Chi-Square test for Independence and Goodness of Fit
- explain basic concepts in Markov processes, M/M/1 and M/M/C queueing systems.

Syllabus

Probability: Definitions of probability, Addition theorem, Conditional probability, Multiplication theorem, Bayes‟ Theorem of Probability and Geometric Probability.

Random variables and their properties: Discrete Random Variable, Continuous Random Variable, Probability Distribution, Joint Probability Distributions their Properties, Transformation Variables, Mathematical Expectations, Probability Generating Functions.

Probability Distributions: Discrete Distributions: Binomial, Poisson Negative Binominal Distributions And Their Properties; **Continuous Distributions:** Uniform, Normal, Exponential Distributions And Their Properties.

Multivariate Analysis: Correlation, Correlation Coefficient, Rank Correlation, Regression Analysis, Multiple Regression, Attributes, Coefficient Of Association, Chi Square Test For Goodness Of Fit, Test For Independence.

Estimation: Sample, Populations, Statistic, Parameter, Sampling Distribution, Standard Error, Un-biasedness, Efficiency, Maximum Likelihood Estimator, Notion & Interval Estimation.

Testing of Hypothesis: Formulation of Null hypothesis, critic al region, level of significance, power of the test;

Sample Tests: Small Sample Tests: Testing equality of means, testing equality of variances, test of correlation coefficient, test for Regression Coefficient; Large Sample tests: Tests based on normal distribution

Queuing Theory: Queue description, characteristics of a queuing model, study state solutions of M/M/1: Model, M/M/1; N Model, M/M/C: Model, M/M/C: N Model, Case studies.

Text Books

1. Probability & Statistics for Engineers and Scientists, Walpole, Myers, Myers, Ye. Pearson Education.

2. Probability, Statistics and Random Processes T.Veerarajan Tata McGraw – Hill

Reference Book

1. Probability & Statistics with Reliability, Queuing and Computer Applications, Kishor S. Trivedi, Prentice Hall of India ,1999

CS 2102: Computer Organization And Architecture

Course Objectives

- To study about structure and functional components of a computer.
- Understanding the hierarchical organization of a computer system which consists of instruction set of commands.
- Learn about the architecture of a computer from a programming view.
- To design a balance system that minimizes performance and utilization of all elements.

Course Outcomes

By the end of the course, the student should be able to:

- Demonstrate knowledge about major components of a computer such as processor, memory and I/O modules along with their interconnections internally with outside world.
- have detailed idea about architecture of central processing unit, functions of control unit, memory, I/O devices and their issues.
- Understand simple and multiple processor organization and their issues.

Syllabus

Register Transfer and Micro operations: Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro operations, Shift Micro operations, Arithmetic Logic Shift Unit.

Basic Computer Organization and Design: Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input- Output and Interrupt, Complete Computer Description, Design of Basic Computer, Design of Accumulator Logic.

Micro programmed Control: Control Memory, Address Sequencing, Micro program Example, Design of Control Unit.

Central Processing Unit: Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer (RISC), Architecture and Programming of 8085 Microprocessor

Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISK Pipeline, Vector Processing, Array Processors.

Input/output Organization: Peripheral Devices, I/O interface, Asynchronous data transfer, Modes of transfer, priority Interrupt, Direct memory access, Input-Output Processor (IOP), Serial Communication.

Memory Organization: Memory Hierarchy, Main memory, Auxiliary memory, Associate Memory, Cache Memory, and Virtual memory, Memory Management Hardware.

Text Books

1. Computer System Architecture, M. Morris Mano, Prentice Hall of India Pvt. Ltd., Third Edition, Sept.2008.
2. Computer Architecture and Organization, P.Chakraborty.
3. Microprocessor Architecture, Programming and Applications with the 8085by Ramesh S Gaonkar

Reference Books

1. Computer Architecture and Organization, William Stallings, PHI Pvt. Ltd., Eastern Economy Edition, Sixth Edition, 2003.
2. Computer Organization and Architecture, Linda Null, Julia Lobur, Narosa Publications ISBN81- 7319-609-5
3. Computer System Architecture", John. P.Hayes.

CS 2103: Elements of Electronics Engineering

Course Objectives

- Introduce students to basics of semiconductors, their classification and properties
- To provide theory of PN junction diode, its characteristics and applications
- To introduce basics of rectifying circuits and bipolar junction transistor
- To provide basics of transistor biasing, transistor amplifiers and field effect transistors

Course Outcomes

By the end of the course, the student should be able to:

- Explain the basics of semiconductors and their classification
- Understand the theory of PN junction diode, rectifying circuits and bipolar junction transistor
- Explain the concepts of transistor biasing, transistor amplifiers and field effect transistors

Syllabus:

Introduction to Electronics and Semiconductors: Energy band theory, Conduction in Insulators, Semiconductors and metals, Electron emission from metals, Classification of semiconductors, Carrier concentration in an intrinsic semiconductor, Properties of intrinsic semiconductor, Drift and diffusion currents.

Semi Conductor Diode: Theory of PN junction diode, Open circuited PN junction, V-I characteristics of a PN diode, Diode current equation, Transition and diffusion capacitances, Break down in PN diode, Applications of PN diodes. Zener diode, Zener regulator, Tunnel diode, Schottky diode.

Rectifying circuits: Half wave and full wave rectifiers, Bridge rectifiers, Efficiency, Ripple and regulation of each rectifier, Capacitor filters.

Bipolar Junction Transistor:– Introduction, construction, Operation of PNP and NPN Transistors – Transistor Circuit configurations- Characteristics of a CE configurations – h parameters, low frequency small signal equivalent circuit of a Transistor.

Transistor Biasing and thermal stabilization: Transistor Biasing, Stabilization, Different methods of transistor biasing – Fixed bias, Collector feedback bias – self bias – Bias compensation.

Transistor Amplifiers: CE, CB, CC amplifier configurations –Multistage amplifier – A Two Stage RC coupled amplifier – frequency response curve and bandwidth.

Field Effect Transistors: Junction Field Effect Transistors (JFET) – JFET characteristics, JFET Parameters, Small signal equivalent circuit – MOSFETS – Depletion and Enhancement MOSFETS.

Text Books:

1. Electronic Device and Circuits by Sanjeev Guptha.

Reference Books:

1. Electronic Device and Circuits Theory by Robert L. Boylested Electronic Device and Circuits by David. A. Bell

CS 2104: Operating Systems

Course objectives:

- To understand evolution of Operating System.
- To understand operating system as a layer of abstraction above physical hardware that facilitates usage convenience and efficient resource management of computer system resources.
- To learn design and implementation of policies and mechanisms for OS subsystem.
- To investigate case studies to understand the design philosophies / paradigm for popular multiuser or single user operating system.

Course Outcomes:

- The student understands OS evolution, its structure and services provided by it.
- Learn process life cycle, process scheduling objectives, policies and mechanisms, process synchronization, inter process communication, deadlocks and other process subsystem related concepts.
- Learn memory hierarchy, allocation and deallocation policies and mechanism for main and auxiliary memory, file system design and implementation issues.
- investigate UNIX/ LINUX and Windows OS platforms w.r.t similarities and differences in design philosophies.

Syllabus:

Introduction to Operating Systems: Over View of Operating Systems, Types of Operating Systems, Operating System Structures, Operating System Services, System Calls, Virtual Machines, Operating System Design and Implementation.

Process Management: Process Concepts, Operations on Processes, Cooperating Processes, Threads, Inter Process Communication, Process Scheduling, Scheduling Algorithms, Multiple- Processor Scheduling, Thread Scheduling.

Process Synchronization: The Critical Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classical Problems of Synchronization, Critical Regions, Monitors.

Deadlocks: System Model, Deadlock Characterization, Methods For Handling Deadlocks, Deadlock Prevention, Avoidance, Deadlock Detection, Recovery from Deadlocks.

Memory Management: Logical versus Physical Address, Swapping, contiguous memory allocation, paging, structure of the page table, segmentation, Virtual Memory, Demand Paging, Page Replacement, Allocation of Frames, Thrashing, Memory-Mapped files.

File Systems, Implementation, and Secondary-storage Structure: Concept of a file, Access Methods, Directory Structure, Protection, File System Structure, Allocation Methods, Free Space Management, Directory Management, Device Drivers, overview of Mass-storage structure, Disk structure, disk attachment, disk scheduling, swap-space management.

Case study: Overview of LINUX, Windows Operating systems.

Text Book:

1. Operating Systems, Abraham Silberschatz, Peter Baer Galvin, and Greg Gagne, John Wiley Publ., Seventh Edition.
2. Operating Systems; A Practical Approach. Rajiv Chopra.

Reference Books:

1. Modern Operating Systems, Andrew S. Tanenbaum, ,2nd edition, 1995, PHI.
2. Operating Systems, William Stallings 5th Edition -PHI
3. Operating Systems: A Design-Oriented Approach', Charles Crowley, 'Tata Hill Co.,1998 edition.

CS 2105: Object Oriented Programming through Java

Course Objectives:

- This subject will help to improve the analytical skills of object-oriented programming
- Overall development of problem solving and critical analysis
- Formal introduction to Java programming language

Course Outcome:

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

- Show competence in the use of the Java programming language in the development of small to medium-sized application programs that demonstrate professionally acceptable coding and performance standard
- Understand the basic principles of the object-oriented programming
- Demonstrate an introductory understanding of graphical user interfaces, multi- threaded programming, and event-driven programming.

Syllabus:

Introduction to Java: Basics of Java programming, Data types, Variables, Operators, Control structures including selection, Looping, Java methods, Overloading, Math class, Arrays in java.

Objects and Classes: Basics of objects and classes in java, Constructors, Finalizer, Visibility modifiers, Methods and objects, Inbuilt classes like String, Character, StringBuffer, File, this reference

Inheritance and Polymorphism: Inheritance in java, Super and sub class, Overriding, Object class, Polymorphism, Dynamic binding, Generic programming, Casting objects, Instance of operator, Abstract class, Interface in java, Package in java, UTIL package.

Event and GUI programming: Event handling in java, Event types, Mouse and key events, GUI Basics, Panels, Frames, Layout Managers: Flow Layout, Border Layout, Grid Layout, GUI components like Buttons, Check Boxes, Radio Buttons, Labels, Text Fields, Text Areas, Combo Boxes, Lists, Scroll Bars, Sliders, Windows, Menus, Dialog Box, Applet and its life cycle, Introduction to swing

I/O programming: Text and Binary I/O, Binary I/O classes, Object I/O, Random Access Files.

Multithreading in java: Thread life cycle and methods, Runnable interface, Thread synchronization, Exception handling with try-catch-finally, Collections in java, Introduction to JavaBeans and Network Programming.

Java Database Connectivity (JDBC): JDBC Product, Types of Drivers, Two-Tier Client/Server Model, Three-Tier Client/Server Model, Basic Steps of JDBC, Creating and Executing SQL Statement, The Result Set Object, Working with Database MetaData Interface

Reference Books:

1 Introduction to Java Programming (Comprehensive Version), Daniel Liang, Seventh Edition, Pearson.

2 Programming in Java, Sachin Malhotra & Saurabh Chaudhary, Oxford University Press.

3 Murach's Beginning Java 2, Doug Lowe, Joel Murach and Andrea Steelman, SPD.

4 Core Java Volume-I Fundamentals, Eight Edition, Horstmann & Cornell, Pearson Education.

5 The Complete Reference, Java 2 (Fourth Edition), Herbert Schild, TMH.

6 Java Programming, D. S. Malik, Cengage Learning.

CS 2106: Computer Organization Lab

Course Objectives

- to design and analyse the operational behaviour of IC gates, multiplexers, decoders, flip-flops, counters, shift registers, binary adders and subtractors and ALU
- to implement assembly language programming using various trainers
- to make students familiar with Pentium class PC architecture

Course Outcomes

After completion of the course the student should be able to:

- analyse the operational behaviour of various digital logic units such as multiplexers, decoders, flip-flops, counters, shift registers, binary adders and subtractors and ALU
- write assembly language code using various trainers
- understand Pentium class PC architecture.

Syllabus

I - Cycle: Digital Logic Design Experiments

TTL Characteristics and TTL IC Gates

Multiplexers & Decoders

Flip-Flops

Counters

Shift Registers

Binary Adders & Subtractors

A L U

II - CYCLE: 8085 Assembly Language Programming

8085 Assembly Language Programming according to theory course microprocessors-I using the following trainers:

Keyboard Monitor of 8085µP Trainer

Serial Monitor of 8085µP Trainer with Terminal

8085 Line Assembler of 8085µP Trainer with PC as Terminal

8085 Cross Assembler using In-Circuit Emulator (ICE) with 8085µP Trainer and PC as Terminal

Graded Problems are to be used according to the syllabus of COMPUTER ORGANIZATION

PENTIUM CLASS PC ARCHITECTURE FAMILIARIZATION HARDWARE & SOFTWARE PARTS DEMONSTRATION

Reference Books

1. Computer System Architecture, M. Morris Mano, Prentice Hall of India Pvt. Ltd., Third Edition, Sept.2008

2. Microprocessor Architecture, Programming and Applications with the 8085 by Ramesh S Gaonkar.

CS 2107: Object Oriented Programming (through Java) Lab

Course Objectives:

- To develop programs using basic OOPS concepts such as classes and objects.
- To implement programs using Inheritance concepts.
- To implement programs using Exception handling.
- To develop programs using operator overloading concepts.

Course Outcomes:

- Student will be able to use OOPs concepts.
- Ability to apply Inheritance concepts to several problems.
- Ability to use Exception Handling concepts.

List of Programs:

1. Program to define a structure of a basic JAVA program
2. Program to define the data types, variable, operators, arrays and control structures.
3. Program to define class and constructors. Demonstrate constructors.
4. Program to define class, methods and objects. Demonstrate method overloading.
5. Program to define inheritance and show method overriding.
6. Program to demonstrate Packages.
7. Program to demonstrate Exception Handling.
8. Program to demonstrate Multithreading.
9. Program to demonstrate I/O operations.
10. Program to demonstrate Network Programming.
11. Program to demonstrate Applet structure and event handling.
12. Program to demonstrate Layout managers.

CS 2108: Operating Systems Lab

Course Objectives:

- To learn about UNIX/LINUX operating system, its intervals.
- To learn system programming for UNIX/LINUX Operating System.
- To understand UNIX/LINUX shell and its programming.
- To understand resource management policies and mechanisms and their performance evaluation.

Course Outcomes:

- The student practices UNIX commands, Vi editor, shell commands.
- The student develops skill in writing C programs using system calls for process management, inter process communication and other aspects.
- The student learns shell programming and develops skill for writing scripts for batch level tasks.
- The student learns to simulate OS resource management aspects like process scheduling , page replacement and others to evaluate performance.

Module I

1. OS lab familiarization, Home Assignment on Unix commands, Vi editor
2. Simple C programs using command line arguments, system calls, library function calls, make utility
3. C programs using fork system call to create processes and study parent, child process mechanism
4. C programs to create process chaining, spawning
5. C programs to handle errors using errno, perror() function
6. C programs to use pipe system call for inter process communication

Module II

1. Familiarization of Unix shell programming
2. Simple shell programming exercises
3. Shell programming using decision making constructs
4. Shell programming using loop constructs,
5. Shell programming for file and directory manipulation
6. shell programme to check whether given string is palindrome or not.
7. shell programme to sort the given numbers. (bubble sort)

Module III

1. C programs to study process scheduling implementing FCFS, Shortest Job First, and Round Robin algorithms
2. C programs to study page replacement implementing FIFO, Optimal, and LRU page replacement algorithms
3. C programs to study deadlock avoidance and detection
4. C Programs to simulate free space management(worst fit, best fit, first fit).

References:

1. Unix concepts and applications by Sumitabha Das, TMH Publications.
2. Unix programming by Stevens, Pearson Education.
3. Shell programming by YashwanthKanetkar.
4. Operating SystemConcepts by Silberschatz, and Peter Galvin.

CS 2109: Intellectual Property Rights

Course Objective:

- To introduce the students to Intellectual Property Rights (IPR) which is a key component in modern knowledge management processes
- To create consciousness on IPR in students at an early stage of their education so that they develop an appreciation for ethical and rightful use of existing knowledge
- To make them understand how to take ownership of knowledge they may develop as a result of their creative innovations, take ownership and either drive themselves in becoming entrepreneurs or become responsible knowledge users in society
- To expose students some of the recent debates on the societal implications of IPR and its role in national/international trade and socio-economic development.

Course outcome:

Learners will be able to

- identify the types of intellectual property protection available for their research outcome
- conduct patent search and analyse patentability of the invention
- understand the basic structure of Patent document
- understand the registration and prosecution of different IPs
- understand the basics of IP commercialization and techno/commercial/legal issues in IPR commercialization

Syllabus

Introduction: Concept of property, Intellectual Property (IP) and Intellectual Property Rights (IPR), Importance of IP, Value creation through IP, Advantages of IP protection, Competitive advantage, Promotion of social good, Prevention of duplicates, counterfeit products and IP.

Evolution of IP system: Historical view of IP system in India and abroad, Legal basis and rationale behind development of IP system, WTO and TRIPS agreement, Role of WIPO.

Types of IPR: Major forms of IP in India and globally, Acts enacted in India related to IP.

Patent: Concept, Life of patent, Rights of Patentee, Criteria of patentability- novelty, non-obviousness, and utility, Non-patentable inventions.

Patent filing and prosecution: Prior art search, Process of obtaining a patent in India, Provisional and complete specification, Convention application, Patent Cooperation Treaty (PCT), Patent Infringement and Enforcement.

Trademark: Types of trademarks, Trademark and Brand, Trademark Registration, Trademark Infringement.

Copyright: Copyrights and related rights, Copyright registration, Copyright infringement,Section 52 of Indian Copyright Act.

Industrial Design: What is Industrial design, Design registration, Design infringement.

Trade Secret: What are Trade Secrets, How trade secrets are maintained in trade and business.

Other forms of IP: Semiconductor Integrated Circuits Layout Design, Geographical Indications, Protection of Plant Varieties & Farmers' right, Traditional knowledge.

IP commercialization: Licensing & Royalty; Technology Transfer; IP assignment, Compulsory License.

Emerging areas : Patinformatics, IP and bank loan, IP insurance, IP audit, IP valuation, IP management, Use of artificial intelligence in IP enforcement, Open innovation.

Text Books

1. Ganguli Prabuddha, Gearing up for Patents The Indian Scenario", Universities Press (1998)
2. Ganguli Prahuddha "Intellectual Property Rights-Unleashing the Knowledge Economy". Tata McGraw Hill (2001)
3. Geographical Indications of Goods Act 1990 Ganguli Piabaddha "Geographical Indications-its evolving contours accessible in http ips.nminsoda/files/2012/05/main book pdf (2009)

Reference Books

1. Ganguli Prabuddha and Jahade Siddharth, "Nanotechnology Intellectual Property Rights Research, Design, and Commercialisation", CRC Press, Taylor and Francis Group, USA (2012)
2. Beyond Intellectual Property: Toward Traditional Resource Rights for Indigenous Peoples and Local Communities [Paperback J,Darrell A. Posey and Graham Dotfield, IDRC Books; annotated edition (June (1996)
3. Netancl Neil Weinstock, Copyright's Paradox, Oxford University Press (2010)
4. The Indian Patents Act 1970 (as amended in 2005)
5. The Indian Copyright Act 1950 as amended in 2017)
6. Indian Trademarks Act 1999
7. The Indian Industrial Designs Act 2000
8. The Protection of Plant Varieties and Farmers' Right Act 2001
9. Inventing the Future: An Introduction to Patents for small and medium sized enterprises, WIPO publication No 917 www.wipo.int/ebookshop
10. Looking Good: An Introduction to Industrial Designs for Small and Medium sized Enterprises; WIPO publication No.498 www.wipo.int/ebookshop

CS 2110: Environmental Science

Course Objectives

The objectives of the Environmental Science course are to

- Familiarize the fundamental aspects of environment and the environmental management'
- Provide information of some of the important international conventions which will be useful during the future endeavours after graduation.
- Make realize the importance of natural resources management for the sustenance of the life and the society.
- Apprise the impact of pollution getting generated through the anthropogenic activities on the environment
- Provide the concept of Sustainable Development, energy and environmental management
- Impart knowledge on the new generation waste like e-waste and plastic waste.

Course Outcomes

After completion of the course the students will have

- Knowledge on the fundamental aspects of environment and the environmental management
- The knowledge on the salient features of the important international conventions
- Understanding of the importance of natural resources management for the sustenance of the life and the society.
- Familiarity on various forms of pollution and its impact on the environment.
- Understand the elements of Sustainable Development, energy and environmental management
- Knowledge on the new generation waste like e-waste and plastic waste.

Syllabus

Introduction: Structure and functions of Ecosystems-Ecosystems and its Dynamics-Value of Biodiversity-impact of loss of biodiversity, Conservation of bio-diversity. Environmental indicators -

Global environmental issues and their impact on the ecosystems. Salient features of International conventions on Environment: Montreal Protocol, Kyoto protocol, Ramsar Convention on Wetlands, Stockholm Convention on Persistent Organic Pollutants, United Nations Framework Convention on Climate Change (UNFCCC),

Natural Resources Management: Importance of natural resources management-Land as resource, Land degradation, Soil erosion and desertification, Effects of usage of fertilizer, herbicides and pesticide- watershed management.

Forest resources: Use and over-exploitation, Mining and dams – their effects on forest ecosystems and the living beings.

Water resources: Exploitation of surface and groundwater, Floods, droughts, Dams:benefits and costs.

Mineral Resources: Impact of mining on the environment and possible environmental management options in mining and processing of the minerals.

Sustainable resource management (land, water, and energy), and resilient design under the changing environment.

Environmental Pollution: Local and Global Issues. Causes, effects and control measures. Engineering aspects of environmental pollution control systems.

Air pollution: impacts of ambient and indoor air pollution on human health. Water pollution: impacts water pollution on human health and loss of fresh water resources. Soil pollution and its impact on environment. Marine pollution and its impact on blue economy. Noise pollution.

Solid waste management: Important elements in solid waste management- Waste to energy concepts. Air (prevention and control of pollution) Act, Water (prevention and control of pollution) Act and their amendments. Salient features of Environmental protection Act, 1986.

Sustainable Development: Fundamentals of Sustainable Development– Sustainability Strategies and Barriers – Industrialization and sustainable development. Circular economy concepts in waste (solid and fluid) management.

Energy and Environment: Environmental Benefits and challenges, Availability and need of conventional energy resources, major environmental problems related to the conventional energy resources, future possibilities of energy need and availability. Solar Energy: process of photovoltaic energy conversion, solar energy conversion technologies and devices, their principles, working and applications, disposal of solar panel after their usage. Biomass energy: Concept of biomass energy

utilization, types of biomass energy, conversion processes, Wind Energy, energy conversion technologies, their principles, equipment and suitability in context of India.

Management of plastic waste and E-waste: Sources, generation and characteristics of various e- and plastic wastes generated from various industrial and commercial activities; Waste management practices including onsite handling, storage, collection and transfer. E-waste and plastic waste processing alternatives. E-Waste management rules and Plastic waste management rules, 2016 and their subsequent amendments.

Text Books:

1. Bharucha,Erach (2004). Textbook for Environmental Studies for Undergraduate Courses of all Branches of Higher Education, University Grants Commission, New Delhi.
2. Basu, M., Xavier, S. (2016). Fundamentals of Environmental Studies, Cambridge University Press, India
3. Masters, G. M., &Ela, W. P. (1991). Introduction to environmental engineering and science. Englewood Cliffs, NJ: Prentice Hall.
4. Enger, E. and Smith, B., Environmental Science: A Study of Interrelationships, Publisher: McGraw-Hill Higher Education; 12th edition, 2010.

Reference Books:

1. Sharma, P. D., & Sharma, P. D. (2005). Ecology and environment. Rastogi Publications
2. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
3. Clark R.S. (2001). Marine Pollution, Clanderson Press Oxford (TB)
4. Jadhav, H & Bhosale, V.M. (1995). Environmental Protection and Laws. Himalaya Pub. House, Delhi 284 p.
5. MoEF&CC, Govt. of India, CPCB: E-waste management rules, 2016 and its amendments 2018.
6. MoEF&CC, Govt. of India, CPCB: Plastic waste management rules, 2016.

II Year - II Semester

Course	Category	Course Title	Hours	Internal	External	Total	Credits

code			per week		Marks	Marks	Marks	
			L	P				
CS2201	ES	Microprocessors	4	0	30	70	100	3
CS2202	PC	Design and Analysis of Algorithms	4	0	30	70	100	3
CS2203	PC	Database Management Systems	4	0	30	70	100	3
CS2204	PC	Formal Languages & Automata Theory	4	0	30	70	100	3
CS2205	HSS	Managerial Economics	4	0	30	70	100	3
CS2206	PC	Algorithms Lab through CPP.	0	3	50	50	100	1.5
CS2207	PC	Database Management Systems Lab	0	3	50	50	100	1.5
CS2208	SC	Java Technologies	1	2	50	50	100	2
CS2209	MC	Professional Ethics& Universal Human Values	0	0	0	100	100	0
CS2210	MC	NCC/NSS	0	2	-	-	-	0
Total credits								**20**
Summer Internship(Community Service)								

CS 2201: Microprocessor

Course Objectives:

- To discuss the architectures of 8085, 8086 microprocessors, their instruction sets and related ALP programs.
- To discuss interfacing semiconductor memories, interfacing peripheral to Intel 8086.
- To study interfacing data converters to 8086 and discuss about micro controller 8051 architecture.

Course Outcomes:

- Understand the basic architectures of 8085 and 8086 microprocessors.
- Ability to write ALP programs using instruction sets.
- Understand the various interfacing concepts and micro controllers.

Syllabus:

Introduction to Microprocessors and Microcomputers: A Brief Architecture and Programming of 8085Microprocessor.

Architecture: Instruction Set and Programming of 8086Microprocessor

Interfacing Semiconductor Memories and I/O Devices: Semiconductor Memories: Classification Internal Organization& Functional Description, Interfacing SRAMs and EPROMs to8086, Interfacing Characteristics of I/Devices, I/O Device addressing methods, I/O Device Programming Methods.

Interfacing Peripherals to Intel8086 -1: Parallel I/O Interface- 8255, Serial I/O Interface –8251, Timer Interface -8253/8254

Interfacing Peripheral to Intel 8086 - 2: Keyboard / Display Interface – 8279, Interrupt Controller Interface – 8259

Interfacing Data Converters to 8086: D/A Conversion Methods, A/D Conversion methods, Interfacing DAC, Interfacing ADC.

Introduction to Micro controllers: Intel 8051Architecture and Programming

Text Books:

1. Microprocessor Architecture, Programming, and Applications with the 8085 Ramesh S.Gaonkar, 4thEdition, PenramInternational,1999
2. The 80x86 Family, Design, Programming and Interfacing, John E.Uffenbeck, 3rdEdition,Pearson Education Inc.,2002
3. KennethJ.Ayala, 8051 Microcontroller Architecture, Programming And Applications, 2ndEdition, Penram InternationalPublications,1999

Reference Books:

1. BARRYB.BREY, The Intel Microprocessors 8086 / 8088, 80186 / 80188, 80286, 80386 and 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium4, Architecture, Programming and Interfacing, 8th Edition, Pearson Education Inc.,2009
2. WalterA.Tribeland Avtar Singh, The 8088 and 8086 Microprocessors, Programming, interfacing, Software, Hardware, and Applications, 4thEdition, Pearson Education Inc.,20033. Microprocessors and Interfacing, Programming and Hardware, 2ndEdition, Douglass V. Hall, TMH Edition,1999
3. SanjayK Bose,Hardware and Software of Personal Computers, New Age International (P)Ltd.,1991 MykePredko, Programming and Customizing the 8051 Microcontroller, TMH,1999

CS 2202: DESIGN AND ANALYSIS OF ALGORITHMS

Course Objectives:

Upon completion of this course, students will be able to do the following:

- Analyse the asymptotic performance of algorithms.
- Write rigorous correctness proofs for algorithms.
- Demonstrate a familiarity with major algorithms and data structures.
- Apply important algorithmic design paradigms and methods of analysis.

- Synthesize efficient algorithms in common engineering design situations

Course Outcomes:

Students who complete the course will have demonstrated the ability to do the following:

- Argue the correctness of algorithms using inductive proofs and invariants.
- Analysis worst-case running times of algorithms using asymptotic analysis.
- Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide-and conquer algorithms. Derive and solve recurrences describing the performance of divide and-conquer algorithms.
- Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic programming algorithms, and analysis them.
- Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize greedy algorithms, and analysis them.

Syllabus

Introduction: What is an Algorithm, Algorithm Specification, Pseudocode Conventions Recursive Algorithm, Performance Analysis, Space Complexity, Time Complexity, Amortized Complexity, Amortized Complexity, Asymptotic Notation, Practical Complexities, Performance Measurement.

The Greedy Method: The General Method, Knapsack Problem, Job Sequencing with Deadlines, Minimum-cost Spanning Trees, Prim's Algorithm, Kruskal's Algorithms, An Optimal Randomized Algorithm, Optimal Merge Patterns, Single Source Shortest Paths.

Divide and Conquer: General Method, Defective Chessboard, Binary Search, Finding the Maximum and Minimum, Merge Sort, Quick Sort, Performance Measurement, Randomized Sorting Algorithms.

Dynamic Programming: All - Pairs Shortest Paths, Single – Source Shortest paths General Weights, String Edition, 0/1 Knapsack, Reliability Design,

Backtracking: The General Method, The 8-Queens Problem, Sum of Subsets, Graph Colouring, Hamiltonian Cycles.

Branch and Bound: The Method, Least cost (LC) Search, The 15-Puzzle: an Example, Control Abstraction for LC-Search, Bounding, FIFO Branch-and-Bound, LC Branch and Bound, 0/1 Knapsack Problem, LC Branch-and Bound Solution, FIFO Branch-and-Bound Solution, Traveling Salesperson.

Limitations of Algorithm Power: Lower-Bound Arguments, Decision Trees, P, NP and NP – complete problems – Challenges of Numerical Algorithms. Limitations of Algorithms Power: Backtracking – Branch-and Bound– Approximation Algorithms for NP-hard Problems – Algorithms for solving Nonlinear Equations.

TEXT BOOKS:

1. Fundamentals of computer algorithms E. Horowitz S. Sahni, Sanguthevar Rajasekaran, University Press.
2. Introduction to Algorithms by Thomas H. Corman, Charles E. Leiserson, Ronald R. Rivest & Clifford Stein, Prentice Hall of India, New Delhi, New Delhi.

REFERENCE BOOKS

1. Data structures and algorithm analysis in C++ / Mark Allen Weiss, Florida International University. — Fourth edition.
2. Introduction to Design & Analysis of Algorithms by Anany Levitin, Pearson Education, New Delhi, 2003
3. Introduction to Algorithms by Thomas H. Corman, Charles E. Leiserson, Ronald R. Rivest & Clifford Stein, Prentice Hall of India, New Delhi, New Delhi.
4. The Design and Analysis of Computer Algorithms, Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman

CS 2203: Database Management Systems

Course Objectives:

- To learn the evolution of DBMS Versus File systems, data models, and layers of abstraction.
- To understand conceptual and physical aspects of database design.
- To learn formal and commercial query language specifications.
- To understand concurrency control, recovery management, and other related issues.

Course Outcomes:

- The student will understand ER-modelling for conceptual database design and relational model.

- The student is introduced to formal and commercial query languages : Relational Algebra, calculus and SQL.
- The student will learn schema refinement and normalization.
- The student understands locking protocols concurrency control, and crash recovery methods.

Syllabus:

Introduction: File system versus a DBMS, Advantages of a DBMS, Describing and Storing Data in a DBMS, The Relational model, Levels of abstraction, Data Independence, Transaction management, Structure of a DBMS.

Introduction to Database Design and The Relational Model: Database Design and ER Diagrams, Entities, Attributes and Entity Sets, Relationships & Relationship Sets, Additional Features of the ER Model, Conceptual Design with ER Model, Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity Constraints, Querying Relational Data, Logical Database Design: ER to Relational, Introduction to Views, Destroying/ Altering Tables and Views.

Relational Algebra and SQL: Preliminaries, Relational Algebra, The form of a Basic SQL Query, UNION, INTERSECT and EXCEPT, Nested Queries, Aggregate Operators, Null Values, Complex Integrity Constraints in SQL, Triggers and Active Databases, Embedded SQL, Dynamic SQL, JDBC.

Database Design: Schema Refinement and Normal Forms, Introduction to Schema Refinement, Functional Dependencies, Reasoning about FD's, Normal Forms, Properties of Decomposition, Normalization, Other kinds of Dependencies.

Transaction Management: The ACID Properties, Transactions & Schedules, Concurrent Execution of Transactions, Lock-Based Concurrency Control.

Concurrency Control: 2PL, Serializability and Recoverability, Introduction to Lock Management, Lock Conversions, Dealing with Deadlocks, Specialized Locking Techniques, Concurrency Control without Locking.

Crash Recovery: Introduction to ARIES, The Log, Other Recovery-Related Structures, The Write-Ahead Log Protocol, Check pointing, Recovering from a System Crash, Media Recovery.

Text Books:

1. Database Management Systems; Raghu Ramakrishnan, Johannes Gehrke 4th Edition, McGraw-Hill.

Reference:

1. Database System Concepts; A. Silberschatz, H. Korth 5th Edition, McGraw-Hill

CS 2204: Formal Languages and Automata Theory

Course objectives:

- To introduce the concepts in automata theory and theory of computation to design grammars and recognizers for different formal languages.
- To employ finite state machines to solve problems in computing.
- To introduce finite state machines, context free grammars and Turing Machines and their properties as the basis for the formal expressivity of computer languages for solving linguistic decision problems.
- To understand the concepts of tractability and decidability, the concepts of NP-completeness and NP-hard problem and also the challenges for Theoretical Computer Science and its contribution to other sciences.

Course outcomes:

- Ability to think analytically and intuitively for problem-solving situations in related areas of theory in computer science
- Ability to describe the language accepted by an automata or generated by a regular expression or a context-free grammar;
- Ability to Understand the functioning of Finite-State Machines, Deterministic Finite-State Automata, Nondeterministic Finite-State Automata and Pushdown Automata and Turing Machines.

Syllabus:

Introduction to Grammars and Languages: Definitions of alphabet, strings, language, grammar, types of grammar, types of machines, generation of languages from grammar, construction of grammar from the given description of languages, Chomsky Hierarchy of languages.

Finite State Machine (FSM): Definition of finite state machine, Representation of FSMs. Classification of FSM's and their construction, Conversion from NFA to DFA, Elimination of ε – transitions from NFA, Equivalence of two FSM's, optimization of finite state machine (Equivalence theorem method and Table filling method), Finite state machine with output: Moore and Mealy machines. Applications of FSM.

Regular Expression and Languages: Regular Expression, Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Properties of Regular Languages: Pumping Lemma for regular Languages, Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, Equivalance and Minimization of Automata.

Context Free Grammars and Languages: Context Free Grammars, Parse Trees, Applications of Context-Free Grammars, Ambiguity in Grammars and Languages, Normal Forms, Pumping Lemma for CFL, Closure properties of CFL, Decision properties for CFL.

Push down Automata: Definition of push down automata, The Languages of a PDA, push down automata, Equivalence of PDA's and CFG's, push down automata to context free grammar, context free grammar to push down automata, Deterministic Pushdown Automata.

Turing Machines: The Definition of Turing Machine, Turing Machine Model, Representation of Turing Machines, Language Acceptability by Turing Machines, Design of Turing Machines, Description of Turing Machines, Techniques for TM Construction, Variants of Turing Machines, Turing Machines and Type 0 Grammars.

Undecidability: A Language That Is Not Recursively Enumerable, An Undecidable Problem That Is RE, Undecidable Problems About Turing Machines, Decidable & Undecidable Problems, Post Correspondence Problem.

Text books:

1. Introduction to automata theory, languages and computation, John.E.H.P croft/ Rajeev Motwani & JD Ullman—pearson education- III edition
2. Theory of computation, K.L.P.Mishra and N.Chandrasekhar, PHI

Reference Books:

1. Theory of computation, formal languages and automata theory, G P Saradhi Varma, B.Thirupathi Rao –Sci Tech publications.

CS 2205: Managerial Economics

Course Objectives:

- To bring about an awareness about the nature of Managerial Economics and its linkages with other disciplines.
- To understand the Micro and Macro Environment of Business.
- To familiarize the prospective engineers with the concepts and tools of Managerial Economics with an objective to understand the real world of business.

Course Outcomes:

After completion of the course, student will be able to:

- Understand the various economic activities in business and industry.
- Analyse the real world business problems.
- Make optimal business decisions for the effective and efficient management of Organisations.

Syllabus

Significance of Economics and Managerial Economics:

Economics: Definitions of Economics- Wealth, Welfare and Scarcity definitions Classification of Economics- Micro and Micro Economics.

Managerial Economics: Definition, Nature and Scope of Managerial Economics, Differences between Economics and Managerial Economics, Main areas of Managerial Economics, Managerial Economics with other disciplines.

Demand and Utility Analysis:

Demand - Definition, Meaning, Nature and types of demand, Demand function, Law of demand - Assumptions and limitations. Exceptional demand curve.

Elasticity of demand - Definition, Measurement of elasticity, Types of Elasticity

(Price, Income, Cross and Advertisement), Practical importance of Price elasticity of demand, Role of income elasticity in business decisions, Factors governing Price Elasticity of demand.

Utility Analysis: Utility- Meaning, Types of Economic Utilities, Cardinal and Ordinal Utility, Total Utility, Marginal Utility, The law of Diminishing Marginal Utility and its Limitations.

Theory of Production and Cost analysis:

Production - Meaning, Production function and its assumptions, use of production function in decision making; **Cost analysis** - Nature of cost, Classification of costs - Fixed vs. Variable costs, Marginal cost, Controllable vs. Non - Controllable costs, Opportunity cost, Incremental vs. Sunk costs, Explicit vs. Implicit costs, Replacement costs, Historical costs, Urgent vs. Postponable costs, Escapable vs. Unavoidable costs, Economies and Diseconomies of scale.

Market Structures: Definition of Market, Classification of markets; Salient features or conditions of different markets - Perfect Competition, Monopoly, Duopoly , Oligopoly, Importance of kinked demand curve ;Monopolistic Competition.

Pricing and Business Cycles:

Pricing Analysis: Pricing – Significance; Different Pricing methods- Cost plus pricing, Target pricing, Marginal cost pricing, Going -rate pricing, Average cost pricing, Peak load pricing , Pricing of joint Products, Pricing over the life cycle of a Product, Skimming pricing Penetration pricing, Mark- up and Mark- down pricing of retailers.

Business cycles - Definition, Characteristics, Phases, Causes and Consequences; Measures to solve problems arising from Business cycles.

Text Books:

1. Sankaran,S., Managerial Economics, Marghan Publications, 2015, Chennai.
2. Aryasri, A.R., Managerial Economics and Financial Analysis, MC Graw Hill Education, New Delhi,2015.

Reference Books:

1. Dwivedi, D.N., Managerial Economics, Vikhas Publishing House Pvt. Ltd. 6th Edition, New Delhi,2004.

2. Dewett, K.K., Modern Economic Theory, S.Chand & Company Ltd., New Delhi, 2005.

CS 2206: Algorithms Lab

Course objectives:

The laboratory component will emphasize two areas:

Implementation of algorithms covered in class: This will involve running the algorithms under varying input sets and measuring running times, use of different data structures for the same algorithm (wherever applicable) to see its effect on time and space, comparison of different algorithms for the same problem etc.

Design of Algorithms: This will involve design and implementation of algorithms for problems not covered in class but related to topics covered in class.

The exact set of algorithms to design and implement is to be decided by the instructor. In addition, there will be at least one significantly large design project involving some real world application. An efficient design of the project should require the use of multiple data structures and a combination of different algorithms/techniques.

Course Outcomes:

The student should be able to:

• Design algorithms using appropriate design techniques (brute-force, greedy, dynamic programming, etc.)

• Implement a variety of algorithms such assorting, graph related, combinatorial, etc., in a high level language.

• Analyze and compare the performance of algorithms using language features.

• Apply and implement learned algorithm design techniques and data structures to solve real-world problems.

Programs List:

1. a. Create a Java class called Student with the following details as variables within it.

(i) USN

(ii) Name

(iii) Programme

(iv) Phone

Write a CPP program to create nStudent objects and print the USN, Name, Programme, and Phoneof these objects with suitable headings.

b. Write a CPP program to implement the Stack using arrays. Write Push(), Pop(), and Display() methods to demonstrate its working.

2.a. Design a superclass called Staff with details as StaffId, Name, Phone, Salary. Extend this class by writing three subclasses namely Teaching (domain, publications), Technical (skills), and Contract (period). Write a CPP program to read and display at least 3 staff objects of all three categories.

b. Write a CPP class called Customer to store their name and date_of_birth. The date_of_birth format should be dd/mm/yyyy. Write methods to read customer data as and display as using StringTokenizer class considering the delimiter character as "/".

3. a. Write a CPP program to read two integers a andb. Compute a/b and print, when b is not zero. Raise an exception when b is equal to zero.

b. Write a CPP program that implements a multi-thread application that has three threads. First thread generates a random integer for every 1 second; second thread computes the square of the number and prints; third thread will print the value of cube of the number.

4. Sort a given set of n integer elements using Quick Sort method and compute its time complexity. Run the program for varied values of n> 5000 and record the time taken to sort. Plot a graph of the time taken versus non graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using CPP how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.

5. Sort a given set of n integer elements using Merge Sort method and compute its time complexity. Run the program for varied values of n> 5000, and record the time taken to sort. Plot a graph of the time taken versus non graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using CPP how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.

6. Implement in CPP, the 0/1 Knapsack problem using (a) Dynamic Programming method (b) Greedy method.

7. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm. Write the program in CPP.

8. Find Minimum Cost Spanning Tree of a given connected undirected graph using Kruskal'salgorithm. Use Union-Find algorithms in your program

9. Find Minimum Cost Spanning Tree of a given connected undirected graph using Prim's algorithm.

10. Write CPP programs to

(a) Implement All-Pairs Shortest Paths problem using Floyd's algorithm.

(b) Implement Travelling Sales Person problem using Dynamic programming.

11. Design and implement in CPP to find a subset of a given set S = {Sl, S2,.....,Sn} of n positive integers whose SUM is equal to a given positive integer d. For example, if S ={1, 2, 5, 6, 8} and d= 9, there are two solutions {1,2,6}and {1,8}. Display a suitable message, if the given problem instance doesn't have a solution. 12. Design and implement in CPP to find all Hamiltonian Cycles in a connected undirected Graph G of n vertices using backtracking principle.

REFERENCES:

1. T. H. Cormen, C. L. Leiserson, R. L. Rivest, and C. Stein, Introduction to Algorithms, MIT Press.
2. J. Kleinberg and E. Tardos, Algorithm Design, Addison-Wesley.
3. Harry R. Lewis and Larry Denenberg, Data Structures and Their Algorithms, Harper Collins.
4. A. Gibbons, Algorithmic Graph Theory, Cambridge University Press.
5. Michael T. Goodrich and Roberto Tamassia, Algorithm Design: Foundations, Analysis, and Internet Examples, John Wiley.
6. R. Sedgewick, Algorithms in C (Parts 1-5), Addison Wesley.
7. M. H. Alsuwaiyel, Algorithm Design Techniques and Analysis, World Scientific.
8. Gilles Brassard and Paul Bratley, Algorithmics : theory and practice, Prentice-Hall.
9. Udi Manber, Introduction to Algorithms: A Creative Approach, Addison-Wesley.
10. Sara Baase and Allen Van Gelder, Computer Algorithms: Introduction to Design and Analysis, Addison-Wesley.

CS 2207: Database Management Systems Lab

Course Objectives

- To introduce to a commercial DBMS such as ORACLE.
- To learn and practice SQL commands for schema creation, data manipulation.
- To learn conceptual and physical database design based on a case study.
- To apply database design stages by studying a case study.

Course Outcomes

By the end of the course, the student should be able to:

- The student is exposed to a commercial RDBMS environment such as ORACLE.
- The student will learn SQL commands for data definition and manipulation.
- The student understands conceptual through physical data base design.
- The student takes up a case study and applies the design steps.

Syllabus

Features of a commercial RDBMS package such as ORACLE/DB2, MS Access, MYSQL & Structured Query Language (SQL) used with the RDBMS.

I. Laboratory Exercises Should Include:

a. Defining Schemas for Applications,

b. Creation of Database,

c. Writing SQL Queries,

d. Retrieve Information from Database,

e. Creating Views

f. Creating Triggers

g. Normalization up to Third Normal Form

h. Use of Host Languages,

i. Interface with Embedded SQL,

j. Use of Forms

k. Report Writing

II. Some sample applications are given below:

1. Accounting Package for Shops,

2. Database Manager for Magazine Agency or News paper Agency,
3. Ticket Booking for Performances,
4. Preparing Greeting Cards & Birthday Cards
5. Personal Accounts - Insurance, Loans, Mortgage Payments, Etc.,
6. Doctor's Diary & Billing System
7. Personal Bank Account
8. Class Marks Management
9. Hostel Accounting
10. Video Tape Library,
11. History of Cricket Scores,
12. Cable TV Transmission Program Manager,
13. Personal Library.
14. Sailors Database
15. Suppliers and Parts Database

Reference Books

1. Database Management Systems; Raghu Ramakrishnan, Johannes Gehrke 4th Edition, McGrawHill
2. Database System Concepts; A. Silberschatz, H. Korth 5th Edition, McGraw-Hill

CS 2208: Java Technologies

Course Objectives:

- Using Graphics, Animations and Multithreading for designing Simulation and Game based applications.

- Design and develop GUI applications using Abstract Windowing Toolkit (AWT), Swing and Event Handling.
- Design and develop Web applications
- Designing Enterprise based applications by encapsulating an application's business logic.
- Designing applications using pre-built frameworks.

Course Outcomes:

- learn the Internet Programming, using Java Applets, apply event handling on AWT and Swing components.
- learn to access database through Java programs, using Java Data Base Connectivity (JDBC), create dynamic web pages, using Servlets and JSP.
- Invoke the remote methods in an application using Remote Method Invocation (RMI) understand the multi-tier architecture of web-based enterprise applications using
- use Struts frameworks, which gives the opportunity to reuse the codes for quick
- development.
- map Java classes and object associations to relational database tables with Hibernate mapping files

Programs:

1) Write a java program to create sample application form in JApplet using swing control.
2) A) Write a Program to show connectivity with database using JDBC/ODBC driver.

   B) Use JDBC connectivity and create Table, insert and update data.
3) Write a java program to demonstrate two-tier client/server model.
4) Write a program in Java to create a Cookie and set the expiry time of the same.
5) write java program to create Servlet to count the number of access time of that servlet page.
6) write a java program to create a form and validate password using servlet.
7) JSP program to demonstrate jsp: forward action tag
8) JSP program to request implicit object.
9) Write a java program to convert an image in RGB to a grayscale image.
10) Write a program in Java to implement a Client/Server application using RMI.
11) A) Develop a Java Bean to demonstrate the use of the same.

    B) Program to implement usebean tag.
12) Write a program to demonstrate struts validation.
13) Write a program to implement struts application.

14) Program to implement basic hibernate program.

15) Write a program to show Database operations using hibernate.

Reference books:

1. Internet and World wide web- How to program , Dietel and Nieto , Pearson. (Chapters: 3, 4, 8, 9, 10, 11, 12 to 18)
2. The Complete Reference, Java 2 , 3ed, Patrik Naughton, Herbert Schildt, TMH.

   (Chapters: 19, 20, 21, 22, 25, 27)

3. Java Server Pages , Hans Bergstan, Oreilly (Chapters: 1-9)

CS 2209: Professional Ethics And Universal Human Values

Course Objectives:

The objective of the course is Six fold:

• Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.

• This course will illuminate the students in the concepts of laws and its applicability to engineers

• Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence

• Strengthening of self-reflection, Development of commitment and courage to act and also enable the students to imbibe and internalize the Values and Ethical Behavior in the personal and professional lives

• To enable the students to imbibe the Values and Ethical Behavior in the personal and Professional lives

• The students will learn the rights and responsibilities Individual, employee, team member and a global citizen

Course Outcomes:

By the end of the course Student will be able to:

• Grasp the meaning of the concept – Law and also Get an overview of the laws relating to Engineers and also Apprehend the importance of being a law abiding person and They would have better critical ability

• Self-explore by using different techniques to live in harmony at various levels

• Analyze themselves and understand their position with respect to the moral and ethical

character needed for a successful and satisfactory work life

• Students are expected to become more aware of themselves and their surroundings

(family, society, nature)

• They would become more responsible in life, and in handling problems with sustainable

solutions, while keeping human relationships and human nature in mind.

• They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society

Syllabus

Need, Basic Guidelines, Content and Process for Value Education

•,Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation - as the process for self-exploration, Continuous Happiness and Prosperity - A look at basic Human Aspirations, Right understanding, Relationship and Physical Facility - the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels. Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking, Include practice sessions and case studies.

Understanding Harmony in the Human Being - Harmony in Myself!

• Understanding human being as: a co-existence of the sentient 'I' and the material 'Body', the needs of Self ('I') and 'Body' - happiness and physical facility, the Body as an instrument of 'I' (I being the doer, seer and enjoyer), the characteristics and activities of 'I' and harmony in 'I', the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail, P to ensure Sanyam and Health, Include practice sessions and case studies.

Understanding Harmony in the Family and Society - Harmony in Human – Human Relationship

• Understanding values in human-human relationship: meaning of Justice (nine universal

values in relationships) and program for its fulfillment to ensure mutual happiness; Trust

and Respect as the foundational values of relationship, the meaning of Trust; Difference between intention and competence, the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship, the harmony in the society (society being an extension of family), Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society, Universal Order from family to world family, Include practice sessions and case studies.

Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

• Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature recyclability and self-regulation in nature, Understanding Existence as Co-existence of mutually interacting units in all – pervasive space, Holistic perception of harmony at all levels of existence, Include practice sessions and case studies.

Concept of Law and Law of Torts

• Understanding Essentials of a Valid Contract and the basics of contract law protecting rights and obligations, Introduction to the Law of Torts and the basics to protect oneself and the company Law affecting the Workplace Employers Responsibilities/Duties Hiring Practices, Introduction to Intellectual Property Law, Professional Code of Conduct for Engineers, Relationship between Law and Ethics, Include practice sessions and case studies.

Implications of the above Holistic Understanding of Harmony on Professional Ethics

• Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the

level of society: as mutually enriching institutions and organizations, Include practice sessions and case studies.

Text Books

1. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and
    a. Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in
    a. Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2
3. R. Subramanian, "Professional Ethics", Oxford University Press.
4. S.B. Srivasthva, "Professional Ethics & Human Values", SciTech Publications (India) Pvt. Ltd. New Delhi.
5. D.R. Kiran, "Professional Ethics & Human Values", TATA Mc Graw Hill Education.
6. Saroj Kumar, "Business Law" and Avtar Singh, "Law of Contract"

Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.

2. A. N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi, 2004.

3. The Story of Stuff (Book), Mohandas Karamchand Gandhi "The Story of My Experiments with Truth", E. FSchumacher. "Small is Beautiful", Slow is Beautiful –Cecile Andrews, J C Kumarappa "Economy of Permanence", Pandit Sunderlal "Bharat Mein Angreji Raj" and Dharampal, "Rediscovering India

4. G K Kapoor, "Business Law" and Sen & Mitra, "Business & Commercial Laws" and

   Calvin Frank Allen, "Business law for Engineers"

5. Hilgard, E. R.; Atkinson, R. C. & Atkinson, R.L. (1975). Introduction to Psychology. 6th

   Edition. New Delhi: Oxford and IBH Publishing Co. Pvt. Ltd.

6. Govindarajan, M; Natarajan, G. M. & Senthilkumar, V.S. (2013). Professional Ethics &

   Human Values. Prentice Hall: New Delhi

7. Gogate, S. B. (2011). Human Values & Professional Ethics. Vikas Publishing: New Delhi.

8. Charles E Harris Jr., Michael S Pritchard, Michael J Rabins, "Engineering Ethics,

   Concepts Cases: 4e, Cengage learning, 2015.

9. Caroline Whitbec, " Ethics in Engineering Practice & Research: 2e, Cambridge University

   Press 2015.

B.Tech & B.Tech + M.Tech
(Computer Science & Engineering)

III Year - I Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
CS3101	PC	Data Communications & Computer Networks	4	0	30	70	100	3
CS3102	PC	Artificial Intelligence	4	0	30	70	100	3
CS3103	PC	Compiler Design	4	0	30	70	100	3
CS3104	PE	Professional Electives - I	4	0	30	70	100	3
CS3105	OE	Open Electives - I	4	0	30	70	100	3
CS3106	PC	Data Communications & Computer Networks Lab	0	3	50	50	100	1.5
CS3107	PC	Python Programming Lab	0	3	50	50	100	1.5
CS3108	SC	Soft Skills	1	2	50	50	100	2
CS3109	INT	Internship - I	0	0	50	50	100	2
Summer Internship 2 Months (Mandatory) after 2nd year (to be evaluated during III Year I Semester)								
							Total Credits	**22**

CS3101: Data Communications & Computer Networks

Course Objectives:

- To study basics of data communication systems.
- To study the various types of transmission media.
- To study the various hardware concepts related to data communications
- To make the students understanding of basic requirements of network hardware, software and its architecture.

Course Outcomes:

- Ability to understand concepts related to data communication hardware.
- Ability to understand basic functionality of modems.
- The student must be able to understand the design and estimate the requirements for practical setup of a given network scenario and size.
- Realize the Operation, maintenance and management of the Internet by mapping the theoretical networking concepts to the real-time network scenarios.

Syllabus:

Introduction to Data Communications: A Communications Model, Data Communications and Data Communications Networking, Protocols and Protocol Architecture, Characteristics of Data Transmission: Concepts and Terminology, Analog and Digital Data Transmission, Transmission Impairments.

Data Communication Interface: Asynchronous and Synchronous Transmission, Line Configurations, Interfacing. Data Link Control Flow Control, Error Detection, Error Control, High-Level Data Link Control (HDLC),Other Data Link Control Protocols.

Signal Encoding Techniques: Digital data to Digital signal, Digital to Analog Signal, Analog data to Digital Signal, and Analog Data to Analog signal.

Multiplexing: Frequency-Division Multiplexing, Synchronous T ime-Division Multiplexing: Characteristics, TDM Link Control, Digital Carrier Systems Statistical Time-Division Multiplexing: Characteristics.

Medium Access Control Sublayer: Wireless LAN's:802.11Architecture and Protocol Stack,802.11 Physical Layer, 802.11MAC Sublayer Protocol,802.11Frame structure, Services. Bluetooth: Bluetooth Architecture, Applications, Protocol Stack, Radio Layer, Link Layer, Frame Structure. RFID:EPC Gen 2 Architecture, EPC Gen 2 Physical Layer, EPC Gen 2 Tag Identification Layer, Tag Identification Message Formats.

Network Layer : Network Layer Design Issues, Routing Algorithms-Shortest path routing algorithm, Congestion Control Algorithms, Network Layer in the Internet, IP Protocol, IP Address.

Transport layer: Transport Service, Elements of Transport Protocols, TCP and UDP Protocols, Network Performance Issues.

Application Layer: Over View of DNS, SNMP, Electronic Mail, World Wide Web, Firewalls.

Text Books:

1. Data Communications and Networking, Behrouz A Forouzan , Tata McGraw-Hill Co

Ltd, Second Edition, ISBN: 0-07-049935-7

2. Computer Networks, Andrews S Tanenbaum,, 5th Edition, Pearson Edu.

References:

1. Data and Computer Communications, Eigth Edition, William Stallings, Pearson Education,Inc.

CS3102: ARTIFICIAL INTELLIGENCE

Course Objectives:

- To learn about AI problem, Production Systems and their characteristics.
- To understand the importance of search and the corresponding search strategies for solving AI problem.
- To introduce to Planning, Natural Language Processing and Expert Systems.

Course Outcomes:

- The Student understands AI problem characteristics, state space approach for solving AI problem, Production System framework.
- The student learn several optimal search strategies and the use of heuristics.
- The student learns relational, inferential, inheritable and procedural knowledge and the corresponding knowledge representation approaches.
- The student is introduced to applying AI problem solving approaches to natural language processing, planning and expert systems.

Syllabus:

Introduction to Artificial Intelligence: Artificial Intelligence, AI Problems, AI Techniques, Defining the Problem as a State Space Search, Problem Characteristics, Production Systems.

Search Techniques: Issues in The Design of Search Programs, Un-Informed Search, BFS, DFS; Heuristic Search Techniques: Generate-And- Test, Hill Climbing, Best-First Search, A* Algorithm, Problem Reduction, AO*Algorithm, Constraint Satisfaction, Means-Ends Analysis.

Knowledge Representation using Rules: Procedural Vs Declarative Knowledge, Logic programming, Forward Vs Backward Reasoning, Matching Techniques, Partial Matching, RETE Matching Algorithm AI Programming languages: Overview of LISP and PROLOG, Production System in Prolog.

Symbolic Logic: Propositional Logic, First Order Predicate Logic: Representing Instance and is-a Relationships, Computable Functions and Predicates, Unification & Resolution, Natural Deduction; Structured Representations of Knowledge: Semantic Nets, Partitioned Semantic Nets, Frames, Conceptual Dependency, Conceptual Graphs, Scripts.

Reasoning under Uncertainty: Introduction to Non-Monotonic Reasoning, Truth Maintenance Systems, Logics for Non-Monotonic Reasoning, Statistical Reasoning: Bayes Theorem, Certainty Factors and Rule-Based Systems, Bayesian Probabilistic Inference, Bayesian Networks, Dempster-Shafer Theory, Fuzzy Logic: Crisp Sets ,Fuzzy Sets, Fuzzy Logic Control, Fuzzy Inferences &Fuzzy Systems.

Natural Language Processing: Steps in The Natural Language Processing, Syntactic Processing and Augmented Transition Nets, Semantic Analysis, NLP Understanding Systems; Planning: Components of a Planning System, Goal Stack Planning, Non-linear Planning using Constra it Posting, Hierarchical Planning, Reactive Systems.

Experts Systems: Overview of an Expert System, Architecture of an Expert Systems, Different Types of Expert Systems Rule Based, Frame Based, Decision Tree based, Case Based, Neural Network based,

Black Board Architectures, Knowledge Acquisition and Validation Techniques, , Knowledge System Building Tools, Expert System Shells.

Text Books:

1. Artificial Intelligence, Elaine Rich and Kevin Knight, Tata Mcgraw -Hill Publications

2. Python Programming: A modular approach by Pearson; by TanejaSheetal (Author), Kumar Naveen.

References:

1. Artificial Intelligence, George F Luger, Pearson Education Publications

2. Artificial Intelligence : A modern Approach, Russell and Norvig, Print ice Hall

3. Introduction To Artificial Intelligence & Expert Systems, Patterson, PHI publications

CS3103: COMPILER DESIGN

Course objectives:

- To explain the basic understanding of grammars and language definition and introducing various phases of designing a compiler.
- To make the student to understand the concepts underlying the design and implementation of language processors and its mechanisms.
- To extend the knowledge of parser by parsing LL parser and LR parser.
- To enrich the knowledge in various phases of compiler ant its use, code optimization techniques, loop optimization techniques, machine code generation, and use of symbol table.

Course outcomes:

- Ability to design & conduct experiments for Intermediate Code Generation in compiler.
- Ability to learn the new code optimization techniques to improve the performance of a program in terms of speed & space.
- Ability to acquire the knowledge of modern compiler & its features.

Syllabus

Introduction: Introduction to Compilers and Language processors, Programming Language basics, Structure & Different Phases of a Compiler, Review of Compiler Structure, Structure of Optimizing Compilation, Compiler construction tools, Boot strapping, Cross compilers.

Finite Automata & Lexical Analysis : Introduction to Lexical Analysis, Lexical Analysers, Approaches to design Lexical Analysers, Language for specifying lexical analysers, Introduction to Finite automata, Regular Expressions & Languages, Recognition of Tokens, Transition Diagrams, Implementation of lexical analyzers, Lexical Analyzer Generator LEX.

Syntax Analysis: Syntactic Specification of Programming Languages, Context Free Grammars & Languages, Introduction to Parsers. Top-down parsing techniques: Brute force parsing, Recursive Descent Parsing, Predictive Parsing, Bottom–up Parsing: Shift reduce parsing, Operator parsing, LR (k) parsing.

Semantic Analysis and Intermediate Code Generation: Semantic Actions, Syntax Directed Translations, Translation on the parse Tree, Implementation of Syntax Directed Translator, Intermediate Codes, Syntax Directed translation to Postfix code, Syntax Trees, Intermediate Code Generation, Three Addr5ess Code-Translation of Expressions, Type Checking & Type Conversions.

Code Optimization: Principal sources of Code Optimization, Loop Optimization, Basic Blocks & Flow Graphs, DAG Representation of Basic Blocks, Applications of DAG, Local Optimization, Unreachable Code Elimination, Dead Code Elimination, Data Flow Analysis, Data Flow Equations & Computations, Peep-Hole Optimization. Machine Dependent Optimizations, Over view of Informal Compiler Algorithm Notation(ICAN), If Simplification, Loop Simplification, Loop Inversion, Branch Optimization and Prediction

Code Generation and Code Scheduling: Issues in Code Generation, Input to Code Generator, Instruction Selection, Register Allocation, Simple Target Machine Model, Program and Instruction Costs, Register allocation & Assignments, Code Generation Algorithm, Code Generators, Optimal Code Generation for Expressions, Code Generation From DAG.

Symbol Tables, Runtime Environment and Error Handling: Contents of a Symbol Table, Data Structures for Symbol Tables; Run time Environments, Implementation of a simple Stack allocation, Heap Management, Block Structured Languages; Error Detection & Recovery, Lexical Phase Errors, Syntactic & Semantic Errors, Error Handling Routines.

Text Books:

1. Principles of Compiler Design by Aho,D. Ullman, Lam and Ravi Sethi, Pearson Education Second Edition
2. Advanced Compiler Design and Implementation, Steven Muchnic, Elsevier Publications.

Reference Books:

1. Compiler Construction by Kenneth. C. Louden, Vikas Pub. House.
2. Compiler Design, A.A. Pentambekar, Technical Publications
3. Modern Compiler Design, Grune.D, Van Reeuwijk K, Bal H.E, Jacobs C J H, Lan gendoen K, Springer,

CS3106: Data Communications & Computer Networks Lab

Course Objectives

- This course provides students with hands on training regarding the design, troubleshooting, modelling and evaluation of computer networks.
- To study the various hardware concepts related to data communications
- To make the students understanding of basic requirements of network hardware, software and its architecture.

Course Outcomes:

- Students learn about networking computers
- How to setup Local Area Network using packet tracer software.
- Students able to going to experiment in a real tested networking environment, and learn about network design and troubleshooting topics and tools.
- Students Learn and simulator Error control and flow control teaching
- Students able to write socket program and client server applications.

Syllabus

Module I: packet tracer software.

1. Study of different types of Network cables and practically implement the cross-wired cable and straight through cable using clamping tool.
2. Connect the computers in Local Area Network.
3. Study of basic network command and Network configuration commands.
4. Configure a Network topology using packet tracer software.

Module II: Network simulator (NS)

1. Implementation of Error Detection / Error Correction Techniques
2. Implementation of Stop and Wait Protocol and sliding window
3. Implementation and study of Goback-N and selective repeat protocols
4. Implementation of High Level Data Link Control
5. Study of Socket Programming and Client – Server model using java
6. Write a socket Program for Echo/Ping/Talk commands using java
7. Implementation of distance vector routing algorithm
8. Implementation of Link state routing algorithm
9. Study of Network simulator (NS) and simulation of Congestion Control Algorithms using NS

CS3107: PYTHON PROGRAMMING LAB

Course Objectives

- familiarize students with key data structures in Python including lists and dictionaries and apply them in context of searching, sorting, text and file handling
- introduce students to calculation of statistical measures using Python such as measures of central tendency, correlation
- familiarize students with important Python data related libraries such as Numpy and Pandas and use them to manipulate arrays and data frames
- introduce students to data visualization in Python through creation of line plots, histograms, scatter plots, box plots and others
- Implementation of basic machine learning tasks in Python including pre-processing data, dimensionality reduction of data using PCA, clustering, classification and cross-validation.

Course Outcomes

After completion of the course the student should be able to:

- implement searching, sorting and handle text and files using Python data structures such as lists and dictionaries
- calculate statistical measures using Python such as measures of central tendency, correlation
- use Python data related libraries such as Numpy and Pandas and create data visualizations
- implement basic machine learning tasks pre-processing data, compressing data, clustering, classification and cross-validation.

Syllabus

1. Python Programs on lists & Dictionaries
2. Python Programs on Searching and sorting
3. Python Programs on Text Handling
4. Python Programs on File Handling
5. Python Programs for calculating Mean, Mode, Median, Variance, Standard Deviation
6. Python Programs for Karl Pearson Coefficient of Correlation, Rank Correlation
7. Python Programs on NumPy Arrays, Linear algebra with NumPy
8. Python Programs for creation and manipulation of Data Frames using Pandas Library
9. Write a Python program for the following.

- Simple Line Plots,
- Adjusting the Plot: Line Colors and Styles, Axes Limits, Labeling Plots,
- Simple Scatter Plots,
- Histograms,
- Customizing Plot Legends,
- Choosing Elements for the Legend,
- Boxplot
- Multiple Legends,
- Customizing Colorbars,
- Multiple Subplots,
- Text and Annotation,
- Customizing Ticks

10. Python Programs for Data preprocessing: Handling missing values, handling categorical data, bringing features to same scale, selecting meaningful features
11. Python Program for Compressing data via dimensionality reduction: PCA
12. Python Programs for Data Clustering
13. Python Programs for Classification
14. Python Programs for Model Evaluation: K-fold cross validation.

Reference Books

1. Core Python Programming, Second Edition, Wesley J. Chun, Prentice Hall
2. Chris Albon, ―Machine Learning with Python Cookbook-practical solutions from pre-processing to Deep learning‖, O'REILLY Publisher,2018

3. Mark Summerfield, Programming in Python 3--A Complete Introduction to the Python Language, Second Edition, Additson Wesley

4. Phuong Vo.T.H , Martin Czygan, Getting Started with Python Data Analysis, Packt Publishing Ltd

5. Armando Fandango, Python Data Analysis, Packt Publishing Ltd

6. Magnus Vilhelm Persson and Luiz Felipe Martins, Mastering Python Data Analysis, Packt Publishing Ltd

7. Sebastian Raschka & Vahid Mirjalili, ―Python Machine Learning‖, Packt Publisher, 2017

CS3108: SOFT SKILLS LAB

Course Objectives:

- To develop skills to communicate clearly.
- To aid students in building interpersonal skills.
- To enhance team building and time management skills.
- To inculcate active listening and responding skills.

Course Outcomes:

- Make use of techniques for self-awareness and self-development.
- Apply the conceptual understanding of communication into everyday practice.
- Understand the importance of teamwork and group discussions skills.
- Develop time management and stress management.

Syllabus

Introduction to Soft Skills: Communication – Verbal and Non Verbal Communication - Personal grooming (Etiquette, Attitude, Body Language), Posture, Gestures, Facial Expressions, Eye Contact, Space Distancing, Presentation Skills, Public Speaking, Just a Minute (JAM) sessions, Adaptability.

Goal Setting and Time Management: Immediate, Short term, Long term, Smart Goals, Strategies to Achieve goals, Types of Time, Identifying Time Wasters, Time Management Skills, Stress Busters.

Leadership and Team Management: Qualities of a Good Leader, Team Dynamics, Leadership Styles, Decision Making, Problem Solving, Negotiation Skills.

Group Discussions: Purpose (Intellectual ability, Creativity, Approach to a problem, Tolerance), Group Behaviour, Analysing Performance.

Job Interviews: Identifying job openings, Covering Letter and CVs / Resumes, Interview (Opening, Body-Answer Q, Close-Ask Q), Telephone Interviews, Types of Questions.

Reference Books:

1. Krannich, Caryl, and Krannich, Ronald L. Nail the Resume! Great Tips for Creating Dynamite Resumes. United States, Impact Publications, 2005.

2. Hasson, Gill. Brilliant Communication Skills. Great Britain: Pearson Education, 2012

3. Prasad, H. M. How to Prepare for Group Discussion and Interview. New Delhi: Tata McGraw-Hill Education, 2001.

4. Pease, Allan. Body Language. Delhi: Sudha Publications, 1998.

5. Rizvi, Ashraf M. Effective Technical Communication: India, McGraw-Hill Education. 2010

Thorpe, Edgar &Showick Thorpe. Winning at Interviews. 2nd Edition. Delhi: Dorling Kindersley, 2006.

III Year - II Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
CS3201	PC	Object Oriented Software Engineering	4	0	30	70	100	3
CS3202	PC	Data Warehousing & Data Mining	4	0	30	70	100	3
CS3203	PC	Cryptography & Network Security	4	0	30	70	100	3
CS3204	PE	Professional Elective - II	4	0	30	70	100	3
CS3205	OE	Open Elective - II	4	0	30	70	100	3
CS3206	PC	Object Oriented Software Engineering Lab	0	3	50	50	100	1.5
CS3207	PC	Knowledge Engineering Lab	0	3	50	50	100	1.5
CS3208	PC	Cryptography & Network Security Lab	0	3	50	50	100	1.5
CS3209	SC	Embedded Systems	1	2	50	50	100	2
Industrial / Research Internship 2 months								
							Total Credits	**21.5**

CS3201: Object Oriented Software Engineering

Course objectives:

- To explain the importance of OOSE in Software development.
- To explain the students the importance of Requirements Engineering.
- To explain the role of UML and Testing in Software Development.
- To explain the entire Software Development Process with aid of case studies.

Course Outcomes:

- Ability to define a problem and perform Requirements Engineering.
- Ability to draw UML diagrams for the requirements gathered.
- Ability to implement the designed problem in Object Oriented Programming Language and
- test whether all the requirements specified have been achieved or not.

Syllabu

Introduction to Object Oriented Software Engineering: Nature of the Software, Types of Software, Software Engineering Projects, Software Engineering Activities, Software Quality, Introduction to Object Orientation, Software Process Models-Waterfall Model, Opportunistic Model ,Phased Released Model, Spiral Model, Evolutionary Model, Concurrent Engineering Model

Requirements Engineering: Domain Analysis, Problem Definition and Scope, Requirements Definition, Types of Requirements, Techniques for Gathering and Analyzing Requirements, Requirement Documents, Reviewing, Managing Change in Requirements.

Unified Modelling Language & Use Case Modelling: Introduction to UML, Modelling Concepts, Types of UML Diagrams with Examples; User-Centred Design, Characteristics of Users, Developing Use- Case Models of Systems, Use-Case Diagram, Use- Case Descriptions, Basics of User Interface Design, Usability Principles, User Interfaces.

Class Design and Class Diagrams: Essentials of UML Class Diagrams, Associations and Multiplicity, Other Relationships, Generalization, Instance Diagrams, Advanced Features of Class Diagrams, Interaction and Behavioural Diagrams: Interaction Diagrams, State Diagrams, Activity Diagrams, Component and Deployment Diagrams.

Software Design and Architecture: Process of Design, Principles Leading to Good Design, Techniques for Making Good Design Decisions, Good Design Document; Pattern Introduction, Design Patterns: Abstraction-Occurrence Pattern, General Hierarchical Pattern, Play-Role Pattern, Singleton Pattern, Observer Pattern, Delegation Pattern, Adaptor Pattern, Façade Pattern, Immutable Pattern, Read-Only Interface Pattern and The Proxy Pattern; Software Architecture Contents of Architecture

Model, Architectural Patterns: Multilayer, Client-Server, Broker, Transaction Processing, Pipe& Filter and MVC Architectural Patterns

Software Testing: Overview of Testing, Testing Concepts, Testing Activities, Testing Strategies, Unit Testing, Integration Testing, Function Testing, Structural Testing, Class Based Testing Strategies, Use Case/Scenario Based Testing, Regression Testing, Performance Testing, System Testing, Acceptance Testing, Installation Testing, OOTest Design Issues, Test Case Design, Quality Assurance, Root Cause Analysis, Post-Mortem Analysis.

Software Process Management: Introduction to Software Project Management, Rationale Management, Configuration Management, Activities of Software Project Management, Structure of Project Plan, Software Engineering Teams, Software Cost Estimation, Project Scheduling, Tracking and Monitoring.

CASE STUDY:

1. Simple Chat Instant Messaging System
2. GPS Based Automobile Navigation System
3. Waste Management Inspection Tracking System(WMITS)
4. Geographical Information System

Text Books:

1. Object-Oriented Software Engineering Practical software development using UML and Java by Timothy C. Leth bridge& Robert, Langaniere Mcgraw-Hill
2. Software Engineering, K.K. Agarwal, New Age Publications2008
3. Object-Oriented Software Engineering: Using UML, Patterns and Java, Bernd Bruegge and Allen H. Dutoit, 2nd Edition, Pearson Education Asia.

Reference:

1. Software Engineering: A Practitioner's Approach, Roger S Pressman.
2. A Practical Guide to Testing Object-Oriented Software, John D. McGregor; David A.Sykes, Addison-Wesley Professional.

]

CS3202: DATA WAREHOUSING & DATA MINING

Course Objectives:

- To understand the evolution of data warehousing and data mining systems
- To understand extracting, cleaning and transformation of data into a warehouse.
- To learn the principles of statistics, information theory, machine learning and other areas AI and implementation of data mining techniques.
- To understand pattern mining using classification and clustering methods.

Course Outcomes:

- The student understands the differences between OLTP and OLAP.
- The student learns how data cube technology supports summarization and querying high dimensional data.
- The student is introduced to similarity, distance, information gain and other performance and error metrics used for evaluation of mining results.
- The student is introduced to various approaches to association rule mining , supervised and unsupervised learning and the corresponding classification and clustering approaches involving decision trees, Bayesian approaches, model based and agglomerative approaches.

Syllabus:

Introduction to Data Mining: Importance of Data Warehousing and Data Mining, Kinds of Patterns, Technologies, Applications, Major Issues in Data Mining, Data Objects and Attributes Types, Statistical Descriptions of Data, Estimating Data Similarity and Dissimilarity

Data exploration and pre-processing: Data Visualization, Quality data, Data Cleaning, Data Integration, Data Reduction, Data Transformation, Discretization and Concept Hierarchy Generation.

Data Warehouse and OLAP Technology: Basic Concepts of Data warehouse, Data Modeling using Cubes and OLAP, DWH Design and usage, Implementation using Data Cubes and OLAPs, Data Generalization with AOI.

Data Cube Technology: Preliminary Concepts of Data Cube Computation, Data Cube Computation Methods: Multi-way Array Aggregation for Full Cube, BUC, Star-cubing, Pre-computing shell fragments for High dimensional OLAP

Mining Frequent Patterns Based on Associations and Correlations: Basic Concepts, Frequent Item set Mining Methods: Apriori Algorithm, Association Rule Generation, Improvements to A Priori, FP-Growth Approach, Pattern Evaluation Methods

Classification &Prediction: Basic Concepts, Decision Tree Induction, Bayes Classification, Rule-Based Classification, Model Evaluation and Selection, Techniques to Improve Classification Accuracy, Classification by Back Propagation, K-nearest neighbor classifier.

Cluster Analysis: Basic Concepts and issues in clustering, Types of Data in Cluster Analysis, Partitioning Methods, Hierarchical Methods, DBSCAN, Grid Based Methods, Evaluation of Clustering Solutions

Text Books:

1. Data Mining- Concepts and Techniques by Jiawei Han, Micheline Kamber and Jian Pei– Morgan Kaufmann publishers –--3rd edition
2. Data Mining Techniques, A.K.Pujari, University Press

References:

1. Data mining concepts byTan, Steinbech, and Vipin Kumar - Pearson Edu

   Publishers.

CS3203: CRYPTOGRAPHY &NETWORK SECURITY

Course Objectives:

- Introduction of the issues in network security- its need and importance, taxonomy and terminology.
- Discussion of various cryptographic techniques.
- Exploration of different types of security threats and remedies.

- Understanding of Internet security protocols and standards.

Course Outcomes:

- Realize the need and importance of network and data security in the Internet and in the distributed environments.
- Identify the different types of network security issues and their remedies.
- Application of various cryptographic tools and techniques in different contexts and as per need of security levels.
- Implementation of some Internet security protocols and standards.

Syllabus:

Overview: Computer Security Concepts, Threats, Attacks, and Assets, Security Functional Requirements, A Security Architecture for Open Systems, Computer Security Trends, Computer Security Strategy. Cryptographic Tools: Confidentiality with Symmetric Encryption, Message Authentication and Hash Functions, Public-Key Encryption, Digital Signatures and Key Management, Random and Pseudorandom Numbers, Practical Application: Encryption of Stored Data. User Authentication: Means of Authentication, Password-Based Authentication, Token-Based Authentication, Biometric Authentication, Remote User Authentication, Security Issues for User Authentication, Practical Application: An Iris Biometric System, Case Study: Security Problems for ATM Systems.

Access Control: Access Control Principles, Subjects, Objects, and Access Rights, Discretionary Access Control, Example: UNIX File Access Control, Role-Based Access Control, Case Study: RBAC System for a Bank. Database Security: The Need for Database Security, Database Management Systems, Relational Databases, Database Access Control, Inference, Statistical Databases, Database Encryption, Cloud Security.

Malicious Software: Types of Malicious Software (Malware), Propagation—Infected Content—Viruses, Propagation—Vulnerability Exploit—Worms, Propagation—Social Engineering—SPAM E-mail, Trojans, Payload—System Corruption, Payload—Attack Agent—Zombie, Bots, Payload—Information Theft—Key loggers, Phishing, Spyware, Payload—Steal thing—Backdoors, Root kits, Countermeasures.

Denial-of-Service Attacks: Denial-of-Service Attacks, Flooding Attacks, Distributed Denial-of-Service Attacks, Application-Based Bandwidth Attacks, Reflector and Amplifier Attacks, Defenses Against Denial-of-Service Attacks, Responding to a Denial-of-Service Attack.

Intrusion Detection: Intruders, Intrusion Detection, Host-Based Intrusion Detection, Distributed Host-Based Intrusion Detection, Network-Based Intrusion Detection, Distributed Adaptive Intrusion Detection, Intrusion Detection Exchange Format, Honey pots, Example System: Snort. Firewalls and Intrusion Prevention Systems: The Need for Firewalls, Firewall Characteristics, Types of Firewalls,

Firewall Basing, Firewall Location and Configurations, Intrusion Prevention Systems, Example: Unified Threat Management Products.

Buffer Overflow: Stack Overflows, Defending Against Buffer Overflows, Other Forms of Overflow Attacks, Software Security: Software Security Issues, Handling Program Input, Writing Safe Program Code, Interacting with the Operating System and Other Programs, Handling Program Output. Operating System Security: Introduction to Operating System Security, System Security Planning, Operating Systems Hardening, Application Security, Security Maintenance, Linux/Unix Security, Windows Security, Virtualization Security.

Symmetric Encryption and Message Confidentiality: Symmetric Encryption Principles, Data Encryption Standard, Advanced Encryption Standard, Stream Ciphers andRC4, Cipher Block Modes of Operation, Location of Symmetric Encryption Devices, Key Distribution. Public-Key Cryptography and Message Authentication: Secure Hash Function, HMAC, The RSA Public-Key Encryption Algorithm, Diffie-Hellman and Other Asymmetric Algorithms.

Internet Security Protocols and Standards: Secure E-mail and S/MIME, Domain Keys Identified Mail, Secure Socket Layer (SSL) and Transport Layer Security(TLS), HTTPS, IPv4 and IPv6 Security. Internet Authentication Applications: Kerberos, X.509, Public-Key Infrastructure, Federated Identity Management. Wireless Network Security: Wireless Security Overview, IEEE 802.11 Wireless LAN Overview, IEEE 802.11i Wireless LAN Security.

Text Book:

1. Computer Security - Principles and Practices (Except the Chapters 13, 14, 15, 16, 17,18, 19), 2nd Edition by William Stallings, Pearson Education, Inc.

Reference Books:

1. Cryptography and Network Security by William Stallings, Pearson Education Asia, New Delhi.
2. Network Security Essentials Applications and Standards, by William Stallings, Pearson Education Asia, NewDelhi.

CS3206: Object Oriented Software Engineering Lab

Course objectives:

- The purpose of the Software Engineering Lab course is to familiarize the students with modern software engineering methods and tools, Rational Products. The course is realized as a project-like assignment that can, in principle, by a team of three/four students working full time. Typically the assignments have been completed during the semester requiring approximately 60-80 hours from each project team.
- The goal of the Software Engineering Project is to have a walk through from the requirements, design to implementing and testing. An emphasis is put on proper documentation. Extensive hardware expertise is not necessary, so proportionate attention can be given to the design methodology.

- Despite its apparent simplicity, the problem allows plenty of alternative solutions and should be a motivating and educating exercise. Demonstration of a properly functioning system and sufficient documentation is proof of a completed assignment.
- Term projects are projects that a group student or might take through from initial specification to implementation. The project deliverables include.

Course outcomes:

- Ability to define a problem and perform Requirements Engineering.
- Ability to draw UML diagrams for the requirements gathered.
- Ability to implement the designed problem in Object Oriented Programming Language and
- test whether all the requirements specified have been achieved or not.

Projects:

1. Documentation including
    A. A problem statement
    B. A requirements document
        a. A Requirements Analysis Document.
        b. A System Requirements Specification.
        c. A Software Requirements Specification.
2. A design document
    A. A Software Design Description and a System Design Document.
3. A test specification.
4. Manuals/guides for
    A. Users and associated help frames
    B. Programmers
    C. Administrators (installation instructions)
5. A project plan and schedule setting out milestones, resource usage and estimated costs.
6. A quality plan setting out quality assurance procedures
7. An implementation.

References:

1. Project-based software engineering: An Object-oriented approach, Evelyn Stiller, Cathie LeBlanc, Pearson Education
2. Visual Modelling with Rational Rose 2002 and UML, Terry Quatrini, Pearson Education
3. UML2 Toolkit, Hans -Erik Eriksson, etc; Wiley

CS3207: KNOWLEDGE ENGINEERING LAB

Course Objectives:

- To study the various data analysis techniques in R Programming language.
- To apply the various data mining techniques available inWEKA for generating Knowledge such as Association Analysis, Classification and Clustering to various standard datasets and own datasets.

- To build Rule based Knowledge Systems using forward chaining and Backward chaining using CLIPS and PROLOG respectively

Course Outcomes:

- Student will be able to write R programs to perform several data analytics operations on datasets
- Ability to extract patterns by applying appropriate data mining techniques from different types of datasets using WEKA.
- Ability to apply knowledge represented in the form of rules to draw conclusions using either forward or backward chaining using CLIPS /PROLOG.

1. Exploratory data analysis using R

1. Load the 'iris. CSV' file and display the names and type of each column. Find statistics such as min, max, range, mean, median, variance, standard deviation for each column of data.
2. Write R program to normalize the variables into 0 to 1 scale using min-max normalisation
3. Generate histograms for any one variable (sepal length/ sepal width/ petal length/ petal width) and generate scatter plots for every pair of variables showing each species in different color .
4. Generate box plots for each of the numerical attributes. Identify the attribute with the highest variance.
5. Study of homogeneous and heterogeneous data structures such as vector, matrix, array, list, data frame in R.
6. Write R Program using 'apply' group of functions to create and apply normalization function on each of the numeric variables/columns of iris dataset to transform them into a value around 0 with z-score normalization.
7. a) Use R to apply linear regression to predict evaporation coefficient in terms of air velocity using the data given below:

   Air Velocity (cm/sec) 20,60,100,140,180,220,260,300,340,380

   Evaporation Coefficient (sqmm/sec)

   0.18, 0.37, 0.35, 0.78, 0.56, 0.75, 1.18, 1.36, 1.17, 1.65

b) Analyze the significance of residual standard-error value, R-squared value, F- statistic. Find the correlation coefficient for this data and analyze the significance of the correlation value.

c) Perform a log transformation on the 'Air Velocity 'column, perform linear regression again, and analyze all the relevant values.

8. Write R Program using 'apply' group of functions to create and apply normalization function on each of the numeric variables/columns of iris dataset to transform them a value around 0 with z-score normalization.

2. WEKA Knowledge Extraction toolkit:

9. Create an ARFF (Attribute-Relation File Format) file and read it in WEKA. Explore the purpose of each button under the preprocess panel after loading the ARFF file. Also, try to interpret using a different ARFF file, weather.arff, provided with WEKA.

10. Performing data preprocessing in WekaStudy Unsupervised Attribute Filters such as Replace Missing Values to replace missing values in the given dataset, Add to add the new attribute Average, Discretize to discretize the attributes into bins. Explore Normalize and Standardize options on a dataset with numerical attributes.

11. Classification using the WEKA toolkit Demonstration of classification process using id3 algorithm on categorical dataset(weather).

    Demonstration of classification process using naïve Bayes algorithm on categorical dataset ('vote').

    Demonstration of classification process using Random Forest algorithm on datasets containing large number of attributes.

12. Classification using the WEKA toolkit – Part 2

    Demonstration of classification process using J48 algorithm on mixed type of dataset after discretizing numeric attributes.

    Perform cross-validation strategy with various fold levels. Compare the accuracy

    of the results.

13. Performing clustering in WEKA

    Apply hierarchical clustering algorithm on numeric dataset and estimate cluster quality. Apply DBSCAN algorithm on numeric dataset and estimate cluster quality.

14. Association rule analysis in WEKA

    Demonstration of Association Rule Mining on supermarket dataset using Apriori Algorithm with different support and confidence thresholds.

    Demonstration of Association Rule Mining on supermarket dataset using FP- Growth Algorithm with different support and confidence thresholds.

3. Building Knowledge based Inference Systems:

15. Implement AI problem solving through Rule based forward chaining inference using public domain software tool like CLIPS.

16. Implement AI problem solving through Rule based Backward chaining inference using PROLOG

References:

Practical data science with R, Nina Zumel and John Mount- Dreamtech Press.

CS3208: CRYPTOGRAPHY & NETWORK SECURITY LAB

Course Objectives

- Understand encryption and decryption
- Understand various algorithm logic such as DES, Blowfish, Rijndael
- Understand how to find IP address, MAC address, neighbouring machines

Course Outcomes

By the end of the course, the student will be able to:

- Perform encryption and decryption using various algorithms
- Implement various algorithm logic
- Calculate message digest of a text
- Find IP address, MAC address, neighbouring machines
- Detect intrusion packets and demonstrate ARP poisoning

List of Experiments

Cycle 1 - Cryptography

1. Write a C program that contains a string (char pointer) with a value 'Hello world'. The program should XOR each character in this string with 0 and displays the result.

2. Write a C program that contains a string (char pointer) with a value 'Hello world'. The program should AND or and XOR each character in this string with 127 and display the result.

3. Write a Java program to perform encryption and decryption using the following algorithms

4. Ceaser cipher

5. Substitution cipher

6. Hill Cipher

7. Write a C/JAVA program to implement the DES algorithm logic.

8. Write a C/JAVA program to implement the Blowfish algorithm logic.

9. Write a C/JAVA program to implement the Rijndael algorithm logic.

10. Write the RC4 logic in Java Using Java cryptography; encrypt the text ‘Hello world’ using Blowfish. Create your own key using Java key tool.

11. Write a Java program to implement RSA algorithm.

12. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript.

13. Calculate the message digest of a text using the SHA-1 algorithm in JAVA.

14. Calculate the message digest of a text using the MD5 algorithm in JAVA.

Cycle 2 - Network Security

1. a) Find the IP address, MAC address of your machine.

   b) Find the neighbouring machines in your network.

   c) Check if a server is up and running.

2. Run tcpdump/windump utility with atleast 4 options.

3. Capture the packets in your system using wireshark and analyse any one TCP packet in detail.

4. Use snort to detect intrusion packets.

5. Demonstrate ARP Poisoning.

Reference Books

1. Computer Security - Principles and Practices, 2ndEdition by William Stallings, Pearson Education, Inc.

2. Cryptography and Network Security by William Stallings, Pearson Education Asia, New Delhi.

CS3209: EMBEDDED SYSTEM

Course Objectives

- To introduce basics of electronics and reading electronics diagrams
- To introduce students to basics of Arduino programming language and IDE
- Assembly language program using 8051
- Interfacing 8051 Microprocessor
- embedded sysyem design using msp430

Course Outcomes :

At the end of this course, students will:

- Learn the basics of electronics, including reading schematics (electronics diagrams) and how to prototype circuits with a breadboard.
- Learn the Arduino programming language and IDE
- Acquire knowledge on how to program basic Arduino/ RASPBERY Pi/8051/MSP430 using assemble language or C language.
- students able to learn how to build prototype models and interfacing various sensor to Arduino/ RASPBERY Pi/8051/MSP430

MODULE I: EMBEDDED SYSYEM DESIGN USING MSP430

1. Introduction to MSP430 launch pad and Programming Environment.

2. Read input from switch and Automatic control/flash LED (soft-ware delay).

3. Interrupts programming example using GPIO.

4. Configure watchdog timer in watchdog & interval mode.

5. Configure timer block for signal generation (with given frequency).

6. Read Temperature of MSP430 with the help of ADC.

7. Test various Power Down modes in MSP430.

8. PWM Generator.

10. Speed Control of DC Motor

MODULE II: EMBEDDED SYSYEM DESIGN USING 8051

1. Assemble language programs using 8051 implementing

a. Addition and subtraction of two 8bit numbers

b. Multiplication and division of two 8bit numbers

c. Largest and smallest in array of numbers

d. Arrange an array an ascending and descending orders

e. To move a block of data to another location

2. Hardware Interfacings with 8051

a. LEDS and Switches,

b. Seven Segment Display and Multi Segment Display,

c. Relays (AC Appliance Control)

d. LCD, Buzzer,

e. IR Sensors and other digital sensors,

f. Matrix Keypad

g. UART Communication (MCU to PC) UART Communication (MCU to MCU)

h. Graphical LCD

i. RTC Based Real Time Clock

j. Sensor Interfacing: Accelerometer/Gyro/Tilt Sensor, Analogue Sensors (Temperature, Gas & Alcohol) UART Based Sensors (Colour Sensor, Humidity Sensor).

MODULE III: EMBEDDED SYSYEM DESIGN USING AURDINO

1. Embedded Systems Introduction, Different Microcontroller Architectures (CISC, RISC,ARISC).

   Internal Resources & Hardware Chips in Details. History of AVR Microcontrollers and Features, Memory Architectures (RAM/ROM). 8051 Architecture and programming.

2. Introduction to ARDUINO, ARDUINO History and Family Programming in Embedded -C, Concepts of C language.

3. Hardware Interfacings with Arduino

k. LEDS and Switches,

l. Seven Segment Display and Multi Segment Display,

m. Relays (AC Appliance Control)

n. LCD, Buzzer,

o. IR Sensors and other digital sensors,

p. Matrix Keypad

q. UART Communication (MCU to PC) UART Communication (MCU to MCU)

r. Graphical LCD

s. RTC Based Real Time Clock

t. Sensor Interfacing: Accelerometer/Gyro/Tilt Sensor, Analogue Sensors (Temperature, Gas & Alcohol) UART Based Sensors (Colour Sensor, Humidity Sensor).

4. Software Programming/Assembly Language Programming for above HW interfacing experiments with development kits or Simulation environment.

MODULE IV: EMBEDDED SYSYEM DESIGN USING RASPBERY Pi

1. Setup Headless Raspberry Pi
2. Basic Input and Output Using Pseudo File system
3. Basic Input and Output Using Address Map
4. Analog Input & Analog Output
5. Interfacing 7 Segment Display & 4x4 Matrix Keyboard/Keypad
6. I2C Communication
7. Servo Motor & stepper Motor

B.Tech & B.Tech + M.Tech
(Computer Science & Engineering)

IV Year - I Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
CS4101	PE	Professional Elective– III	4	0	30	70	100	3
CS4102	PE	Professional Elective - IV	4	0	30	70	100	3
CS4103	PE	Professional Elective - V	4	0	30	70	100	3
CS4104	OE	Open Elective– III	4	0	30	70	100	3
CS4105	OE	Open Elective - IV	4	0	30	70	100	3
CS4106	HSSE	HSS Elective	4	0	30	70	100	3
CS4107	SC	Deep Learning	1	2	50	50	100	2
CS4108	INT	Internship -II	0	0	50	50	100	2
Industrial / Research Internship 2 months(Mandatory) after 3rd year (to be evaluated during IV Year I Semester)								
							Total Credits	**22**

CS4107 DEEP LEARNING

Course objectives

- Provides a review of the basic concepts, approaches and limitations of traditional machine learning algorithms
- familiarize students with basic ideas of feed forward neural networks learning with Backpropagation of error and advancements towards deep learning
- introduce the optimization and regularization concepts in deep learning
- understand representation and learning using Convolutional Neural networks
- introduce students to sequential modelling using recurrent neural networks, with LSTM and other variants.

Course outcomes

- students get the ability to analyse the ML concepts with an understanding on pros and cons of different ML approaches and their limitations

- Students will have clear understanding of ANN and Backpropagation algorithm
- Students will be able to model problems using CNN and RNNs for appropriate applications
- Ability to explore parameter setting for optimal performance of a deep learning model
- Knows the basic concepts of successful applications of Deep Learning like NLP and image processing.

Syllabus

Machine Learning Basics: Learning Algorithms, Capacity, Overfitting, and Underfitting, Hyperparameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood

Estimation, Bayesian Statistics, Supervised and Unsupervised Learning algorithms, Stochastic Gradient Descent, Building a ML algorithm, Challenges and Motivation to Deep learning

Deep forward Networks: Learning XOR, Gradient -based Learning, Hidden Units, Architecture Design, Back-propagation and other Differentiation algorithms

Regularization for Deep Learning: Parameter Norm Penalties, Norm Penalties as constrained Optimization, Regularization and under -constrained problems, dataset Augmentation, Noise robustness, semi-supervised learning, multitask learning, Early stopping, parameter tying and setting, sparse presentations, bagging and other ensemble methods, dropout, adversarial training, tangent distance, prop and manifold tangent classifier

Optimization for Training Deep Models: Difference between learning and pure optimization, Challenges in NN optimization, Basic algorithms, parameter Initialization strategies, Algorithms with adaptive learning rates, approximate second order methods, Optimization strategies and meta-algorithms

Convolutional Networks: Convolution operation, Motivation, pooling, convolution and pooling as an infinitely strong prior, variants of basic convolution function, structured outputs, data types, efficient convolution algorithms, random or unsupervised features

Sequence Modelling: Recurrent and recursive nets: Unfolding computational graphs, recurrent neural networks, bidirectional RNNs, Encoder-decoder Sequence-to-sequence Architectures, Deep recurrent networks, recursive neural networks, challenge of long-term dependencies, echo state networks, leaky units and other strategies for multiple time scales, Long Short -term Memory (LSTM) and other gated RNNs

Practical methodology and applications: Performance metrics, default baseline models, determining whether to gather more data, selecting hyperparameters, debugging strategies, multidigit number recognition, large scale deep learning, applications in computer vision and NLP

Text Book:

1. "Deep Learning", Ian Goodfellow, YoshuaBengio and Aaron Courville, published by MIT Press,UK, 2017 Series

2. Deep Learning with Keras: The Textbook by Antonio Gulli and Sujit Pal, PacktPublishing Ltd, Birmingham, UK, April 2017

Reference Book:

1. Deep Learning with TensorFlow, The Textbook by Giancarlo Zaccone, Md. Rezaul Karim, and Ahmed Menshawy, Packt Publishing Ltd, Birmingham, UK, April 2017.

DEPARTMENT OF COMPUTER SCIENCE AND SYSTEM ENGINEERING
Group A
Scheme (With effect from 2021-22 admitted batch)
B. Tech (CSE)
II Year - I Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
CS2101	BS	Probability, Statistics And Queuing Theory	4	0	30	70	100	3
CS2102	PC	Elements of Electronics Engineering	4	0	30	70	100	3
CS2103	PC	Computer Organization And Architecture	4	0	30	70	100	3
CS2104	PC	Operating System	4	0	30	70	100	3
CS2105	PC	Object Organization Programming Through Java	4	0	30	70	100	3
CS2106	PC	Computer Organization Lab	0	3	30	70	100	1.5

CS2107	PC	Object Organization Programming Through Java	0	3	50	50	100	1.5
CS2108	PC	Operating System Lab	0	3	50	50	100	1.5
CS2110	SC(MC)	Intellecual Property Rights	1	2	50	50	100	2
CS2110	MC	Environmental Science	0	0	-	100	100	0
Total credits								**21.5**

B. Tech (CSE)
II Year - II Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
CS2201	ES	Microprocessors	4	0	30	70	100	3
CS2202	PC	Design and Analysis of Algorithms	4	0	30	70	100	3
CS2203	PC	Database Management Systems	4	0	30	70	100	3
CS2204	PC	Formal Languages & Automata Theory	4	0	30	70	100	3
CS2205	HSS	Managerial Economics	4	0	30	70	100	3
CS2206	PC	Algorithms Lab	0	3	50	50	100	1.5
CS2207	PC	Database Management Systems Lab	0	3	50	50	100	1.5
CS2208	SC	Java Technologies Lab	1	2	50	50	100	2
CS2209	MC	Professional Ethics & Universal Human Values	0	0	0	100	100	0
CS2210	MC	NCC/NSS	0	2	-	-	-	0
Total credits								**20**
Summer Internship (Community Service)								

B. Tech (CSE)
III Year - I Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
CS3101	PC	Data Communications & Computer Networks	4	0	30	70	100	3
CS3102	PC	Artificial Intelligence	4	0	30	70	100	3
CS3103	PC	Compiler Design	4	0	30	70	100	3
CS3104	OE/JOE	Open electives - I	4	0	30	70	100	3
CS3105	PE	Professional electives - I	4	0	30	70	100	3
CS3106	PC	Data Communications & Computer Networks Lab	0	3	50	50	100	1.5
CS3107	PC	Phyton lab	0	3	50	50	100	1.5
CS3108	SC	Soft Skills	1	2	50	50	100	2

CS3109	INT	Internship - 1						
Summer Internship 2 Months (Mandatory) after 2nd year (to be evaluated during III Year I Semester)			0	0	50	50	100	2
							Total Credits	**22**

B. Tech (CSE)
III Year - II Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
CS3201	PC	Object Oriented Software Engineering	4	0	30	70	100	3
CS3202	PC	Data Warehousing & Data Mining	4	0	30	70	100	3
CS3203	PC	Cryptography & Network Security	4	0	30	70	100	3
CS3204	PE	Professional electives - II	4	0	30	70	100	3
CS3205	OE/JOE	Open electives - II	4	0	30	70	100	3
CS3206	PC	Object Oriented Software Engineering Lab	0	3	50	50	100	1.5
CS3207	PC	Knowledge Engineering Lab	0	3	50	50	100	1.5
CS3208	PC	Cryptography & Network Security Lab	0	3	50	50	100	1.5
CS3209	SAC/SSC	Embedded Systems Lab	1	2	50	50	100	2
Industrial / Research Internship 2 months								
							Total Credits	**21.5**

B. Tech (CSE)
IV Year - I Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
CS4101	PE	Professionalelectives – III	4	0	30	70	100	3
CS4102	PE	Professional electives - III	4	0	30	70	100	3
CS4103	PE	Professional electives - III	4	0	30	70	100	3
CS4104	OECV	Open electives – III	4	0	30	70	100	3
CS4105	OEC	Open electives - III	4	0	30	70	100	3
CS4106	HSSE	Operations Research	4	0	30	70	100	3
CS4107	SC	Deep Learning	1	2	50	50	100	2
Industrial / Research Internship 2 months (Mandatory) after 3rd year (to be evaluated during IV Year I Semester)			0	0	50	50	100	2
							Total Credits	**22**

B. Tech (CSE)
IV Year - II Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
IT4201	PROJ	Project work, Seminar and Internship in Industry	0	0	100	100	200	14
Internship (6 Months)								
							Total Credits	**14**

SA **:** Skill Advanced
SI **:** Skill Interdisciplinary
OE/JOE **:** Open Elective / Job Oriented Elective

PROFESSIONAL ELECTIVES

1. PRINCIPLES OF PROGRAMMING LANGUAGES
2. DISTRIBUTED SYSTEM
3. REAL TIME OPERATING SYSTEM
4. SENSOR NETWORK
5. SOFTWARE PROJECT MANAGEMEN
6. SOFTWARE TESTING TECHNIQUE
7. GRID COMPUTINN
8. CLOUD COMPUTING
9. DIGITAL IMAGE PROCESSING
10. MACHINE LEARNIN
11. BIG DATA ANALYTIC
12. NATURAL LANGUAGE PROCESSING
13. SOFT COMPUTING
14. HUMAN COMPUTER INTERACTION (PROF. CH. SN)
15. BIO-INFORMATICS

PRINCIPLES OF PROGRAMMING LANGUAGES

Course objectives:

- To learn the underlying principles and concepts of programming language.
- To understand programming language translation process.
- To expose students to the important paradigms of programming.
- To understand the concepts of distributed processing and network programming.

Course outcomes:

- Ability to compare different programming languages.
- Ability to discuss the significant achievements in programming language history.
- Ability to assess the programming languages in scientific manner.

SYLLABUS

Language Design Issues: Study Programming Languages, History of Programming Languages, Role of Programming Languages, Programming Environments.

Impact of Machine Architectures: Operation of a Computer, Virtual Computers and Binding Times; Language Translation Issues: Programming Language Syntax, Stages in Translation, Formal Translation Models, Recursive Descent Parsing; Modeling Language Properties: Formal Properties of Languages, Language Semantics.

Elementary Data Types: Properties of Types and Objects, Scalar Data Types, Composite Data Types Encapsulation: Structured Data Types, Abstract Data Types, Encapsulation by Subprograms, Type Definitions. Inheritance: Abstract Data Types Revisited, Inheritance, Polymorphism.

Implement and Explicit Sequence Control, Sequence with Arithmetic Expressions, Sequence Control Between Statements, Sequencing with Non arithmetic Expressions.

Subprogram Control: Subprogram Sequence Control, Attributes of Data Control Parameter Transmission, Explicit Common Environment.

Storage Management: Elements Requiring Storage, Programmer- and System - Controlled Storage, Static Storage Management, Heap Storage Management.

Distributed Processing: Variations on Subprogram Control, Parallel Programming, Hardware Developments, Software Architecture. Network Programming: Desktop Publishing, The World Wide Web.

Text Book:

1. Programming languages – Design and Implementation by Terrence W. Pratt Marvin V.Zelkowitz.3 rd Edition, Prentice Hall of India.

Reference Books:

1. Concepts of Programming Languages by Robert L. Sebesta, 4th Edition, Pearson Education.
2. Fundamentals of Programming Languages, Design & Implementation by Seyed
3. H.Roosta. Vikas publications.
4. Programming Languages by Paradigm and Practice – Doris Appleby Julius J. Vendekopple Tata McGraw Hill Edition

DISTRIBUTED SYSTEMS

Course Objectives:

- This course provides an introduction to the fundamentals of distributed computer systems, assuming the availability of facilities for data transmission.

Course Outcomes:

- By the end of the course, students should be able to build distributed systems that:
- Scale as the number of entities in the system increase
- Can sustain failures and recover from them
- Work with distributed, fault tolerant file systems
- Can handle and process large data volumes
- Are secure and handle certain classes of distributed denial of service attacks
- Are Loosely coupled, transactional and eventually stable

SYLLABUS

Introduction to Distributed Systems, What is a Distributed System?, Hard ware concepts, Software concepts, Design issues.

Communication in Distributed Systems, Lay red Protocols, ATM networks, The Client – server model, Remote Procedure call, Group communication.

Synchronization in Distributed System, Clock Synchronization, Mutual Exclusion, Election algorithms, Atomic transactions, Deadlocks in Distributed Systems.

Process and processors in Distributed System threads, System Models, Processors allocation, Scheduling in Distributed System, Fault tolerance, Real time Distributed System.

Distributed File Systems, Distributed File System Design, Distributed File System implementation, Trends in Distributed File System.

Distributed Shared Memory, Introduction, What is Shared memory?, Consistency models, Page based Distributed Shared memory, Shared –variable Distributed Shared memory, Object based Distributed Shared Memory.

Text Book:

Distributed Operating Systems, Andrew S. Tanenbanm

Reference Book:

Advanced Concepts in Operating Systems, Makes Singhal and Niranjan G.Shivaratna

REAL TIME OPERATING SYSTEMS

Course Objectives
The objective of this course is to

- develop an understanding of various Real Time systems Application
- obtain a broad understanding of the technologies and applications for the emerging and exciting domain of real-time systems
- Get in-depth hands-on experience in designing and developing a real operational system.

Course Outcomes
On completion of this course, the students will be able to

- understand concepts of Real-Time systems and modeling
- recognize the characteristics of a real-time system
- understand and develop document on an architectural design of a real-time system
- devel op and document Task scheduling, resource management, real-time operating systems and fault tolerant applications of Real-Time Systems.

SYLLABUS

Introduction to Operating System: Basic Organization, BIOS and Boot Process, Processes, Thread, Multithreading, Scheduling

Real-time concepts: RTOS concepts and definitions, real-time design issues, examples, Hardware

Considerations: logic states**,** CPU, memory, I/O, Architectures, RTOS building blocks, Real-Time Kernel

Process Management: Concepts, scheduling, IPC, RPC, CPU Scheduling, scheduling criteria, scheduling algorithms

Threads: Multi-threading models, threading issues, thread libraries

Mutex: creating, deleting, prioritizing mutex, mutex internals

Inter-process communication: buffers, mailboxes, queues, semaphores, deadlock, priority inversion, Pipes

Memory Management: process stack management, run-time buffer size, swapping, overlays, block/page management, replacement algorithms, real-time garbage collection

Kernel Design Issues: structure, process states, data structures, inter-task communication mechanism, Linux

Text Books:

1. "MicroC/OS-II : The Real-Time Kernel" by J. J. Labrosse, CRC Press.
2. "Real-Time and Embedded Guide" by Herman B

Reference Books:

1. "Real-Time System Design and Analysis" by Philips A. Laplante
2. "Linux for Embedded and Real-Time Applications" by Doug Abbott

SENSOR NETWORKS

Course Objectives:

- To understand the concepts of sensor networks
- To understand the MAC and transport protocols for ad hoc networks
- To understand the security of sensor networks
- To understand the applications of adhoc and sensor networks

Course Outcomes:

- Ability to understand the state-of-the-art research in the emerging subject of Ad Hoc and Wireless Sensor Networks
- Ability to solve the issues in real-time application development based on ASN.
- Ability to conduct further research in the domain of ASN

SYLLABUS

Introduction: The vision of Ambient Intelligence, Application examples, Types of applications, Challenges for Wireless Sensor Networks(WSNs), Sensor networks vs Enabling Technologies for WSNs, **Single node architecture:** Hardware components, Energy consumption of sensor nodes, Some examples of sensor nodes, Operating systems and execution environments

Network architecture: Sensor network scenarios, Optimization goals and figures of merit, Designprinciples for WSNs,Physical layer and transceiver design considerations in WSNs:

MAC Protocols: Fundamentals of (wireless) MAC protocols, Low duty cycle protocols and wakeup concepts, Contention-based protocols, Schedule-based protocols, The IEEE 802.15.4 MAC protocol,How about IEEE 802.11 and Bluetooth

Link layer protocols: Fundamentals: tasks and requirements, Error control, Framing, Link management

Naming and addressing: Fundamentals, Address and name management in wireless sensor networks, Assignment of MAC addresses, Content-based and geographic addressing

Routing protocols: The many faces of forwarding and routing, Energy-efficient unicast, Broadcastand multicast, Geographic routing.

Data-centric and content-based networking : Introduction, Data-centric routing, Data aggregation, Data-centric storage

Transport layer and Quality of Service: The transport layer and QoS in wireless sensor networks, Coverage and deployment, Reliable data transport, Single packet delivery, Block delivery, Congestion control and rate control

Text Book

1. Protocols and Architectures for Wireless Sensor Networks, Holger Karl, Andreas Willig., JohnWiley & Sons Ltd, 2005
2. Network Management Fundamentals, Alexender Clemn CISCIPress2007

SOFTWARE PROJECT MANAGEMENT

Course Objectives:

- To understand the Software Project Planning and Evaluation techniques.
- To plan and manage projects at each stage of the software development life cycle (SDLC).
- To learn about the activity planning and risk management principles.
- To manage software projects and control software deliverables.
- To develop skills to manage the various phases involved in project management and people management.
- To deliver successful software projects that support organization‘s strategic goals.

Course Outcomes:

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

- Understand Project Management principles while developing software.
- Gain extensive knowledge about the basic project management concepts, framework and the process models.
- Obtain adequate knowledge about software process models and software effort estimation techniques.
- Estimate the risks involved in various project activities.
- Define the checkpoints, project reporting structure, project progress and tracking mechanisms using project management principles.
- Learn staff selection process and the issues related to people management

SYLLABUS

Introduction to Software Project Management: Introduction to Project and Project Management, Reasons for IT project failure, Triple constraint of IT project management, Management spectrum of project, Overview of project life cycle models, Project manager skills and job description conceptualization and initiation of IT project, Business case.

Project Charter : Introduction, Project management process and their correlation with project life cycle phases, Introduction to Project Integration management and seven processes, Project Charter. **Project Scope Management:** Introduction, Processes of scope management.

Project Human Resource Management: Introduction, Organizational structure – Function, Project and Matrix, Keys to managing people motivation theories and improving effectiveness, Project team selection.

Project Time and Cost Management : Introduction, Development of project schedule, CPM and PERT, Activities their sequencing and dependencies, Project network diagrams, Development of Gantt Charts, Earned Value Management, Introduction to Constructive Cost Model (COCOMO).

Project Risk Management : Introduction, Risk Management Process, Risk Identification for IT projects, Qualitative and Quantitative approaches to Risk Analysis, Risk Strategies, Risk Monitoring and Control, Risk Response and Evaluation Project Quality Management.

Project Communication Management: Introduction, Project Communication Plan, Project metrics, Information distribution, Performance Reporting. Project Change Management: Introduction, Impact of change, Change as a process, Change Management plan, Dealing with resistance and conflict, Configuration management.

Project Procurement Management: Introduction, Processes Planning Purchases and Acquisition, Contracting, Request Seller Responses, Select Sellers, Contract Administration, Contract Closure, Outsourcing of products and services.

Project Leadership and Ethics: Introduction, Project Leadership, Modern approaches, Styles of leadership, Ethical leadership, Making sound ethical decisions in the situations of conflict. Closure of a Project**:** Introduction, Project implementation, Administrative closure, Project Evaluation.

TEXT BOOK:

1. Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Fifth Edition, Tata McGraw Hill, New Delhi, 2012.

REFERENCES:

1. Robert K. Wysocki ―Effective Software Project Management – Wiley Publication, 2011.
2. Walker Royce: ―Software Project Management- Addison-Wesley, 1998.
3. Gopalaswamy Ramesh, ―Managing Global Software Projects – McGraw Hill Education (India), Fourteenth Reprint 2013

SOFTWARE TESTING TECHNIQUES

Course Objectives:

- To study fundamental co14.ncepts in software testing and discuss various software testing issues and solutions in software unit, integration, regression and system testing
- To learn how to plan a test project, design test cases and data, conduct testing, manage software problems and defects, generate a test report
- To expose the advanced software testing concepts such as object-oriented software testing methods, web-based and component-based software testing

Course Outcomes:

By the end of the course, the student should have the ability to:

- Identify and understand various software testing problems, apply software testing knowledge and engineering methods and solve these problems by designing and selecting software test models, criteria, strategies, and methods
- Design and conduct a software test process for a software project
- Analyze the needs of software test automation
- Use various communication methods and skills to communicate with their teammates to conduct their practice-oriented software testing projects

SYLLABUS

Software Testing: Introduction, Evolution, Myths & Facts, Goals, Psychology, definition, Model for testing, Effective Vs Exhaustive Software Testing.
Software Testing Terminology and Methodology: Software Testing Terminology, Software Testing Life Cycle, Software Testing Methodology.

Verification and Validation: Verification & Validation Activities, Verification, Verification of Requirements, High level and low level designs, verifying code, Validation
Dynamic Testing-Black Box testing techniques: Boundary Value Analysis, Equivalence class Testing, State Table based testing, Decision table based testing, Cause-Effect Graphing based testing, Error guessing

White-Box Testing: need, Logic Coverage criteria, Basis Path testing, Graph matrices, Loop testing, data flow testing, mutation testing Static Testing: Inspections, Structured Walkthroughs, Technical Reviews .Validation activities: Unit testing, Integration Testing, Function testing, system testing, acceptance testing

Regression testing: Progressives Vs regressive testing, Regression test ability, Objectives of regression testing, Regression testing types, Regression testing techniques Efficient Test Suite Management: growing nature of test suite, Minimizing the test suite and its benefits,

test suite prioritization, Types of test case prioritization, prioritization techniques, measuring the effectiveness of a prioritized test suite. Software Quality Management: Software Quality metrics, SQA models Debugging: process, techniques, correcting bugs.

Automation and Testing Tools: need for automation, categorization of testing tools, selection of testing tools, Cost incurred, Guidelines for automated testing, overview of some commercial testing tools such as Win Runner, Load Runner, Jmeter and JUnit . Test Automation using Selenium tool.

Testing Object Oriented Software: basics, Object oriented testing Testing Web based Systems: Challenges in testing for web based software, quality aspects, web engineering, testing of web based systems, Testing mobile systems

Text Books:

1) Software Testing, Principles and Practices, Naresh Chauhan, Oxford.
2) Software Testing- Yogesh Singh, CAMBRIDGE.

Reference books:

1) Foundations of Software testing, Aditya P Mathur, 2ed, Pearson.

Software testing techniques – Baris Beizer, Dreamtech, second edition.

GRID COMPUTING

Course Objectives:

The student should be made to:

- Understand how Grid computing helps in solving large scale scientific problems.
- Gain knowledge on the concept of virtualization that is fundamental to cloud computing.
- Learn how to program the grid and the cloud.
- Understand the security issues in the grid and the cloud environment.

Course Outcomes:

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

- Apply grid computing techniques to solve large scale scientific problems
- Apply the concept of virtualization
- Use the grid and cloud tool kits
- Apply the security models in the grid and the cloud environment

SYLLABUS

Introduction The Data Centre, the Grid and the Distributed / High Performance Computing, Cluster Computing and Grid Computing, Metacomputing – the Precursor of Grid Computing, Scientific, Business and e-Governance Grids, Web Services and Grid Computing, Business Computing and the Grid – a Potential Win – win Situation, e-Governance and the Grid.

Technologies and Architectures for Grid Computing Clustering and Grid Computing, Issues in Data Grids, Key Functional Requirements in Grid Computing, Standards for Grid Computing, Recent Technological Trends in Large Data Grids

World Wide Grid Computing Activities, Organizations and Projects Standard Origanizations, Organizations Developing Grid Computing Tool Kits, Framework, and Middleware, Grid Projects and Organizations Building and Using Grid Based Solutions, Commercial Organizations Building and Using Grid Based Solutions.

Web Services and the Service Oriented Architecture (SOA) History and Background, Service Oriented Architecture, How a Web Service Works, SOAP and WSDL, Description, Creating Web Services, Server Side. OGSA and WSRF OGSA for Resource Distribution, Stateful Web Services in OGSA, WSRF (Web Services Resource Framework), Resource Approach to Stateful Services, WSRF Specification.

Globus Toolkit History of Globus Toolkit, Versions of Globus Toolkit, Applications of GT4-Cases, GT4-Approaches and Benefits, Infrastructure Management, Monitoring and

Discovery, Security, Data, Choreography and Coordination, Main Features of GT4 Functionality – a Summary, GT4 Architecture, GT4 Command Line Programs, GT4 Containers

The Grid and the Databases Issues in Database Integration with the Grid, The Requirements of a Grid-enabled Database, Storage Request Broker (SRB), How to Integrate the Databases with the Grid?, The Architecture of OGSA-DAI for Offering Grid Database Services

Cluster Computing: Approaches to Parallel Computing, How to Achieve Low Cost Parallel Computing through Clusters, Definition and Architecture of a Cluster,

Cluster Middleware : An Introduction Levels and Layers of Single System Image (SSI), Cluster Middleware Design Objectives, Resource Management and Scheduling, Cluster Programming Environment and Tools . Early Cluster Architectures and High Throughput Computing Clusters: Early Cluster Architectures, High Throughput Computing Clusters, Condor.

Text Books

1. C.S.R.Prabhu – "Grid and Cluster Computing"-PHI(2008)
   Chapters: 1 to 13, 16, 17.

Reference Books

Jankiram, "Grid Computing Models : A Research Monograph", TMH (2005)

CLOUD COMPUTING

Course Objectives:

- To import fundamental concepts in the area of cloud computing.
- To understand the concept of Virtualization and cloud data storage.
- To learn cloud Application Development and cloud Governance.
- To gain competence in Map Reduce and Hadoop Overview.

Course Outcomes:

By the end of the course, the student should be able to:

- Identify the architecture and infrastructure of cloud computing.
- Develop applications for cloud computing.
- Design and Implement a novel cloud computing application.

SYLLABUS

Introduction to cloud computing: Cloud computing components, Infrastructure services, storage applications, database services – introduction to Saas, Paas, Iaas, Idaas, data storage in cloud

Virtualization: enabling technologies, types of virtualization, server virtualization, desktop virtualization, memory virtualization, application and storage virtualizationtools and products available for virtualization

SAAS and PAAS: Getting started with Saas, SaaS solutions,SOA , PaaS and benefits.

Iaas and Cloud data storage: understanding Iaas, improving performance for load balancing, server types within Iaas, utilizing cloud based NAS devices, cloud based data storage, and backup services, cloud based block storage and database services

Cloud Application development: Client server distributed architecture for cloud designing cloud based solutions, coding cloud based applications,traditional Apps vs cloud Apps, client side programming, server side programming overview-fundamental treatment of web application frameworks.

Cloud Governance and economics: Securing the cloud, disaster recovery and business continuity in the cloud, Managing the cloud, migrating to the cloud, governing and evaluating the clouds business impact and economics,

Inside Cloud: Introduction to MapReduce and Hadoop-over view of big data and its impact on cloud

Text Books:

1. Cloud Computing: SaaS, PaaS, IaaS, Virtualization, Business Models, Mobile, Security and More, Kris Jamsa, Jones & Bartlett Publishers,Paper back edition, 2013
2. Cloud Computing: A Practical Approach,Anthony T .Velte, Toby J.Velte, Robert Elsenpeter, Tata McGraw Hill Edition

References:

1. Hadoop Map Reduce cookbook, SrinathPerera and Thilina Gunarathne, Packt publishing

DIGITAL IMAGE PROCESSING

Course objectives

- To explain fundamentals of Image processing concepts.
- To provide mathematical foundation of image enhancement , image compression and image segmentation.
- To explain the students about Morphology and its applications in image processing.
- To explain various methods and techniques for image transformation.

Course outcomes

By the end of the course, the student should obtain:

- Ability to develop algorithms for fundamental concepts in Image processing.
- Ability to perform image enhancement , image compression and image segmentation using various methods.
- Ability to implement Image transformation techniques

SYLLABUS

Fundamentals of Image Processing: Image Acquisition, Image Model, Sampling,

Quantization, Relationship Between Pixels, Distance Measures, Connectivity , Image

Geometry, Photographic Film. Histogram: Definition, Decision Of Contrast Basing On Histogram, Operations Basing on Histograms Like Image Stretching, Image Sliding, Image Classification. Definition and Algorithm of Histogram Equalization.

Image Enhancement in Spatial Domain : Arithmetic and Logical Operations, Pixel or Point Operations, Size Operations; Smoothing Filters-Mean, Median, Mode Filters – Comparative Study.

Edge enhancement in spatial domain: Edge enhancement filters, Directorial Filters,

Sobel, Laplacian, Robert, KIRSCH Homogeneity & DIFF filters, PREWITT Filter, Contrast based edge enhancement techniques, Comparative study, Low pass filters, High pass filters, Sharpening filters, Comparative study, Color fundamentals and color model

Image Compression: Run Length Encoding, modified run length encoding, Contour

Coding, Huffman Code, Compression Due to Change in Domain, Compression Due to Quantization Compression at the Time of Image Transmission. Brief Discussion on:- Image Compression Standards.

Image Segmentation: Definition of segmentation, Characteristics of Segmentation,

Detection of Discontinuities, Thresholding. Pixel Based Segmentation Method. Region

Based Segmentation Methods, Segmentation by Pixel Aggregation, Segmentation by Sub Region Aggregation, Histogram Based Segmentation, Spilt and Merge Technique, Segmentation of moving objects.

Morphology: Dilation, Erosion, Opening, Closing, Hit-And-Miss Transform, Thinning, Thickening, Skeletons , Pruning Extensions to Gray – Scale Images Application of Morphology in I.P

Image Transforms : A Detail Discussion On Fourier Transform, DFT,FFT, Properties of

Fourier transform, WALSH Trans Form , WFT, HADAMARD Transform, DCT Image

Enhancement in Frequency Domain: Design of Low Pass, High Pass, EDGE

Enhancement, Smoothening Filters in Frequency Domain. Butter Worth Filter, Homomorphic Filters in Frequency Domain Advantages of Filters in Frequency Domain, Comparative Study of Filters in Frequency, Domain and Spatial Domain.

Text Book:

1. Digital Image Processing, Rafael C. Gonzalez And Richard E. Woods, Addision Wesley

Reference Books:

1. Fundamentals Of Electronic Image Processing By Arthyr – R – Weeks, Jr.(PHI)
2. Image Processing, Analysis, And Machine Vision By Milan Sonka Vaclan Halavac Roger Boyle, Vikas Publishing House.
3. Digital Image Processing, S. Jayaraman, S. Esakkirajan& T. Veera Kumar, TMH
4. Fundamentals of Digital Image Processing, Chris Solomon, Tobi Breckon, WileyBlackwell

MACHINE LEARNING

Course Objectives

- introduce students to the approaches to machine learning and related algorithms
- familiarize students with ideas of concept learning, version spaces and issues regarding data sources
- understand representation and learning using Decision Trees, Neural Networks, Genetic Algorithms
- introduce students to Bayesian approaches and key concepts of Expectation Maximization
- introduce students to inductive and analytical learning problems and related concepts of inductive bias, using prior knowledge to initialize the hypothesis.

Course outcomes

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

- describe learning tasks and various approaches, algorithms in machine learning
- understand concept learning, version spaces and related concepts of bias-free learning and active queries
- represent and formulate problems in Decision Trees, Neural Networks, Genetic Algorithms
- understand the basics of Bayes theorem and key concepts of Expectation Maximization in Bayesian approaches.

SYLLABUS

Introduction to Machine Learning, Applications of Machine learning, Supervisory Learning: Learning classes from examples, Vapnik-Charvonenkis (VC) Dimension, Probably Approximately Correct(PAC) Learning, noise, learning multiple classes, regression, model selection and generalization, dimensions of supervised machine learning algorithms

Bayesian Decision Theory: Classification, losses and risks, discriminant functions, utility theory, value of information, Bayesian networks, Influence diagrams, Association rules, Parametric Methods: Maximum likelihood estimation, evaluating an estimator with bias and variance, Bayes' estimator, parametric classification, regression, tuning model complexity: bias vs variance dilemma, model selection procedures

Multivariate methods: Multivariate data, parameter estimation, missing value imputation, univariate normal distribution and classification, discrete features, regression, Dimensionality Reduction: Subset selection, PCA, Factor Analysis, multi-dimensional scaling, LDA

Clustering: Mixture densities, K-means clustering, Expectation Maximization algorithm, mixtures of Latent Variable Models, Supervised learning after clustering, Hierarchical clustering, choosing number of clusters

Non-parametric methods: Non-parametric methods density estimation, generalisation to multivariate data, nonparametric classification, condensed nearest neighbors, non-parametric regression: smoothing models, choosing smoothing parameters

Decision trees and Linear Discrimination: Univariate classification and regression trees, rule extraction from trees, Multivariate trees, Generalizing linear model, two class and multi-class geometry of linear discriminant, pairwise separation, gradient descent, logistic discrimination for binary and multi-class problems, discrimination by regression, Support vector machines, optimal separating hyperplane, kernel functions for non-separable spaces, SVM for regression.

Hidden Markov Models: Discrete Markov processes, Hidden Markov Models, Three basic problems of HMM, Evaluation problem, finding the state sequence, Learning model parameters, continuous observations, Model selection in HMM Assessing and comparing classification Algorithms: Cross-validation and resampling methods, measuring error, interval estimation, hypothesis testing, assessing performance of a classifier, comparing two classification algorithms, comparing multiple classification algorithms based on variance

Text Book:

1. Introduction to Machine Learning by Ethem Alpaydin, Prentice-Hall of India, 2006

Reference books:

1. Machine Learning, Peter Flach, Cambridge University Press, 2012
2. Machine Learning, Tom Mitchell , McGraw Hill, 1997

BIG DATA ANALYTICS

Course Objectives:

This course is aimed at enabling the students to

- Provide an overview of an exciting growing field of big data analytics.
- Introduce the tools required to manage and analyze big data like Hadoop, NoSQL, Map Reduce, HIVE, Cassandra, Spark.
- Teach the fundamental techniques and principles in achieving big data analytics with scalability and streaming capability.
- Optimize business decisions and create competitive advantage with Big Data analytics

Course Outcomes:

After the completion of the course, student will be able to

- Illustrate on big data and its use cases from selected business domains.
- Interpret and summarize on NoSQL, Cassandra
- Analyze the HADOOP and Map Reduce technologies associated with big data analytics and explore on Big Data applications Using Hive.
- Make use of Apache Spark, RDDs etc. to work with datasets.
- Assess real time processing with Spark Streaming.

SYLLABUS

Introduction big data, why big data, convergence of key trends, unstructured data, industry examples of big data, web analytics, big data and marketing, fraud and big data, risk and big data, credit risk management, big data and algorithmic trading, big data and healthcare, big data in medicine, advertising and big data, big data technologies, introduction to Hadoop, open source technologies, cloud and big data, mobile business intelligence, Crowd sourcing analytics, inter and trans firewall analytics.

Introduction to NoSQL, aggregate data models, aggregates, key-value and document data models, relationships, graph databases, schema less databases, materialized views, distribution models, sharding, master-slave replication, peer- peer replication, sharding and replication, consistency, relaxing consistency, version stamps, Working with Cassandra ,Table creation, loading and reading data.

Data formats, analyzing data with Hadoop, scaling out, Architecture of Hadoop distributed file system (HDFS), fault tolerance ,with data replication, High availability, Data locality , Map Reduce Architecture, Process flow, Java interface, data flow, Hadoop I/O, data integrity, compression, serialization.

Introduction to Hive, data types and file formats, HiveQL data definition, HiveQL data manipulation, Logical joins, Window functions, Optimization, Table partitioning, Bucketing,

Indexing, Join strategies.

Apache spark- Advantages over Hadoop, lazy evaluation, In memory processing, DAG, Spark context, Spark Session, RDD, Transformations- Narrow and Wide, Actions, Data frames ,RDD to Data frames, Catalyst optimizer, Data Frame Transformations, Working with Dates and Timestamps, Working with Nulls in Data,

Working with Complex Types, Working with JSON, Grouping, Window Functions, Joins, Data Sources, Broadcast Variables, Accumulators, Deploying Spark- On-Premises Cluster Deployments, Cluster Managers- Standalone Mode, Spark on YARN , Spark Logs, The Spark UI- Spark UI History Server, Debugging and Spark First Aid

Spark-Performance Tuning, Stream Processing Fundamentals, Event-Time and State full Processing - Event Time, State full Processing, Windows on Event Time- Tumbling Windows, Handling Late Data with Watermarks, Dropping Duplicates in a Stream, Structured Streaming Basics - Core Concepts, Structured Streaming in Action, Transformations on Streams, Input and Output.

Text Books:

1. Big Data, Big Analytics: Emerging, Michael Minnelli, Michelle Chambers, and AmbigaDhiraj
2. SPARK: The Definitive Guide, Bill Chambers &MateiZaharia, O'Reilley, 2018Edition
3. Business Intelligence and Analytic Trends for Today's Businesses", Wiley,2013
4. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World Polyglot Persistence", Addison-Wesley Professional,2012
5. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley,2012

Reference Books:

1. "Hadoop Operations", O'Reilley, Eric Sammer,2012
2. "Programming Hive", O'Reilley, E. Capriolo, D. Wampler, and J. Rutherglen,2012
3. "HBase: The Definitive Guide", O'Reilley, Lars George,2011
4. "Cassandra: The Definitive Guide", O'Reilley, Eben Hewitt,2010
5. "Programming Pig", O'Reilley, Alan Gates,2011

NATURAL LANGUAGE PROCESSING

Course Objectives:

This course introduces the fundamental concepts and techniques of natural language processing (NLP).

- Students will gain an in-depth understanding of the computational properties of natural languages and the commonly used algorithms for processing linguistic information.
- The course examines NLP models and algorithms using both the traditional symbolic and the more recent statistical approaches.
- Enable students to be capable to describe the application based on natural language processing and to show the points of syntactic, semantic and pragmatic processing.

Course Outcomes:

After completion of this course

- Demonstrate a given text with basic Language features
- To design an innovative application using NLP components
- Explain a rule based system to tackle morphology/syntax of a language
- To design a tag set to be used for statistical processing for real-time applications
- To compare and contrast the use of different statistical approaches for different types of NLP applications.

SYLLABUS

INTRODUCTION: Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM – Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance.

WORD LEVEL ANALYSIS: Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part- of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy model

SYNTACTIC ANALYSIS: Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing Probabilistic CFG,

Probabilistic CYK, Probabilistic Lexicalized CFGs – Feature structures, Unification of feature structures

SEMANTICS AND PRAGMATICS: Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.

DISCOURSE ANALYSIS AND LEXICAL RESOURCES: Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC).

Text Books:

1. Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, 2nd Edition, Daniel Jurafsky, James H. Martin -Pearson Publication,2014.
2. Natural Language Processing with Python, First Edition, Steven Bird, Ewan Klein and Edward Loper, OReilly Media,2009.

Reference Books:

1. Language Processing with Java and LingPipe Cookbook, 1st Edition, Breck Baldwin, Atlantic Publisher,2015.
2. Natural Language Processing with Java, 2nd Edition, Richard M Reese, OReilly Media,2015.
3. Handbook of Natural Language Processing, Second, NitinIndurkhya and Fred J. Damerau, Chapman and Hall/CRC Press, 2010.Edition
4. Natural Language Processing and Information Retrieval, 3rd Edition, TanveerSiddiqui, U.S. Tiwary, Oxford University Press,2008.

SOFT COMPUTING

Course objectives:

- To make the student to understand the role of imprecision and uncertainty in real world scenarios.
- To explain the role of Soft Computing in addressing the imprecision and uncertainty.
- To explain the principal components of soft computing that include Fuzzy Sets and Fuzzy Logic, Artificial Neural Networks, Genetic Algorithms and Rough Sets.
- To learn the Design and Implementation of Soft Computing methodologies.
- To explain the design of hybrid systems which is combination of one or more soft computing methodologies mentioned.

Course outcomes:

By the end of the course, the student should be able to obtain:

- Ability to represent Uncertainty / imprecision data.
- Ability to select a suitable method of Soft Computing to solve a particular problem.
- Ability to build hybrid systems using Soft Computing techniques.

SYLLABUS

Soft Computing: Introduction to Fuzzy Computing, Neural Computing, Genetic Algorithms, Associative Memory, Adaptive Resonance Theory, Different Tools and Techniques, Usefulness and Applications.

Fuzzy Sets and Fuzzy Logic: Introduction, Fuzzy Sets Versus Crisp Sets, Operations on Fuzzy Sets, Extension Principle, Fuzzy Relations and Relation Equations, Fuzzy Numbers, Linguistic Variables, Fuzzy Logic, Linguistic Hedges, Applications,

Interference in fuzzy logic: fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzifications and Defuzzificataions, Fuzzy Controller, Fuzzy Controllers, Fuzzy Pattern Recognition, Fuzzy Image Processing, Fuzzy Database.

Artificial Neural Network: Introduction, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, re-current networks. Various learning techniques, perception and convergence rule, Auto-associative and hetro-associative memory , Hebb's Learning, Adaline, Perceptron

Multilayer Feed Forward Network: Back Propagation Algorithms, Different Issues Regarding Convergence of Multilayer Perceptron, Competitive Learning, SelfOrganizing, Feature Maps, Adaptive Resonance Theory, Associative Memories, Applications.

Evolutionary and Stochastic Techniques: Genetic Algorithm (GA), Genetic Representations, (Encoding) Initialization and Selection, Different Operators of GA, Analysis of Selection Operations, Hypothesis of Building Blocks, Schema Theorem and Convergence of Genetic Algorithm, Simulated Annealing and Stochastic Models, Boltzmann Machine, Applications.

Rough Set: Introduction, Imprecise Categories Approximations and Rough Sets, Reduction of Knowledge, Decision Tables and Applications. Hybrid Systems: NeuralNetwork-Based Fuzzy Systems, Fuzzy Logic-Based Neural Networks, Genetic Algorithm for Neural Network Design and Learning, Fuzzy Logic and Genetic Algorithm for Optimization, Applications

Text Books:

1. Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications, S.Rajsekaran and G.A. Vijayalakshmi Pai, Prentice Hall of India.
2. Rough Sets, Z.Pawlak, Kluwer Academic Publisher, 1991.
3. Intelligent Hybrid Systems, D. Ruan, Kluwer Academic Publisher, 1997

References:

1. Artificial Intelligence and Intelligent Systems, N.P.Padhy, Oxford University Press.
2. Neural Fuzzy Systems, Chin-Teng Lin & C. S. George Lee, Prentice Hall PTR. Addison-Wesley
3. Learning and Soft Computing, V. Kecman, MIT Press, 2001
4. Fuzzy Sets and Fuzzy Logic, Klir & Yuan, PHI, 1997

HUMAN COMPUTER INTERACTION

Course Objectives:

- To gain an overview of Human-Computer Interaction, with an understanding of user interface design in general, and alternatives to traditional "keyboard and mouse" computing
- be able to predict user performance in various human-computer interaction tasks
- appreciate the importance of a design that maintains a focus on the user; be familiar with a variety of both conventional and non-traditional user interface paradigms

Course Outcomes:

By the end of the course, the student should be able to:

- apply HCI and principles to interaction design.
- appreciate importance of user documentation and information search

SYLLABUS

Introduction: Usability of Interactive Systems- introduction, usability goals and measures, usability motivations, universal usability, goals for our profession Managing Design Processes: Introduction, Organizational design to support usability, Four pillars of design, development methodologies, Ethnographic observation, Participatory design, Scenario Development, Social impact statement for early design review, legal issues, Usability Testing and Laboratories

Menu Selection, Form Fill-In and Dialog Boxes: Introduction, Task- Related Menu Organization, Single menus, Combinations of Multiple Menus, Content Organization, Fast Movement Through Menus, Data entry with Menus: Form Fill-in, dialog Boxes, and alternatives, Audio Menus and menus for Small Displays

Command and Natural Languages: Introduction, Command organization Functionality, Strategies and Structure, Naming and Abbreviations, Natural Language in Computing Interaction Devices: Introduction, Keyboards and Keypads, Pointing Devices, Speech and Auditory Interfaces, Displays- Small and large

Quality of Service: Introduction, Models of Response-Time impacts, Expectations and attitudes, User Productivity, Variability in Response Time, Frustrating Experiences Balancing Function and Fashion: Introduction, Error Messages, Nonanthropomorphic Design, Display Design, Web Page Design, Window Design, Color

User Documentation and Online Help: Introduction, Online Vs Paper Documentation, Reading from paper Vs from Displays, Shaping the content of the Documentation, Accessing the Documentation, Online tutorials and animated documentation, Online communities for User Assistance, The Development Process

Information Search: Introduction, Searching in Textual Documents and Database Querying, Multimedia Document Searches, Advanced Filtering and Searching Interfaces

Information Visualization: Introduction, Data Type by Task Taxonomy, Challenges for Information Visualization

Text Books:

1. Designing the User Interface, Strategies for Effective Human Computer Interaction, 5ed, Ben
2. Shneiderman, Catherine Plaisant, Maxine Cohen, Steven M Jacobs, Pearson
3. The Essential guide to user interface design,2/e, Wilbert O Galitz, Wiley DreamaTech.

Reference Books:

1. Human Computer, Interaction Dan R.Olsan, Cengage ,2010.
2. Designing the user interface. 4/e, Ben Shneidermann , PEA.

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BIO-INFORMATICS

Course Objectives

- To import fundamental concepts in the area of Bioinformatics.
- To understand the concept of DNA Sequence analysis and Protein Information Resources.
- To learn Pairwise alignment techniques and Secondary database searching.
- To gain competence in Analysis packages.

Course Outcomes

By the end of the course, the student should be:

- Able to understand the application areas of Bioinformatics.
- Able to realize the revolution of Bioinformatics in present areas
- Able to understand building blocks of Bioinformatics and characteristics.

SYLLABUS

Basic Biology: What is life? The unity and the diversity of living things. Prokaryotes and Eukaryotes, Yeast and People, Evolutionary time and relatedness, Living parts: Tissues, cells, compartments and organelles, Central dogma of molecular biology, Concept of DNA, RNA, Protein and metabolic pathway. What is Bioinformatics? Recent challenges in Bioinformatics.

Biological databases: Their needs and challenges. Example of different biological databases – sequence, structure, function, micro-array, pathway, etc.

Sequence Analysis: Theory and Tools: -Pairwise alignment – Different local and global search alignment, Heuristic searches (like BLAST) applicable to search against database, Multiple alignment algorithms, Whole genome comparison.

Walk through the genome: Prediction of regulatory motifs, Operon, Gene, splices site, etc.

Markov models: Hidden Markov models – The evaluation, decoding and estimation problem and the algorithms. Application in sequence analysis.

Molecular phylogeny: maximum Parsimony, distance Matrix and maximum likelihood methods. Concepts of adaptive evolution.

Application of graph theory in Biology: Biochemical Pathway, Protein-protein interaction network, Regulatory network and their analysis.

Text Books:

1. Bioinformatics: David Mount
2. Biological Sequence Analysis: Probabilistic Models of Proteins and Nucleic acids, R.

3. Durbin, S.R. Eddy, A. Krogh and G. Mitchison**.**

OPEN ELECTIVES:

1. CYBER SECURITY & DIGITAL FORENSICS
2. BLOCK CHAIN TECHNOLOGIES
3. MOBILE COMPUTING
4. MOBILE ADHOC NETWORKS
5. RECOMMENDER SYSTEMS
6. NOSQL DATABASE
7. DATA SCIENCE
8. BUSINESS ANALYTICS
9. PYTHON PROGRAMMING
10. WEB TECHNOLOGIES
11. INTERNET OF THINGS
12. EMBEDDED SYSYTEMS

CYBER SECURITY & DIGITAL FORENSICS

Course Objective

- Understand the threats in networks and security concepts.
- Apply authentication applications in different networks.
- Understand security services for email.
- Awareness of firewall and it applications.

Course Outcomes

By the end of the course, the student should be able to:

- Differentiate among different types of security attacks.
- Define computer forensics.
- Identify the process in taking digital evidence.
- Describe how to conduct an investigation using methods of memory, operating system, and network and email forensics.
- Assess the different forensics tools.

SYLLABUS

Introduction to Information Security Fundamentals and Best Practices: Protecting Your Computer and its Contents, Securing Computer Networks--Basics of Networking, Compromised Computers, Secure Communications and Information Security Best Practices, Privacy Guidelines, Safe Internet Usage.

Ethics in Cyber Security & Cyber Law: Privacy, Intellectual Property, Professional Ethics, Freedom of Speech, Fair User and Ethical Hacking, Trademarks, Internet Fraud, Electronic Evidence, Cybercrimes.

Penetration Testing: Overview of the web from a penetration testers perspective, Exploring the various servers and clients, Discussion of the various web architectures, Discussion of the different types of vulnerabilities, Defining a web application test scope and process, Defining types of penetration testing.

Web Application Security: Common Issues in Web Apps, What is XSS, SQL injection, CSRF, Password Vulnerabilities, SSL, CAPTCHA, Session Hijacking, Local and Remote File Inclusion, Audit Trails, Web Server Issues.

Forensics & Network Assurance: Forensic Technologies, Digital Evidence Collection, Evidentiary Reporting, Layered Defense, Surveillance and Reconnaissance, Outsider Thread Protection

Information Risk Management: Asset Evaluation and Business Impact Analysis, Risk Identification, Risk Quantification, Risk Response Development and Control, Security Policy,

Compliance, and Business Continuity. Forensic investigation using Access Data FTK, En-Case

Cyber Incident Analysis and Response: Incident Preparation, Incident Detection and Analysis. Containment, Eradication, and Recovery. Proactive and Post-Incident Cyber Services, CIA triangle

Text Books:

1 The Official CHFI Study Guide for Computer Hacking Forensic Investigator by Dave Kleiman

2 CISSP Study Guide, 6th Edition by James M. Stewart

BLOCK CHAIN TECHNOLOGY

Course Objectives:

- To understand the basic concepts block chain technology and to explore the driving force behind the crypto currency Bitcoin.
- To understand about the different methods of Decentralization using Block Chain and different Bitcoins and Alternative Coins.
- To understand about Ethereum and applications using Smart contracts and Block Chain Applications

Course Outcomes:

At the end of the course the student will be able to:

- Understand the types, benefits and limitation of block chain.
- Explore the block chain decentralization and cryptography concepts.
- Enumerate the Bitcoin features and its alternative options.
- Describe and deploy the smart contracts

SYLLABUS

BlockChain and its History: History of blockchain, Types of blockchain, Blockchain Components – Permissioned Blockchain Permission less Blockchain – Consortium Blockchain – basics of Consensus Algorithms, Architecture & Properties of Blockchain.

Decentralization and Consensus Algorithms :Decentralization using blockchain, Methods of decentralization, Routes to decentralization, Decentralized organizations, Distributed systems, Distributed ledger, Merkle tree, structure of a block, Consensus

Algorithms- Proof of Work, Proof of Stack, Proof of Burn, Proof of Elapsed Time, Proof of Activity, Proof of Concept.

Bitcoin and Alternative Coins : Bitcoin, Transactions, Bitcoin payments , Bitcoin properties – Transaction life cycle – creation of coin –sending payments – double spending using blockchain – bitcoin anonymity – Ether: Ethercoin properties, Alternative Coins, Bitcoin limitations, Namecoin, Litecoin, Primecoin, Zcash

Ethereum and smart contracts: Ethereum Architecture, solidity programming basics, Smart Contract, Deploying Smart Contracts, Integration with UI.

Blockchain Applications : Blockchain-Outside of Currencies: Internet of Things, Government, Health, Finance, Media ,Secure Voting and Digital Identity, Real Estate, Education

Textbooks:

1. Mastering Blockchain - Distributed ledgers, decentralization and smart contracts explained, Author- Imran Bashir, Packt Publishing Ltd, Second Edition, ISBN 978-1-78712-544-5, 2017
2. Bitcoin and Cryptocurrency Technologies, Author- Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder, Princeton University, 2016
3. Blockchain Technology, Author- Chandramouli Subramanian, Asha A George, Abhilash K A, Meena Karthikeyan,University Press (India) Private Limited, 2021

References:

1. Blockchain Basics: A Non-Technical Introduction in 25 Steps, Author- Daniel Drescher, Apress, First Edition, 2017

MOBILE COMPUTING

Course objectives

- To introduce the basic concepts and principles in mobile computing. This includes major techniques involved, and networks & systems issues for the design and implementation of mobile computing systems and applications.
- To explore both theoretical and practical issues of mobile computing.
- To provide an opportunity for students to understand the key components and technologies involved and to gain hands-on experiences in building mobile applications.

Course outcomes

On successful completion of course learner will be able:

- To identify basic concepts and principles in mobile communication & computing, cellular architecture.
- To describe the components and functioning of mobile networking.
- To classify variety of security techniques in mobile network.
- To describe and apply the concepts of mobility management

SYLLABUS

Basics of Android: Introduction to Android Operating System, Version of Android, Installing of software, Android example, Internal Details, Software Stack, Android Core Building Blocks, Android Emulator, AndroidManifest.xml, R.java file, Hide Title Bar, Screen Orientation.

User Interface Widgets: Working with Button, Toast, Custom Toast, Button, Toggle Button, Switch Button, Image Button, Check Box, Alert Dialog, Spinner, Spinner and other widgets, Auto Complete Text View, Rating Bar, Date Picker. Time Picker, Progress Bar, Activity life cycle and example, Intents-types, Fragment lifecycle and types.

Android Menu, Layouts and Views: Option Menu, Context Menu, Popup Menu, Types of layouts-Relative, Linear, Table, Grid. Types of views- Grid, Web, Scroll, Search, Tab Host, Dynamic List, Expanded List views.

Android services and Data storage: web service, Android services, Android Service API, lifecycle and examples. Shared preferences, Soap Vs Restful web service, , Internal storage, External storage, Sqlite Databases, Storing data into external oracle database.

Multimedia and Animation: Playing audio and video, creating audio player ,Alarm manager, gallery, Animation API, Drawable class, Rotate, Fade, Zoom animations, XML &JSON -XML Parsing SAX, XML Parsing DOM , XML Pull Parser , JSON Parsing.

Speech API and Telephony API, Web services: Text To Speech API, Example, managing speech and pitch, Speech to text. Telephony manager, Get calls state, call tracker, make phone call and send SMS, Email. Web Service introduction, SOAP vs RESTFUL web services, external oracle data base connections.

Content Providers and Notifications: Fundamentals of content providers, Content URI, Creation of custom content provider. Notification API, Notification Builder, Issuing notifications, Notification Compact builder, Examples

Text Book

1. Beginning Android 4 Application Development- WEI-MENG LEE, Wiley India Pvt.ltd

Reference Books

1. Introduction to Android Application Development: Android Essentials,4/E, Joseph Annuzzi, Jr.Lauren Darcey, Shane Conder, Pearson Education publishers
2. Professional Android 4 Application Development, Reto Meier, Wiley India Pvt.ltd
3. Android Application Development, Pradeep Kothari, Dreamtech publications
4. http://developer.android.com/guide/index.html

MOBILE ADHOC NETWORK

Course Objectives

- To understand the concepts of mobile adhoc networks
- To understand the concepts of wireless LANs, wireless adhoc networks, types and their routing protocols
- To introduce students to mobile communications and mobile computing
- To understand basics of Mobile Data Networks, MANETs and other wireless technologies

Course outcomes

By the end of the course, the student should be able to obtain:

- Ability to understand the state-of-the-art research in the emerging subject of Mobile Adhoc Networks
- Explain basics, standards and topologies of wireless LANs
- Understand basics, types, routing protocols and applications of wireless adhoc networks
- Understand basics of Mobile Data Networks, MANETs and other wireless technologies

SYLLABUS

Introduction: Introduction to Wireless Networks, Various Generations of Wireless Networks, Virtual Private Networks- Wireless Data Services, Common Channel Signaling, Various Networks for Connecting to the Internet, Bluetooth Technology, Wifi-WiMax-Radio Propagation mechanism, Path loss Modeling and Signal Coverage

Wireless Local Area Networks: Introduction-WLAN topologies-IEEE 802.11 Standards ,MAC Protocols, Comparison of 802.11 a,b,g and n Standards, HIPER LAN , ZigBee802.15.4,WirelessLocalLoop

Wireless Adhoc Networks: Basics of Wireless Networks, Infrastructure Versus Infrastructure less Networks – Properties of Wireless, AD hoc Networks, Types of Ad Hoc Networks, Challenges in AD Hoc Networks – Applications of Wireless AD Hoc Networks , Routing Protocols for Ad Hoc Networks: Introduction-Proactive Routing Protocols- Reactive Routing protocols-Hybrid Routing Protocols-QoS Metrics-Energy impact issues in Routing.

Mobile Communications: Introduction to cellular concept, Frequency Reuse, Handoff, GSM:Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security, and New data services, Introduction to mobile computing, novel applications, limitations, and architecture.

Mobile Data Networks: Location/mobility management, Mobile IP, Dynamic routing protocols, Location-based protocols, Emerging topics: sensor networking, Data-Oriented CDPD network, GPRS and higher data rates, Short messaging service in GSM.

Mobile Ad Hoc Networks (MANETs): Overview, Properties of A MANET, Spectrum of MANET Applications, Routing and Various Routing Algorithms.

Other Wireless Technologies: Introduction, IEEE802.15.4 and Zigbee, General Architecture, Physical Layer, MAC layer, Zigbee, WiMAX and IEEE 802.16, Layers and Architecture, Physical Layer, OFDM Physical layer.

Security in Ad Hoc Networks: Introduction- Security Attacks, Intrusion Detection System, Intrusion Prevention system, Intrusion Response system, Wired Equivalent Privacy(WEP) -A Security Protocol for Wireless Local Area Networks (WLANs), Security in MANETs.

Text Books

1. Principles of Wireless Networks, Kaveth Pahlavan, K.Prasanth Krishnamurthy, Pearson Publications, Asia, 2002
2. Mobile Cellular Communications, G. Sasibhusan Rao, Pearson Publications.

Reference Books

1. Guide to Wireless Ad Hoc Networks: Series: Computer Communications and Networks,
2. Misra,Sudip; Woungang, Isaac; Misra, Subhas Chandra, 2009,Springer

RECOMMENDER SYSTEM

Course Objectives:

This course covers the basic concepts of recommender systems, including personalization algorithms, evaluation tools, and user experiences

Course Outcomes:

By the end of the course, the student should be able to:

- Describe basic concepts behind recommender systems
- Explain a variety of approaches for building recommender systems
- Describe system evaluation methods from both algorithmic and users' perspectives
- Describe applications of recommender systems in various domains

SYLLABUS

Collaborative recommendations: User-based nearest neighbor recommendation, Item - based nearest neighbor recommendation, About ratings, Model-based and Preprocessing-based approaches, Recent practical approaches and Systems.

Content- based recommendation: Content representation and content similarity, Similarity-based retrieval, Other text classification methods.

Knoledge-based recommendation: Introduction ,Knowledge representation and reasoning, Interacting with constraint--based recommenders, Interacting with case-based recommenders, Example applications.

Hybrid recommendation approaches: Opportunities for hybridization , Monolithic hybridization design, Parallelized hybridization design, Pipelined hybridization design.

Evaluating recommender systems: Introduction , General properties of evaluation research, Popular evaluation designs, Evaluation on historical datasets, Alternate evaluation designs.

Attacks on collaborative recommender systems: A first example, Attack dimensions , Attack types, Evaluation of effectiveness and countermeasures, Countermeasures, Privacy aspects - distributed collaborative filtering.

Online consumer decision making: Introduction , Context effects, Primacy/recency effects, Further effects, Personality and social psychology. Recommender systems and the next-generation web: Trust aware recommender systems, Folksonomies and more, Ontological filtering, Extracting semantics from the web.

Text Book:

1. Recommender Systems: An Introduction by Dietmar Jannach, Markus Zanker, Alexander Felfernig, Gerhard Friedrich, Cambridge University Press.

Reference Book:

1. Recommender Systems: The Textbook by Charu C. Aggarwal, Springer Publications.

NoSQL DATABASES

Course Objectives:

Upon successful completion of this course, a student will be able to:

- Define NoSQL, its characteristics and history, and the primary benefits for using NoSQL data
- Define the major types of NoSQL databases including a primary use case and advantages/disadvantages of each type
- Create wide-column, document, key-value, graph and object-oriented databases, add content, and run queries 3.
- Describe the NoSQL data architecture patterns
- Perform basic database administration tasks.
- Develop NoSQL desktop and cloud database solutions.

Course Outcomes:

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

- Enumerate different features of NOSQL Databases
- Compare different data models
- Design a Key-Value Database for a real world problem
- Design a Document Database for a real world problem
- Design a Graph Database for a real world problem

SYLLABUS

Introduction to NoSQL. The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Standard Model, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters,The Emergence of NoSQL.

Aggregate Data Models, Aggregates, Consequences of Aggregate Orientation, Key-Value and Document Data Models, Column-Family Stores, Summarizing Aggregate-Oriented Databases.

More Details on Data Models, Relationships, Graph Databases, Schemaless Databases, Materialized Views, Modeling for Data Access, Distribution Models, Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication, Consistency, Update Consistency, Read Consistency, Relaxing Consistency, The CAP Theorem, Relaxing Durability, Quorums

Key-Value Databases, Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information,

User Profiles, Preferences, Shopping Cart Data, When Not to Use, Relationships among Data, Multi operation Transactions, Query by Data, Operations by Sets

Document Databases, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analytics or Real-Time Analytics, E-Commerce Applications, When Not to Use, Complex Transactions Spanning Different Operations, Queries against Varying Aggregate Structure

Column-Family Stores, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Counters.

Graph Databases, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Connected Data, Routing, Dispatch, and Location-Based Services Recommendation Engines

Text Books:

1. Sadalage, P. & Fowler, M., NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence. (1st Ed.). Upper Saddle River, NJ: Pearson Education, In, 2012.

Reference Books:

1. Gauravvaish, Getting started with NoSQL , PACKT publishing, ISBN: 978184969488
2. Redmond, E. & Wilson, J., Seven Databases in Seven Weeks: A Guide to Modern Databases and the NoSQL Movement (1st Ed.), 2012
3. Raleigh, NC: The Pragmatic Programmers, LLC. ISBN-13: 978- 1934356920 ISBN-10: 1934356921

DATA SCIENCE

Course Objectives:

From the course the student will learn

- Provide you with the knowledge and expertise to become a proficient data scientist.
- Demonstrate an understanding of statistics and machine learning concepts that are vital for data science
- Learn to statistically analyze a dataset;

Course Outcomes:

At the end of the course, student will be able to

- Describe what Data Science is and the skill sets needed to be a data scientist
- Explain in basic terms what Statistical Inference means. Identify probability distributions commonly used as foundations for statistical modeling. Fit a model to data
- Use R to carry out basic statistical modeling and analysis
- Apply basic tools (plots, graphs, summary statistics) to carry out EDA Describe the Data Science Process and how its components interact.

SYLLABUS

Introduction: The Ascendance of Data, Motivating Hypothetical: Data Sciencester, Finding Key Connectors, The Zen of Python, Getting Python, Virtual Environments, Whitespace Formatting, Modules, Functions, Strings, Exceptions, Lists, Tuples, Dictionaries defaultdict, Counters, Sets, Control Flow, Truthiness, Sorting, List Comprehensions, Automated Testing and assert, Object-Oriented Programming, Iterables and Generators, Randomness, Regular Expressions, Functional Programming, zip and Argument Unpacking, args and kwargs, Type Annotations, Type Annotations.

Visualizing Data: matplotlib, Bar Charts, Line Charts, Scatterplots. Linear Algebra: Vectors, Matrices, Statistics: Describing a Single Set of Data, Correlation, Simpson's Paradox, Some Other Correlational Caveats, Correlation and Causation.

Gradient Descent: The Idea Behind Gradient Descent, Estimating the Gradient, Using the Gradient, Choosing the Right Step Size, Using Gradient Descent to Fit Models, Minibatch and Stochastic Gradient Descent.
Getting Data: stdin and stdout, Reading Files, Scraping the Web, Using APIs,

Working with Data: Exploring Your Data Using Named Tuples Data classes, Cleaning and Munging, Manipulating Data, Rescaling, Dimensionality Reduction.

Machine Learning: Modeling, Over fitting and Underfitting, Correctness, The Bias-Variance Tradeoff, Feature Extraction and Selection, k-Nearest Neighbors, Naive Bayes, Simple Linear Regression, Multiple Regression, Digression, Logistic Regression Support Vector Machines, Decision Trees

Neural Networks: Perceptrons, Feed-Forward Neural Networks, Backpropagation. Clustering: The Idea, The Model, Choosing k, Bottom-Up Hierarchical Clustering. Recommender Systems:

Manual Curation, Recommending What's Popular, User-Based Collaborative Filtering, Item-Based Collaborative Filtering, Matrix Factorization

Data Ethics, Building Bad Data Products, Trading Off Accuracy and Fairness, Collaboration, Interpretability, ecommendations, Biased Data, Data Protection IPython, Mathematics, NumPy, pandas, scikit-learn, Visualization, R Up Hierarchical Clustering.

Text books:

1. Joel Grus, "Data Science From Scratch", OReilly.
2. Allen B.Downey, "Think Stats", OReilly.

Reference Books:

1. Doing Data Science: Straight Talk From The Frontline, 1st Edition, Cathy O'Neil and Rachel Schutt, O'Reilly, 2013.
2. Mining of Massive Datasets, 2nd Edition, Jure Leskovek, Anand Rajaraman and Jeffrey Ullman, v2.1, Cambridge University Press, 2014.
3. "The Art of Data Science", 1st Edition, Roger D. Peng and Elizabeth matsui, Lean Publications, 2015
4. "Algorithms for Data Science", 1st Edition, Steele, Brian, Chandler, John, Reddy, Swarna, Springer's Publications, 2016.

BUSINESS ANALYTICS

Course objectives:

- To introduce students to problem solving with Business Analytics and the use of spreadsheets for descriptive analytics, data queries and visualization
- To introduce students to statistical sampling, sampling distributions, confidence intervals and statistical inference
- To familiarize students with various types of regression including simple linear regression and multiple linear regression

Course outcomes:

After completion of the course the student should be able to:

- Describe data and models used for Business Analytics and apply various descriptive analytic techniques to analyze data
- Estimating population parameters, interval estimates, construct confidence intervals and perform hypothesis testing
- Estimate and interpret the parameters of simple linear regression and multiple linear regressions

SYLLABUS

Foundations of Business Analytics: Evolution of Business Analytics, Scope, data and models for Business Analytics, problem solving with Business Analytics, Analytics on spreadsheets, Excel functions for Database queries, Add-ons for Business Analytics. Descriptive Analytics: Data visualization, creating charts in MS Excel, Data Queries, Tables, sorting and filtering, Data summarization with statistics, Data exploration using Pivot tables

Statistical Sampling: methods, estimating population parameters, sampling error, sampling distributions, interval estimates, confidence intervals, using confidence intervals for decision making, prediction intervals Statistical Inference: Hypothesis testing, one-sample Hypothesis testing, two-tailed test of Hypothesis for mean, two-sample Hypothesis testing, Analysis of variance, chi-square test for independence

Trendliness and Regression: Modelling Relationships and trends in data, Simple linear regression, least squares regression, regression on analysis of variance, testing hypothesis for regression coefficients, Confidence intervals for regression coefficients, Residual analysis and regression assumptions, Multiple linear regression, building regression models, regression with categorical independent variables with two or more levels, regression with nonlinear terms, advanced techniques for regression modelling

Forecasting Techniques: Qualitative and judgemental forecasting, statistical forecasting models, forecasting models for stationery time series, forecasting models for time series with linear trend, forecasting models for time series with seasonality, selecting appropriate time-series-based forecasting models, regression forecasting with casual variables, practice of forecasting

Spreadsheet modeling and Analysis: Strategies for predictive decision modelling, Implementing models on spreadsheet, spreadsheet applications in Business analytics, Model assumptions, complexity and realism, developing user-friendly applications, analyzing uncertainty and model assumptions, model analysis using analytics solver platform

Linear Optimization & Applications: Building Linear Optimization Models on spreadsheets, solving Linear Optimization models, Graphical interpretation of linear optimization, Using optimization models of prediction and insight, Types of constraints in optimization models, process selection models, Blending Models, Portfolio Investment models

Text Book

1. "Business Analytics: Methods, Models, and Decisions" James R. Evans, Pearson Publications,Second edition

Reference Book

1. "Business Analytics: The Science of Data-Driven Decision Making", U.Dinesh Kumar, Wiley Publications

PYTHON PROGRAMMING

Course Objectives

- To develop skills on procedural oriented and object oriented programming in Python
- To understand and apply different data wrangling techniques using Python.
- To perform data analysis using python libraries like NumPy, Pandas and exploratory data analysis using Matplotlib

Course Outcomes

At the end of the course, a student should be able to:

- acquire programming knowledge on Basics of Python
- acquire programming knowledge on Text and File Handling
- develop Python programs to Mean, Median, Mode, Correlation
- acquire programming knowledge on NumPy, Pandas Library
- acquire programming knowledge on Graph Visualizations in Python and Data Analysis using Python

SYLLABUS

Introduction to Python: Rapid Introduction to Procedural Programming, Data Types: Identifiers and Keywords, Integral Types, Floating Point Types Strings: Strings, Comparing Strings, Slicing and Striding Strings, String Operators and Methods, String formatting with str.format Collections Data Types: Tuples, Lists, Sets, dictionaries, Iterating and copying collections

Python Control Structures, Functions and OOP: Control Structures and Functions: Conditional Branching, Looping, Exception Handling, Custom Functions, Python Library Modules: random, math, time, os, shutil, sys, glob, re, statistics, creating a custom module

Object Oriented Programming: Object Oriented Concepts and Terminology, Custom Classes, Attributes and Methods, Inheritance and Polymorphism, Using Properties to Control Attribute Access, File Handling: Writing and Reading Binary Data, Writing and Parsing Text Files

NumPy Arrays and Vectored Computation: NumPy arrays, Array creation, Indexing and slicing, Fancy indexing, Numerical operations on arrays, Array functions, Data processing using arrays, Loading and saving data, Saving an array, Loading an array, Linear algebra with NumPy, NumPy random number

Data Analysis with Pandas: An overview of the Pandas package, The Pandas data structure-Series, The Data Frame, The Essential Basic Functionality: Rendering and altering labels ,

Head and tail, Binary operations, Functional statistics , Function application Sorting, Indexing and selecting data, Computational tools, Working with Missing Data, Advanced Uses of Pandas for Data Analysis - Hierarchical indexing, The Panel data

Data Analysis Application Examples: Data munging, Cleaning data, Filtering, Merging data, Reshaping data, Data aggregation, Grouping data

Data Visualization: The matplotlib API primer-Line properties, Figures and subplots, Exploring plot types-Scatter plots, Bar plots, Histogram plots, Legends and annotations, Plotting functions with Pandas.

Text Books

1. Programming in Python 3: A Complete Introduction to Python Language, Mark Summerfield, Second Edition, Addison-Wesley Publications
2. Python: End-to-End Data Analysis Learning Path, Module 1: Getting Started with Python Data Analysis , Phuong VothiHong , Martin Czygan, , Packt Publishing Ltd

Reference Books

1. Learning Python, 5th Edition, Mark Lutz, Orielly Publications
2. Python for Data Analysis, Wes McKinney, Orielly Publications
3. How to Think Like a Computer Scientist: Learning with Python 3 Documentation 3rd Edition, Peter Wentworth, Jeffrey Elkner, Allen B. Downey, Chris Meyers
4. Core Python Programming, Second Edition, Wesley J. Chun, Prentice Hall
5. Python Cookbook – Recipes for Mastering Python 3,3rdEdition, David Beazley, Brian K. Jones, Oreilly

WEB TECHNOLOGIES

Course Objectives:

On completing this course student will be able to

- Understand the principles of Web based application development.
- Design dynamic content in Web Pages using JavaScript.
- Understanding the concepts of java Servlets, java Server Pages and design applications using them.
- Understand the concepts of Component development and design applications by establishing connections to Databases

Course Outcomes :

- Students will be able to construct web based applications and Identify where data structures are appearing in them.
- Students will be able to connect java programs to different databases.
- Students will be able to develop EJB programs

SYLLABUS

Introduction to HTML , Core Elements , Links and Addressing, Images , Text , Colors and Background, Lists, Tables and Layouts , Frames, Forms , Cascading Style Sheets.

Introduction to Java Scripts, Elements of Objects in Java Script, Dynamic HTML with Java Script

Document type definition, XML Syntax, XML Schemas, Document Object model, Presenting XML, Using XML Processors

Introduction to Servlet, Servlet Life Cycles, Servlet Basics, Tomcat Web Server, Configuring Apache Tomcat, Handling Client Request and Response, Handling Cookies, Session Tracking.

Introduction to PHP, Language Basics, Functions, Strings, Arrays. Web Techniques, Data bases, Graphics, PDF, Dates and Times.

Web Services: JAX-RPC-Concepts-Writing a Java Web Service-Writing a Java Web Service Client- Describing Web Services: WSDL- Representing Data Types: XML Schema-Communicating Object Data: SOAP Related Technologies-Software Installation-Storing Java Objects as Files-Databases and Java Servlets.

MYSQL Installation, Accessing MySQL Using PHP, Form Handling, Cookies, Sessions, and Authentication,Tables, Inserting Data into Tables , Selecting Data from a Table,Updating Table , Deleting data from Table, Webpage creation.

Text Books:

1. Web Programming, building internet applications, 2nd Ed., Chris Bates, Wiley Dreamtech
2. The complete Reference HTML and DHTML, Thomas A. Powey
3. Learning Php, Mysql, Robin Nixon
4. Programming Php, Kevin Tatroe, Peter MacIntyre & Rasmus Lerdorf foreword by Michael Bourque.

Reference Books:

1. Internet , World Wide Web , How to program, Dietel , Nieto, PHI/PEA
2. Web Tehnologies, Godbole, kahate, 2nd Ed., TMH

INTERNET OF THINGS

Course Objectives:

- Vision and Introduction to Internet of Things(IoT).
- Understand IoT Market perspective.
- Data and Knowledge Management and use of Devices in IoT Technology.
- Understand State of the Art – IoT Architecture.
- Understand Real World IoT Design Constraints, Industrial Automation and Commercial.

Course Outcomes (COs):

At the end of the course, student will be able to

- Explain in a concise manner how the general Internet as well as Internet of Things work.
- Understand constraints and opportunities of wireless and mobile networks for Internet of Things.
- Use basic sensing and measurement and tools to determine the real-time performance of network of devices.
- Develop prototype models for various applications using IoT technology.

SYLLABUS

The Internet of Things: An Overview of Internet of things, Internet of Things Technology, behind IoTs Sources of the IoTs, M2M Communication, Examples of IoTs, Design Principles For Connected Devices Internet Connectivity Principles, Internet connectivity, Application Layer Protocols: HTTP, HTTPS, FTP, Telnet.

Business Models for Business Processes in the Internet of Things ,IoT/M2M systems LAYERS AND designs standardizations ,Modified OSI Stack for the IoT/M2M Systems ,ETSI M2M domains and High- level capabilities ,Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability

Design Principles for the Web Connectivity for connected-Devices, Web Communication protocols for Connected Devices, Message Communication protocols for Connected Devices, Web Connectivity for connected-Devices.

Data Acquiring, Organizing and Analytics in IoT/M2M, Applications /Services /Business

Processes, IOT/M2M Data Acquiring and Storage, Business Models for Business Processes in the Internet Of Things, Organizing Data, Transactions, Business Processes, Integration and Enterprise Systems.

Data Collection, Storage and Computing Using a Cloud Platform for IoT/M2M Applications/Services, Data Collection, Storage and Computing Using cloud platform Everything as a service and Cloud Service Models, IOT cloud-based services using the Xively (Pachube/COSM), Nimbits and other platforms Sensor, Participatory Sensing, Actuator, Radio Frequency Identification, and Wireless, Sensor Network Technology, Sensors Technology,Sensing the World.

Text Books:

1. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education
2. Internet of Things, A.Bahgya and V.Madisetti, Univesity Press,2015

Reference Books:

1. Designing the Internet of Things, Adrian McEwen and Hakim Cassimally,Wiley
2. Getting Started with the Internet of Things,CunoPfister , Oreilly

EMBEDDED SYSYTEMS

Course Objectives:

- To study the basics of embedded systems and its examples.

- To study the 8051 Microcontroller architecture and its instruction set.
- To discuss various software architectures in embedded systems.
- To discuss Inter Task Communication procedures in RTOS and design issues of RTOS.
- To study various embedded software development tools and debugging techniques.

Course Outcomes:

- Student will be understand the basic architecture of 8051 micro controller.
- ability to write ALP programs using 8051 instruction set.
- Ability to understand the concepts related to RTOS and its Inter Task Communication methods.
- Ability to understand various design issues of RTOS.
- Understand about embedded software development tools.

SYLLABUS

Introduction to Embedded Systems: Examples, Typical Hardware, Memory, Microprocessors , Busses; Introduction to 8051 Microcontroller , Architecture, Instruction set, Programming. Interrupts: Interrupt Basics, Shared-Data problem, Interrupt Latency.

Software Architectures: Round-Robin Architecture, Round-Robin with Interrupts Architecture, Function-Queue Scheduling Architecture, Real-Time Operating Systems Architecture, Selection of Architecture.

Real Time Operating System: Tasks and Task States, Tasks and Data, Semaphores and Shared Data, Semaphore Problems, Semaphore variants.

Inter Task Communication: Message Queues, Mailboxes, Pipes, Timer Functions, Events, Memory Management, Interrupt Routines in RTOS Environment.

Design issues of RTOS: Principles , Encapsulation Semaphores and Queues, Hard RealTime Scheduling Considerations, Saving Memory Space, Saving Power.

Embedded Software development Tools: Host and Target Machines , Linker/Locator for Embedded Software, Getting Embedded Software into the Target System.

Embedded Software Debugging Techniques :Testing on your Host Machine, Instruction Set Simulators, Laboratory Tools used for Debugging.

Introduction to the Internet of Things: History of IoT, IoT Architecture, M2M – Machine to Machine, Web of Things, IoT protocols, The Layering concepts, IoT Communication Pattern, IoT protocol Architecture.

Text Books:

1. The 8051 Microcontroller Architecture, Programming & Applications, Kenneth J. Ayala, Penram International.
2. An Embedded Software Primer, David E. Simon, Pearson Education , 2005.
3. Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems, Marina Ruggieri & Homayoun Nikookar, River Publishers Series in Communications.

Reference Book:

1. Embedded Systems: Architecture , Programming and Design, Raj Kamal, Tata McGraw- Hill Education, 2008

HSS ELECTIVES

OPERATIONS RESEARCH

Course Objectives

Upon completion of this course, you will be able to:

- Formulate a real-world problem as a mathematical programming model
- Implement and solve the model in EXCEL and LINDO
- Understand the theoretical workings of the simplex method for linear programming and perform iterations of it by hand
- Understand the relationship between a linear program and its dual, including strong duality and complementary slackness
- Perform sensitivity analysis to determine the direction and magnitude of change of a model's optimal solution as the data change
- Solve specialized linear programming problems like the transportation and assignment problems
- Solve network models like the shortest path, minimum spanning tree, and maximum flow problems
- Understand the applications of, basic methods for, and challenges in integer programming

Course Outcome:

After learning the course the students should be able to:

- Students will be able to describe characteristics and scope of OR.
- Students will be able to define and formulate mathematical problems.
- Students will be able to select optimal problems solving techniques for a given problem using LP.
- Students will be able to formulate and solve transportation, travelling sales man and transshipment problems.
- Students will be able to formulate and solve optimization problems related to job/ work assignments.
- Students will be able to demonstrate and solve simple models of Game theory.

- Students will be able to evaluate optimum solution using dynamic programming for different applications.
- Students will be able to choose / devise appropriate queuing model for practical application.
- Students will be able to solve different problems related to Network

SYLLABUS

Overview of Operations Research: Types of OR Models , Phases of Operations Research– OR Techniques, Introduction to Linear Programming, Formulation of Linear Programming Problem, Graphical Solution; Graphical Sensitivity Analysis

Standard Form of LPP: Basic Feasible Solutions , Unrestricted Variables, Simplex Algorithm , Artificial Variables, Big M Me th od , Two Phase Simplex Method, Degeneracy, Alternative Optimal, Unbounded Solutions, Infeasible Solutions, Primal And Dual Problems And Their Relations, Dual Simplex Method

Transportation Problem : LPP, Initial Solutions, North West Corner Rule, Lowest Cost Method, Vogels Approximation Method, Optimum Solutions of TPP, Degeneracy in Transportation, Transportation Algorithms

Assignment Problem :, Assignment Problem as LPP, Hungarian Method, Travelling Salesman Problem, Solutions Of TSP, Sequencing Problems, N-Jobs Two Machine Problems, NJobs K Machines Problems, Two-Jobs M- Machine Problems, Crew Scheduling Problems

Network Representation of A Project: CPM and PERT , Critical Path Calculations, Time – Cost Optimizations, PERT Analysis and Probability Considerations, Resource Analysis in Network Scheduling.

Replacement Problems: Individual And Group Replacement Policy, Reliability & System Failure Problems, Inventory-Factors Effecting Inventory-EOQ, Inventory Problems With and Without Shortages, Inventory Problems With Price Breakups, Multi Item Deterministic Problems. Probabilistic Inventory Problems

Game Theory : Two Person Zero Sum Games , Mixed Strategy Games and Their Algorithms.

TextBooks:

1. Operations Research, KantiSwaroop, P.K. Gupta, Man Mohan, Sulthan Chand & SonsEducation
2. Operations Research–AnIntroduction, HandyATaha–PearsonEducation

References

1. Taha.H.A ,operation Research : An Introduction, McMilan publishing Co., 1982. 7 th ed.
2. Ravindran A, Philips D.T & Solbery.J.J, Operations Research: Principles and practice, John Wiley & Sons, New York, 1987.
3. Frank S. Budnick, Dennis Mcleavey and Richard Mojena, Principles of Operations Research for Management. All India Traveler Book seller, Delhi.
4. Gillet.B.E., Introduction to Operations Research - A Computer oriented algorithmic approach, McGraw Hill, 1987.
5. Joseph.G.Ecker & Michael Kupper Schimd, Introduction to operations Research, John Wiley & Sons, 1988.
6. Hillier.F.S & Liberman.G.J, operation Research, Second Edition, Holden Day Inc, 1974.
7. Kanti Swarup, Gupta.P.K. & Man Mohan, operations Research, S.Chand & Sons

ORGANIZATIONAL BEHAVIOUR

Course Objectives:

- To understand the basic concepts of organizational behaviour, its foundations and importance.
- To enable students to have a basic perspective of Motivation and Motivation theories.
- To acquaint the students about group behaviour in organizations, including communication, leadership conflicts and organizational change and how these are linked to and impact organizational performance.

Course Outcomes:

- Indentifying fundamental aspects of organizational dynamics.
- Evaluate main theories of motivation and formulating suitable motivational strategies.
- Analyze the behaviour of individuals and groups in organizations.
- Understanding of Leadership theories and Leadership behaviour.
- Apply relevant theories, concepts to address important Organizational Behaviour questions.

SYLLABUS

Organizational Behaviour : Concept of Organisation - Concept of Organizational Behaviour - Nature of Organizational Behaviour - Role of Organizational behaviour - Disciplines contributing to Organizational Behaviour.

Motivation: Definition - Nature of Motivation - Role of Motivation - Theories of Motivation : Maslow's Need Hierarchy Theory, Herzberg's Motivation Hygiene Theory and Mc Gregor's Theory X and Theory Y.

Group Dynamics: Meaning - Concept of Group - Types of groups -Formal and Informal groups - Group development - Group cohesiveness and factors affecting group cohesiveness.

Leadership: Concept of Leadership - Difference between Leadership and Management - Importance of Leadership - Leadership styles: Autocratic leadership, Participative leadership and Free Rein leadership.

Communication: Meaning - Communication Process - Forms of communication: Oral, Written and Non- Verbal communication - Direction of communication : Downward, Upward and Horizontal communication.

Organizational conflicts: Concept of conflict - Reasons for conflict - Types of Conflict: Intrapersonal conflict, Interpersonal conflict, Intragroup conflict, Intergroup conflict, Interorganisational conflict - Conflict management.

Organizational Change: Nature - Factors inOrganisational change -Planned change: Process of planned change - Resistance to change: Factors in resistance to change - Overcoming resistance to change.

Text Books.

1. .L.M.Prasad: Organizational Beaviour, Sultan Chand & Sons, New Delhi -110002
2. K. Aswathappa: Organizational Behaviour, Himalaya Publishing House, New Delhi

Reference Books.

1. Stephen Robbins: Organizational Behaviour, Pearsons Education, New Delhi.

INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP

Course Objectives:

- To familiarize the students with the concepts of Management.
- To relate the concepts of Management with industrial organizations.
- To explain the factors affecting productivity and how productivity can be increased in an Industrial undertaking.
- To set forth a basic framework for understanding Entrepreneurship.

Course Outcomes:

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

- Understand the roles, skills and functions of management.
- Distinguish the different types of business organizations.
- Identify the factors involved in Production Operations Management.
- Diagnose organizational problems and take suitable decisions.
- Establish good Human Resource Management practices.
- Acquire necessary knowledge and skills required for organizing and carrying out

SYLLABUS

Basic Concepts of Management: Definition, Nature and Importance ; Functions of the Management; Levels of Management; F.W Taylor's Scientific Management; Henry Fayol's Principles of Management;

Forms of Business Organizations: Introduction, Types of Business organizations: Private Sector- Individual Ownership , Partnership, Joint stock companies and Co-Operative organizations**;** Public sector- Departmental Organizations, Public Corporations and Government Companies; The Joint sector Management.

Production and operations Management: Plant location- Factors to be considered in the selection of Plant location; Break - even analysis- Significance and managerial applications; Importance of Production Planning and Control and its Functions; Human Resource Management and Functions of Human Resource Manager (in brief); Functions of Marketing; Methods of Raising Finance.

Entrepreneurship : Definition, Characteristics and Skills , Types of Entrepreneurs, Entrepreneur vs. Professional Managers, , Growth of Entrepreneurs, Nature and Importance of Entrepreneurs, Women Entrepreneurs, Problems of Entrepreneurship.

Entrepreneurial Development and Project Management: Institutions in aid of Entrepreneurship Development, Idea generation: Sources and Techniques;, Stages in Project

formulation ; Steps for starting a small enterprise - Incentives for Small Scale Industries by Government.

Text Books:

1. Sharma,S.C, and Banga, T.R., Industrial Organization & Engineering Economics, Khanna Publishers, Delhi, 2000.
2. Vasant Desai , (The Dynamics of Entrepreneurial Development and Management (Planning for future Sustainable growth),HImalayan Publishing House, 2018.

Reference Books:

1. Aryasri , A.R., Management Science, McGraw HIll Education (India Private Limited , New Delhi 2014.
2. Sheela, P. , and Jagadeswara Rao**,** K., Entrepreneurship, Shree Publishing House, Guntur, Andhra Pradesh, 2017.