COURSE STRUCTURE
AND
DETAILED SYLLABUS

R22

COMPUTER SCIENCE AND ENGINEERING

for

BTech 4-Year Degree Course

(Applicable for the students admitted into E1 from the Academic Year 2022-23)

(I – IV Years Syllabus)

RAJIV GANDHI UNIVERSITY OF KNOWLEDGE TECHNOLOGIES

Basar, Nirmal, Telangana – 504107

Structure of Credits

S.No	Course Category	Course Type	Standard Credits as per AICTE	Department Credits
1	BSC	Basic Science Course	25	24
2	ESC	Engineering Science Course	24	16
3	HSMC	Humanities and Social Sciences including Management Course	12	14
4	PCC	Program Core Course	48	67
5	PEC	Program Elective Course	18	15
6	OEC	Open Elective Course	18	9
7	MC	Mandatory Course	0	0
8	SIP	Seminar + Internship + Project Work + Comprehensive Viva	15	15
Total			**160**	**160**

S.No	Course Category	Credit Breakup	Percentage of the credit
1	BSC	24	15.00%
2	ESC	16	10.00%
3	HSMC	14	8.75%
4	PCC	67	41.88%
5	PEC	15	9.37%
6	OEC	9	5.63%
7	MC	0	0.0%
8	SIP	15	9.37%
Total			100%

Definition of Credit

1	**1 Hr. Lecture(L) per week**	**1 credit**
2	**1 Hr. Tutorial(T) per week**	**1 credit**
3	**1 Hr. Practical(P) per week**	**0.5 credit**

Semester wise Course Structure

FIRST YEAR (E1) – SEMESTER – I

Sl. No	Course Code	Course Title	Course Category	L	T	P	Total Contact Hours	Credits
1	MA1103	Linear Algebra and Calculus	BSC	3	1	0	4	4
2	MA1102	Discrete Mathematics	BSC	3	0	0	3	3
3	CY1101	Engineering Chemistry	BSC	3	0	0	3	3
4	CY1701	Engineering Chemistry Lab	BSC	0	0	3	3	1.5
5	ME1703	Engineering Workshop	ESC	0	1	2	3	2
6	CS1101	Programming for Problem Solving	PCC	3	0	0	3	3
7	CS1701	Programming for Problem Solving Lab	PCC	0	0	3	3	1.5
8	BM1105	Constitution of India	MC	2	0	0	2	0
9		Induction Program						
Total				**14**	**2**	**8**	**24**	**18**

FIRST YEAR (E1) – SEMESTER – II

Sl. No	Course Code	Course Title	Course Category	L	T	P	Total Contact Hours	Credits
1	HS1201	English	HSMC	2	0	0	2	2
2	HS1801	English Language Lab	HSMC	0	0	2	2	1
3	MA1201	Differential Equations and Vector Calculus	BSC	3	1	0	4	4
4	PH1201	Engineering Physics	BSC	3	0	0	3	3
5	PH1801	Engineering Physics Lab	BSC	0	0	3	3	1.5
6	EE1202	Basic Electrical and Electronics Engineering	ESC	3	0	0	3	3
7	EE1802	Basic Electrical and Electronics Engineering Lab	ESC	0	0	2	2	1
8	CS1202	Data Structures and Algorithms	PCC	3	0	0	3	3
9	CS1802	Data Structures and Algorithms Lab	PCC	0	0	3	3	1.5
10	BS1201	Environmental Science	MC	3	0	0	3	0
Total				**17**	**1**	**10**	**28**	**20**

SECOND YEAR (E2) – SEMESTER – I

Sl. No	Course Code	Course Title	Course Category	L	T	P	Total Contact Hours	Credits
1	BM2101	Managerial Economics & Financial Analysis	HSMC	3	1	0	4	3
2	EC2105	Digital Electronic Circuits	ESC	3	0	0	3	3
3	EC2702	Digital Electronic Circuits Lab	ESC	0	0	2	2	1
5	CS2101	Database Management System	PCC	3	0	0	3	3
6	CS2701	Database Management System Lab	PCC	0	0	3	3	1.5
7	CS2102	Object Oriented Programming Structures through Java	PCC	3	0	0	3	3
8	CS2702	Object Oriented Programming Structures through Java Lab	PCC	0	0	3	3	1.5
4	CS2103	Computer Organization and Architecture	PCC	3	0	0	3	3
9	HS2101	Essence of Indian Traditional Knowledge	MC	2	0	0	2	0
Total				**17**	**1**	**8**	**26**	**19**

SECOND YEAR (E2) – SEMESTER – II

Sl. No	Course Code	Course Title	Course Category	L	T	P	Total Contact Hours	Credits
1	MA2202	Probability and Statistics	BSC	3	1	0	4	4
2	CE2804	Engineering Graphics	ESC	1	0	4	5	3
3	CS2203	Design and Analysis of Algorithms	PCC	3	0	0	3	3
4	CS2803	Design and Analysis of Algorithms Lab	PCC	0	0	3	3	1.5
5	CS2201	Web Technologies	PCC	3	0	0	3	3
6	CS2801	Web Technologies Lab	PCC	0	0	3	3	1.5
8	CS2202	Operating System	PCC	3	0	0	3	3
9	CS2802	IT Workshop	PCC	0	0	3	3	1.5
Total				**13**	**1**	**13**	**27**	**20.5**

THIRD YEAR (E3) – SEMESTER – I

Sl. No	Course Code	Course Title	Course Category	L	T	P	Total Contact Hours	Credits
1	BM3102	Fundamental of Management for Engineers	HSMC	3	0	0	3	3
2	HS3101	Corporate Communication	HSMC	0	0	2	2	1
4	CS3101	Computer Networks	PCC	3	0	0	3	3
5	CS3701	Computer Networks Lab	PCC	0	0	3	3	1.5
6	CS3102	Cloud Computing	PCC	3	0	0	3	3
7	CS3702	Cloud Computing Labs	PCC	0	0	3	3	1.5
3	CS3103	Artificial Intelligence	PCC	3	0	0	3	3
8	CS3104	Software Engineering	PCC	3	0	0	3	3
9	CS3113	Data Analytics Program Elective - I	PEC-I	3	0	0	3	3
10	CS3901	Mini Project-I	SIP	0	0	2	0	1
Total				**18**	**0**	**10**	**26**	**23**

THIRD YEAR (E3) – SEMESTER – II

Sl. No	Course Code	Course Title	Course Category	L	T	P	Total Contact Hours	Credits
1	HS3203	Soft Skills	HSMC	0	0	2	2	1
2	EC3203	Introduction to Internet of Things	ESC	3	0	0	3	3
4	CS3201	DevOps	PCC	3	0	0	3	3
5	CS3801	DevOps Lab	PCC	0	0	3	3	1.5
6	CS3202	Machine Learning	PCC	3	0	0	3	3
7	CS3802	Machine Learning Lab	PCC	0	0	3	3	1.5
3	CS3203	Automata Theory and Compiler Design	PCC	3	1	0	4	4
8	CS3225	Human Computer Interaction	PEC-II	3	0	0	3	3
9	CS3232	Adhoc Sensor Networks	PEC-III	3	0	0	3	3
10	CS3902	Mini Project-II	SIP	0	0	4	0	2
Total				**18**	**1**	**12**	**27**	**25**

FOURTH YEAR (E4) – SEMESTER – I

Sl. No	Course Code	Course Title	Course Category	L	T	P	Total Contact Hours	Credits
1	BM4106	Intellectual Property Rights	HSMC	3	1	0	4	3
2	CS4101	Cryptography and Network Security	PCC	3	0	0	3	3
3	CS4701	Cryptography and Network Security Lab	PCC	0	0	3	3	1.5
4	CS4144	Natural Language Processing with Deep Learning	PEC-IV	3	0	0	3	3
5	CS4154	Software Testing Methodologies	PEC-V	3	0	0	3	3
6	OEC_	Open Elective-I	OEC	3	0	0	3	3
7	CS4901	Project-I	SIP	0	0	8	0	4
8	CS4900	Summer Internship	SIP	0	0	0	0	1
Total				**15**	**0**	**11**	**19**	**21.5**

FOURTH YEAR (E4) – SEMESTER – II

Sl. No	Course Code	Course Title	Course Category	L	T	P	Total Contact Hours	Credits
1	OEC_	Open Elective-II	OEC	3	0	0	3	3
2	OEC_	Open Elective-III	OEC	3	0	0	3	3
3	CS4902	Project-II	SIP	0	0	12	0	6
4	CS4000	Comprehensive Viva	SIP	0	0	0	0	1
Total				**6**	**0**	**12**	**6**	**13**

Course Category wise Structure

HSMC Courses

Sl. No	Course Code	Course Title	Course Category	L	T	P	Total Contact Hours	Credits
1	HS1201	English	HSMC	2	0	0	2	2
2	HS1801	English Language Lab	HSMC	0	0	2	2	1
3	HS3203	Soft Skill	HSMC	0	0	2	2	1
4	HS3101	Corporate Communication	HSMC	0	0	2	2	1
5	BM3102	Fundamental of Management for Engineer	HSMC	3	0	0	3	3
6		Organizational Behaviour	HSMC	3	0	0	3	3
7	BM2101	Managerial Economics & Financial Analysis	HSMC	3	1	0	3	3
Total				11	1	6	18	14

BSC Courses

Sl. No	Course Code	Course Title	Course Category	L	T	P	Total Contact Hours	Credits
1	MA1101	Linear Algebra and Calculus	BSC	3	1	0	4	4
2	MA1102	Discrete Mathematics	BSC	3	0	0	3	3
3	MA1202	Differential Equations and Vector Calculus	BSC	3	1	0	4	4
4	MA2201	Probability and Statistics	BSC	3	1	0	4	4
5	CY1101	Engineering Chemistry	BSC	3	0	0	3	3
6	CY1701	Engineering Chemistry Lab	BSC	0	0	3	3	1.5
7	PH1201	Engineering Physics	BSC	3	0	0	3	3
8	PH1801	Engineering Physics Lab	BSC	0	0	3	3	1.5
Total				18	3	6	27	24

ESC Courses

Sl. No	Course Code	Course Title	Course Category	L	T	P	Total Contact Hours	Credits
1		Engineering Workshops	ESC	0	1	2	3	2
2	EE1102/ EE2104	Basic Electrical and Electronics Engineering	ESC	3	0	0	3	3
3	EE1702/ EE2703	Basic Electrical and Electronics Engineering Lab	ESC	0	0	2	2	1
4	EC2101	Digital Electronic Circuits	ESC	3	0	0	3	3
5	EC2701	Digital Electronic Circuits Lab	ESC	0	0	2	2	1
6		Computer Aided Engineering Graphics	ESC	1	0	4	5	3
7		Introduction to Internet of Things	ESC	3	0	0	3	3
Total				**10**	**1**	**10**	**21**	**16**

PCC Courses

Sl. No	Course Code	Course Title	Course Category	L	T	P	Total Contact Hours	Credits
1	CS1101/ CS1201	Programming for Problem Solving	PCC	3	0	0	3	3
2	CS1701/ CS1801	Programming for Problem Solving Lab	PCC	0	0	3	3	1.5
3	CS1202	Data Structures and Algorithms	PCC	3	0	0	3	3
4	CS1802	Data Structures and Algorithms Lab	PCC	0	0	3	3	1.5
5	CS2103	Computer Organization and Architecture	PCC	3	0	0	3	3
6	CS2101	Database Management System	PCC	3	0	0	3	3
7	CS2701	Database Management System Lab	PCC	0	0	3	3	1.5
8	CS2102	Object Oriented Programming	PCC	3	0	0	3	3
9	CS2702	Object Oriented Programming Lab	PCC	0	0	3	3	1.5
10	CS2201	Design and Analysis of Algorithms	PCC	3	0	0	3	3
11	CS2801	Design and Analysis of Algorithms Lab	PCC	0	0	3	3	1.5
12	CS2202	Web Technologies	PCC	3	0	0	3	3
13	CS2802	Web Technologies Lab	PCC	0	0	3	3	1.5
14	CS2203	Operating System	PCC	3	0	0	3	3
15		IT Workshop	PCC	0	0	3	3	1.5
16	CS3103	Artificial Intelligence	PCC	3	0	0	3	3
17	CS3102	Cloud Computing	PCC	3	0	0	3	3
18	CS3702	Cloud Computing Lab	PCC	0	0	3	3	1.5
19	CS3101	Computer Networks	PCC	3	0	0	3	3
20	CS3701	Computer Networks Lab	PCC	0	0	3	3	1.5
21	CS3104	Software Engineering	PCC	3	0	0	3	3
22	CS3203	Automata Theory and Compiler Design	PCC	3	1	0	4	4
23	CS3201	DevOps	PCC	3	0	0	3	3
24	CS3801	DevOps Labs	PCC	0	0	3	3	1.5
25	CS3202	Machine Learning	PCC	3	0	0	3	3
26	CS3802	Machine Learning Lab	PCC	0	0	3	3	1.5
27	CS4101	Cryptography and Network Security	PCC	3	0	0	3	3
28	CS4701	Cryptography and Network Security Lab	PCC	0	0	3	3	1.5
Total				48	1	36	85	67

PEC Courses

Sl. No	Course Code	Course Title	Course Category	L	T	P	Total Contact Hours	Credits
1	CS311X	Program Elective - I	PEC	3	0	0	3	3
2	CS322X	Program Elective - II	PEC	3	0	0	3	3
3	CS323X	Program Elective - III	PEC	3	0	0	3	3
4	CS414X	Program Elective - VI	PEC	3	0	0	3	3
5	CS415X	Program Elective - V	PEC	3	0	0	3	3
Total				15	0	0	15	15

SIP

Sl. No	Course Code	Course Title	Course Category	L	T	P	Total Contact Hours	Credits
1	CS3901	Mini Project - I	SIP	0	0	2	0	1
2	CS3902	Mini Project - II	SIP	0	0	4	0	2
3	CS4901	Project -I	SIP	0	0	8	0	4
4	CS4902	Project-II	SIP	0	0	12	0	6
5	CS4900	Summer Internship	SIP	0	0	0	0	1
6	CS4000	Comprehensive Viva	SIP	0	0	0	0	1
Total				0	0	26	0	15

Program Elective Courses

Sl. No	Course Code	Course Title	Course Category
1	CS3111	Advanced Algorithms	Program Elective - I
	CS3112	Advanced Computer Architecture	
	CS3113	Data Analytics	
	CS3114	Image Processing	
	CS3115	Graph Theory	
2	CS3221	Natural Computing	Program Elective - II
	CS3222	Computational Number Theory	
	CS3223	Distributed Databases	
	CS3224	Computer Vision	
	CS3225	Human Computer Interaction	
3	CS3231	High Performance Computing	Program Elective - III
	CS3232	Adhoc Sensor Networks	
	CS3233	Social Network Analysis	
	CS3234	Text Mining & Analytics	
	CS3235	Information Retrieval	
4	CS4141	Quantum Computing	Program Elective - IV
	CS4142	Machine Learning for Healthcare/Finance	
	CS4143	Deep Learning	
	CS4144	Natural Language Processing with Deep Learning	
	CS4145	Theory of Computation	
5	CS4151	Introduction to Blockchain Technologies	Program Elective - V
	CS4152	Robotic Process Automation	
	CS4153	Mobile Application Development	
	CS4154	Software Testing Methodologies	
	CS4155	Cyber Forensics	

Engineering 1 - Semester 1

Course Code	Course Title					Course Type
MA1103	Linear Algebra and Calculus					BSC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	1	0	40	60	4

Course Objectives

- To introduce students to the fundamental concepts and operations of matrix theory and their applications in linear algebra and other fields.
- To enable students to understand the properties of vectors, vector spaces, and linear transformations.
- To familiarize students with the methods of solving systems of linear equations and finding the inverse of a matrix.
- To provide students with an understanding of sequences, series, and their convergence.

Course Outcomes

1. Students will be able to understand and apply the fundamental concepts and operations of matrix theory, such as types of matrices, elementary operations, and matrix inverse.
2. Students will be able to analyze the properties of vectors, vector spaces, and linear transformations, and apply them to real-world problems.
3. Students will be able to solve systems of linear equations using elementary operations and Gauss elimination method, and find the inverse of a matrix using Gauss-Jordan method.
4. Students will be able to determine the convergence or divergence of sequences and series using various tests, such as comparison test, ratio test, and root test.

Detailed Contents

UNIT-I

Matrix Theory

Types of Matrices, Symmetric, Hermitian, Skew-Symmetry, Skew-Hermitian, Orthogonal matrices, Unitary matrices; Elementary row and column operations on a matrix, Rank of a matrix by Echelon form and Normal form, Inverse of a Non-singular matrix by Gauss-Jordan method; Consistency and solutions of system of linear equations using elementary operations, Gauss elimination method.

UNIT-II

Vector spaces:

Definition of vector spaces and subspaces with example; Linear dependence of vectors,basis and dimension,Linear Transformation ,range and kernel of linear map ,rank and nullity theorem, Characteristic roots and vectors of a matrix; Cayley-Hamilton theorem (without proof) ; finding inverse and power of a matrix by Cayley-Hamilton Theorem; Quadratic forms and Nature of the Quadratic forms.

UNIT-III

Sequences & Series:

Definition of a sequence, limit; Convergent, Divergent and Oscillatory sequences. Convergent, Divergent and Oscillatory Series; Series of positive terms; Comparison test, p-test, D-Alembert's ratio test; Raabe's test; Cauchy's Integral test; Cauchy's root test; Logarithmic test. Alternating series; Leibnitz test; Alternating Convergent series; Absolute and conditional convergence.

UNIT-IV

Calculus:

Mean value theorems: Roll's theorem, Lagrange's Mean value theorem, Cauchy's Mean value theorem; Taylor's and Maclaurin's series with remainders, Expansions; Definition of Improper Integrals and Beta and Gamma functions and their applications.

UNIT-V

Multivariable Calculus (Partial Differentiation and applications):

Functions of two variables, Definitions of Limits and continuity, Partial Differentiation; Euler's theorem; Total Derivative; Jacobian; Functional dependence and independence; Maxima and minima of functions of several variables (two and three variables) using Lagrange Multipliers.

Text Books

- Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley and Sons, 8th Edition,
- G. Strang, "Introduction to Linear Algebra," 5th ed. Wellesley, MA: Wellesley-Cambridge Press, 2016.
- R.K.Jain and S.R.K.Iyengar Advanced Engineering Mathematics, Narosa Publications House.2008.
- B.S. Grewal, Higher Engineering Mathematics, Khanna Publications, 2009.

References

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson,Reprint,2002.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11thReprint, 2010.
3. N.P. bail and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications, Reprint,2008.

Course Code	Course Title					Course Type
MA1102	Discrete Mathematics					BSC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	0	0	40	60	3

Course Objectives

- Introduces elementary discrete mathematics for computer science and engineering.
- Use sets for solving applied problems, and use the properties of set operations algebraically.
- Work with relations and investigate their properties.
- Investigate functions as relations and their properties.
- Introduce basic concepts of graphs, digraphs and trees.

Course Outcomes

1. Ability to understand and construct precise mathematical proofs.
2. Ability to use logic and set theory to formulate precise statements.
3. Ability to analyze and solve counting problems on finite and discrete structures.
4. Ability to describe and manipulate sequences.
5. Ability to apply graph theory in solving computing problems.

Detailed Contents

UNIT-I

The Foundations: Logic and Proofs Propositional Logic, Applications of Propositional Logic, Algebra of Propositions, Propositional Equivalence, Predicates and Quantifiers, Rules of Inference, Introduction to Proofs, Proof Methods and Strategy.

UNIT-II

Basic Structures: Sets, Functions, Matrices and Relations Sets, Functions, Cardinality of Sets and Matrices Relations, Relations and Their Properties, n-ary Relations and Their Applications, Representing Relations, Types of Relations, Closures of Relations, Equivalence Relations, Composite Relation, Partial Orderings, Hasse Diagrams

UNIT-III

Algorithms, Induction and Recursion: Algorithms, The Growth of Functions, Complexity of Algorithms

Induction and Recursion: Mathematical Induction, Strong Induction and Well-Ordering, Recursive Definitions and Structural Induction, Recursive Algorithms, Program Correctness

UNIT-IV

Discrete Probability and Advanced Counting Techniques: An Introduction to Discrete Probability, Probability Theory, Bayes' Theorem, Expected Value and Variance

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

UNIT-V

Graphs: Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Articulation Points, Bipartite Graphs, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Coloring.

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

Text Books

- K.H. Rosen, "Discrete Mathematics and its Applications with Combinatorics and Graph Theory," 7th ed., Tata McGraw-Hill Education, 2012.

References

1. J.P. Tremblay and R. Manohar, "Discrete Mathematical Structures with Applications to Computer Science," Tata McGraw-Hill Education, 2009.
2. J.L. Mott, A. Kandel, and T.P. Baker, "Discrete Mathematics for Computer Scientists & Mathematicians," 2nd ed., Pearson Education.
3. R. Johnsonbaugh, "Discrete Mathematics," 7th ed., Pearson Education.
4. E.G. Goodaire and M.M. Parmenter, "Discrete Mathematics with Graph Theory," Prentice Hall, 2006.
5. R.P. Grimaldi, "Discrete and Combinatorial Mathematics - An Applied Introduction," 5th ed., Pearson Education.

Course Code	Course Title					Course Type
CY1101	Engineering Chemistry					BSC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	0	0	40	60	3

Course Objectives

- To provide an understanding of electrochemistry and its practical applications.
- To introduce the concepts of corrosion and water treatment.
- To study different energy sources and their characteristics.
- To understand the basics of chemical kinetics and reaction rates.
- To introduce the properties and synthesis of nanomaterials.

Course Outcomes

1. Understand the fundamentals of electrochemistry and its applications in various fields.
2. Identify different types of corrosion and apply corrosion prevention methods.
3. Analyze different types of fuels and their characteristics.
4. Understand the basics of chemical kinetics and solve problems related to reaction rates.
5. Recognize different types of nanomaterials and their properties, and apply the synthesis techniques to produce them.

Detailed Contents

UNIT-I

Electrochemistry: Introduction to electrochemistry: Galvanic cell (Daniel cell), Nernst equation. Types of electrodes: metal-metal ion electrodes, metal-insoluble salt-anion electrodes, calomel electrode, gas-ion electrodes, hydrogen and chlorine electrodes, oxidation-reduction electrodes (quinhydrone electrode), amalgam electrodes and ion exchange electrode (glass electrode). EMF and applications of EMF: determination of pH of the solution, potentiometric titrations, Classification of commercial cells - primary cells (dry cell) and secondary cells (Lithium ion battery, Pb-acid storage battery). Fuel cells: H2-O2 fuel cell.

UNIT-II

Corrosion and water treatment: Dry and wet corrosion and their mechanisms. Pilling - Bedworth Rule. Types of Corrosion: galvanic corrosion, concentration cell corrosion, pitting corrosion and stress corrosion. Factors influencing the rate of corrosion: Temperature, pH and dissolved oxygen. Corrosion Prevention methods: Cathodic protection – Sacrificial Anodic method and Impressed current method. **Metallic coatings:** galvanization and tinning methods. Water: Hardness of water, Degrees of hardness. Calculation of hardness by EDTA method. Disadvantages of hard water in boilers: priming, foaming, scales, sludges and caustic embrittlement. Treatment of boiler feed water: Zeolite process, Ion exchange process.

UNIT-III

Energy sources: Introduction. Definition and classification of fuels. Calorific value of a fuel, Characteristics of a good fuel. Coal, types of Coal. Analysis of Coal: Proximate and Ultimate analysis.

Bomb Calorimeter and Junker's gas Calorimeter. Problems on calculation of calorific value. Liquid fuels Introduction .Synthetic Petrol: Fisher Tropsch process. Introduction to Bio-fuels: Bio-diesel, Biogas.

UNIT-IV

Chemical kinetics: Introduction to rate of reaction and rate constant determination. Factors influencing rate of reaction. Complex reactions: definition and classification of complex reactions, definition of reversible reactions with examples, rate law derivation for reversible reactions. Consecutive reactions: definition, rate law derivation and examples of consecutive reactions. Parallel reactions: definition, rate law derivation and examples of parallel reactions. Steady-state approximation: introduction, kinetic rate law derivation by applying steady state approximation in case of the oxidation of NO and pyrolysis of methane.

UNIT-V

Nanochemistry: Introduction to nanomaterials, classification: Carbon based nanomaterials, metallic nanoparticles, metal oxide nanoparticles. Properties at nanoscale. Synthetic approaches: Top-Down (Photolithography, ball milling) and Bottom-Up (Sol-gel, Hydrothermal). Brief overview on characterization of nanomaterials: X-ray, SEM and TEM. Applications of nanomaterials.

Text Books

- S. Agarwal, Engineering Chemistry. New Delhi, India: Dhanpat Rai & Co., 2017.

References

1. S. Chawla, A Textbook of Engineering Chemistry. New Delhi, India: Dhanpat Rai & Co., 2013.
2. S. Chawla, Essentials of Experimental Engineering Chemistry. New Delhi, India: Dhanpat Rai & Co., 2009.
3. O.P. Pandey, Practical Chemistry. New Delhi, India: S. Chand and Company Ltd., 2011.
4. V.K. Ahluwalia, College Practical Chemistry. New Delhi, India: New Age International Publishers, 2015.
5. K. Mukkanti, Practical Engineering Chemistry. New Delhi, India: BS Publications, 2011.
6. R. Kulakarni and Adil, Laboratory Manual. New Delhi, India: Prentice-Hall of India Pvt. Ltd., 2010.

Course Code	Course Title					Course Type
CY1701	Engineering Chemistry Lab					BSC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	0	0	3	40	60	1.5

Course Objectives

- To learn the preparation of organic compounds in the laboratory.
- To estimate the hardness and alkalinity of the given sample of water.
- To understand the Job's method for determining the composition.
- Learn how to use the pH meter and polarimeter.
- Synthesis of a pharmaceutically active drug.

Course Outcomes

1. Minimum knowledge on basic synthesis, quantitative and qualitative analysis is being imparted.

List of Experiments:

1. **Synthesis:** Synthesis of soap from cheap oil, Synthesis of Thiokol rubber.
2. **Volumetric analysis:** Estimation of alkalinity of water, Estimation of total hardness of water by EDTA method.
3. **Job's method:** Determination of composition of Ferric-Thiocyanate complex by Job's method.
4. **pH meter:** Estimation of the strength of a weak acid by pH metry.
5. **Polarimeter:** Determination of specific rotation of sucrose by polarimeter.
6. **Synthesis of Aspirin Drug (NSAID).**

References

1. V.K. Ahluwalia, S. Dhingra, and A. Gulati, "College Practical Chemistry," New Delhi, India: S. Chand Publishing, 2016.
2. K. Mukkanti, "Practical Engineering Chemistry," Hyderabad, India: Universities Press, 2010.
3. S. Chawla, "A Textbook of Engineering Chemistry," 16th ed., New Delhi, India: Dhanpat Rai & Co., 2017.
4. S. Chawla, "Essentials of Experimental Engineering Chemistry," 2nd ed., New Delhi, India: Dhanpat Rai & Co., 2015.
5. V.K. Ahluwalia and R. Aggarwal, "Comprehensive Practical Organic Chemistry – Preparation and Quantitative Analysis," New Delhi, India: S. Chand Publishing, 2010.

Course Code	Course Title					Course Type
ME1703	Engineering Workshop					ESC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	0	1	2	40	60	2

Course Objectives

- To understand the basic manufacturing process of producing a component by casting, forming plastic molding, joining processes, machining of a component either by conventional or by unconventional processes.
- To understand the advanced manufacturing process of additive manufacturing process.

Course Outcomes

1. Students will gain knowledge of the different manufacturing processes which are commonly employed in the industry, to fabricate components using different materials.

Detailed Contents

Module – 1: Metal Casting: Introduction, Tools, Types of Patterns, Pattern Materials, Types of casting – Sand, Die and other casting processes and Applications

Module – 2: Metal Forming: Introduction, Classification, Types of Bulk and sheet metal forming and Applications.

Module – 3: Powder Metallurgy: Introduction, Powder production methods, Compaction, Sintering, Secondary operations and Applications.

Module – 4: Joining: Types of Joining, Introduction to Welding, Brazing and soldering, Arc, Solid state welding processes.

Module – 5: Conventional Machining Processes: Introduction to machining operations; Lathe operations, Drilling, Milling and Grinding.

Module – 6: Unconventional Machining Processes.

Module – 7: CNC Machining and Additive manufacturing.

List of Experiments:

1. **Fitting –** Step and V Fit.
2. **Carpentry** – Half lap joint and Dove tail joint.
3. **House Wiring** – Series, Parallel, Staircase and Godown wiring.
4. **Tin Smithy** – Tray and Cylinder.
5. **Welding** – Bead formation, Butt and Lap joint welding.
6. **Foundry** – Mold preparation with Single piece and Split piece pattern.

7. **Machining** – Plain turning, Facing, Step and Taper turning.
8. **Plastic molding** – Demo.
9. **WIRE EDM, CNC, 3D Printer** – Demo.

Text Books

- Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
- Kalpakjian S. and Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.

References

1. Gowri P. Hariharan and A. Suresh Babu,"Manufacturing Technology – I" Pearson Education, 2008.
2. Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.
3. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGrawHill House, 2017.

Course Code	Course Title					Course Type
CS1101/CS1201	Programming for Problem Solving					PCC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	0	0	40	60	3

Course Objectives

- To learn the fundamentals of computers.
- To understand the various steps in program development.
- To learn the syntax and semantics of the C programming language.
- To learn the usage of structured programming approaches in solving problems.

Course Outcomes

1. To write algorithms and to draw flowcharts for solving problems.
2. To convert the algorithms/flowcharts to C programs.
3. To code and test a given logic in the C programming language.
4. To decompose a problem into functions and to develop modular reusable code.
5. To use arrays, pointers, strings and structures to write C programs.
6. Searching and sorting problems.

Detailed Contents

UNIT-I

Introduction to Programming: Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.) .

Representation of Algorithm : Algorithms for finding roots of a quadratic equations, finding minimum and maximum numbers of a given set, finding if a number is prime number Flowchart/Pseudocode with examples, Program design and structured programming.

Introduction to C Programming Language: variables (with data types and space requirements), Syntax and Logical Errors in compilation, object and executable code, Operators, expressions and precedence, Expression evaluation, type conversion, The main method and command line arguments, Bitwise operations: Bitwise AND, OR, XOR and NOT operators.

UNIT-II

Conditional Branching, Loops, Arrays: Conditional Branching and Loops: Writing and evaluation of conditionals and consequent branching with if, if-else, switch-case, ternary operator, goto, Iteration with for, while, do- while loops.

I/O: Simple input and output with scanf and printf, formatted I/O, Introduction to stdin, stdout and stderr. Command line arguments.

Arrays: one and two dimensional arrays, creating, accessing and manipulating elements of arrays.

UNIT-III

Strings, Structures, Pointers: Strings: Introduction to strings, handling strings as array of characters, basic string functions available in C (strlen, strcat, strcpy, strstr etc.), arrays of strings .
Structures: Defining structures, initializing structures, unions, Array of structures
Pointers: Idea of pointers, Defining pointers, Pointers to Arrays and Structures.

UNIT-IV
Functions, Recursion, Preprocessor, Storage classes and Dynamic Memory Allocation: Functions: Designing structured programs, declaring a function, Signature of a function, Parameters and return type of a function, passing parameters to functions, call by value, Passing arrays to functions, passing pointers to functions, idea of call by reference.
Recursion: Simple programs, such as Finding Factorial, Fibonacci series etc., Limitations of Recursive functions.
Preprocessor: Commonly used Preprocessor commands like include, define, undef, if, ifdef, if and if Storage classes (auto, extern, static and register).
Dynamic memory allocation: Allocating and freeing memory .

UNIT-V
Files, Searching and Sorting: Files: Text and Binary files, Creating and Reading and writing files, Appending data to existing files.
Basic searching in an array of elements (linear and binary search techniques), Basic algorithms to sort array elements (Bubble, Selection and Insertion sort).

Text Books

- Jeri R. Hanly and Elliot B.Koffman, Problem solving and Program Design in C 7th Edition, Pearson

References

1. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition).
2. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
3. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill.
4. Yashavant Kanetkar, Let Us C, 18th Edition, BPB.
5. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression).
6. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
7. Herbert Schildt, C: The Complete Reference, McGraw Hill, 4th Edition.
8. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.

Course Code	Course Title					Course Type
CS1701/CS1801	Programming for Problem Solving Lab					PCC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	0	0	3	40	60	1.5

Course Objectives

- To work with an IDE to create, edit, compile, run and debug programs.
- To analyze the various steps in program development.
- To develop programs to solve basic problems by understanding basic concepts in C like operators, control statements etc.
- To develop modular, reusable and readable C Programs using the concepts like functions, arrays etc.
- To Write programs using the Dynamic Memory Allocation concept.
- To create, read from and write to text and binary files.

Course Outcomes

The candidate is expected to be able to:

1. Formulate the algorithms for simple problems.
2. Translate given algorithms to a working and correct program.
3. Correct syntax errors as reported by the compilers.
4. Identify and correct logical errors encountered during execution.
5. Represent and manipulate data with arrays, strings and structures.
6. Use pointers of different types.
7. Create, read and write to and from simple text and binary files.
8. Modularize the code with functions so that they can be reused.

Lab Experiments

Practice sessions:

A. Write a simple program that prints the results of all the operators available in C (including pre/ post increment , bitwise and/or/not , etc.). Read required operand values from standard input.

B. Write a simple program that converts one given data type to another using auto conversion and casting. Take the values from standard input.

.

Simple numeric problems:

A. Write a program for finding the max and min from the three numbers.

B. Write the program for the simple, compound interest.

C. Write a program that declares Class awarded for a given percentage of marks, where mark <40%= Failed, 40% to <60% = Second class, 60% to <70%=First class, >= 70% = Distinction. Read percentage from standard input.

D. Write a program that prints a multiplication table for a given number and the number of rows in the table. For example, for a number 5 and rows = 3, the output should be:

5 x 1 = 5
5 x 2 = 10
5 x 3 = 15

E. Write a program that shows the binary equivalent of a given positive number between 0 to 255.

Expression Evaluation:

A. A building has 10 floors with a floor height of 3 meters each. A ball is dropped from the top of the building. Find the time taken by the ball to reach each floor. (Use the formula s = ut+(1/2)at^2 where u and a are the initial velocity in m/sec (= 0) and acceleration in m/sec^2 (= 9.8 m/s^2)).
B. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement).
C. Write a program that finds if a given number is a prime number
D. Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.
E. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
F. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
G. Write a C program to find the roots of a Quadratic equation.
H. Write a C program to calculate the following, where x is a fractional value. i. 1-x/2 +x^2/4-x^3/6
I. Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression: 1+x+x^2+x^3+ … +x^n. For example: if n is 3 and x is 5, then the program computes 1+5+25+125.

Arrays, Pointers and Functions:

A. Write a C program to find the minimum, maximum and average in an array of integers.
B. Write a function to compute mean, variance, Standard Deviation, sorting of n elements in a single dimension array.
C. Write a C program that uses functions to perform the following:
    a. Addition of Two Matrices
    b. Multiplication of Two Matrices
    c. Transpose of a matrix with memory dynamically allocated for the new matrix as row and column counts may not be the same.
    d. To find the GCD (greatest common divisor) of two given integers.
    e. To find x^n.
D. Write C programs that use both recursive and non-recursive functions
   To find the factorial of a given integer.
E. Write a program for reading elements using a pointer into an array and display the values using the array.
F. Write a program for display values reverse order from an array using a pointer.
G. Write a program through a pointer variable to sum of n elements from an array.

Files:

A. Write a C program to display the contents of a file to standard output device.
B. Write a C program which copies one file to another, replacing all lowercase characters with their uppercase equivalents.

C. Write a C program to count the number of times a character occurs in a text file. The file name and the character are supplied as command line arguments.
D. Write a C program that does the following:
   a. It should first create a binary file and store 10 integers, where the file name and 10 values are given in the command line. (hint: convert the strings using atoi function).
   b. Now the program asks for an index and a value from the user and the value at that index should be changed to the new value in the file. (hint: use fseek function) .
   c. The program should then read all 10 values and print them back.
E. Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file).

Strings:

A. Write a C program to convert a Roman numeral ranging from I to L to its decimal equivalent.
B. Write a C program that converts a number ranging from 1 to 50 to Roman equivalent.
C. Write a C program that uses functions to perform the following operations:
   a. To insert a sub-string into a given main string from a given position.
   b. To delete n Characters from a given position in a given string.
D. Write a C program to determine if the given string is a palindrome or not (Spelled same in both directions with or without a meaning like madam, civic, noon, abcba, etc.)
E. Write a C program that displays the position of a character ch in the string S or – 1 if S doesn‘t contain ch.
F. Write a C program to count the lines, words and characters in a given text.

Miscellaneous:

A. a.Write a menu driven C program that allows a user to enter n numbers and then choose between finding the smallest, largest, sum, or average. The menu and all the choices are to be functions. Use a switch statement to determine what action to take. Display an error message if an invalid choice is entered.

B. b.Write a C program to construct a pyramid of numbers as follows:

```
1       *       1       1       *
1 2     * *     2 3     2 2     * *
1 2 3   * * *   4 5 6   3 3 3   * * *
                        4 4 4 4 * *
                                *
```

Sorting and Searching:

A. Write a C program that uses a non recursive function to search for a Key value in a given list of integers using linear search method.
B. c.Write a C program that uses non recursive function to search for a Key value in a given sorted list of integers using binary search method.
C. e.Write a C program that implements the Bubble sort method to sort a given list of integers in ascending order.
D. Write a C program that sorts the given array of integers using selection sort in descending order.
E. Write a C program that sorts the given array of integers using insertion sort in ascending order.
F. Write a C program that sorts a given array of names.

Text Books

- Jeri R. Hanly and Elliot B.Koffman, Problem solving and Program Design in C 7th Edition, Pearson.

References

1. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition).
2. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, PHI.
3. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill.
4. Yashavant Kanetkar, Let Us C, 18th Edition, BPB.
5. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression).
6. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
7. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition.
8. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.

Course Code	Course Title					Course Type
BM1105	Constitution of India					MC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	2	0	0	40	60	0

Course Objectives:

- To realize the significance of constitution of India to students from all walks of life and help them to understand the basic concepts of Indian constitution.
- To identify the importance of fundamental rights as well as fundamental duties.
- To identify the importance of Directive Principles of State Policy.
- To understand the functioning of Union and State Governments in Indian federal system.

Course Outcomes:

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

1. Describe historical background of the constitution making and its importance for building a democratic India.
2. Explain the value of the fundamental rights and duties for becoming good citizen of India.
3. Comprehend the structure and philosophy of the Constitution
4. Understand the power and functions of various constitutional offices and institutions.
5. Realize the significance of the constitution and appreciate the role of constitution and citizen oriented measures in a democracy.

Detailed Contents

UNIT-I: Introduction to Indian Constitution

- Meaning of Constitution
- Historical background of Indian constitution: Regulating Act 1773, PittsIndia Act 1784, Charter Act of1813, Charter Act 1833, Charter Act 1853, The Government of India Act

of 1858, Indian Councils Act of1861, India Council Act of1892, Indian Councils Act of1909, Government of India Act of 1919, Government of India Act of 1935, Indian Independence Act of 1947.

- Making of the Indian constitution.

UNIT-II: Philosophy of the Indian Constitution

- Preamble of the Constitution
- Salient Features of Indian Constitution

UNIT-III: Contours of Constitutional Rights

- Fundamental Rights
  - Right to Equality
  - Right to Freedom
  - Right against Exploitation
  - Right to Freedom of Religion
  - Cultural and Educational Rights
  - Right to Constitutional Remedies

UNIT-IV:

- Directive Principles of State Policy
- Fundamental Duties

UNIT-V: Union/Central Government

❖ **Union Government**

- Union Legislature(Parliament)
- LokSabha and Rajyasabha (with Powers and Functions)

❖ **Union Executive:**

- President of India (with Powers and Functions)
- Prime Minister of India (with Powers and Functions).

Text Books

1. Indian Polity-M.Laxmi kanth
2. Indian Constitution-V.S.Bagad-Technical Publications.
3. Indian Constitution-D.Srinivasan- Himalaya Publishers.

References

1. https://www.india.gov.in/my-government/constitution-India

Engineering 1 - Semester 2

<table>
<tr><th>Course Code</th><th colspan="5">Course Title</th><th>Course Type</th></tr>
<tr><td>HS1201</td><td colspan="5">English</td><td>HSMC</td></tr>
<tr><td rowspan="2">Prerequisite</td><td colspan="3">Contact Hours per Week</td><td rowspan="2">Internal</td><td rowspan="2">External</td><td rowspan="2">Credits</td></tr>
<tr><td>L</td><td>T</td><td>P</td></tr>
<tr><td></td><td>2</td><td>0</td><td>0</td><td>40</td><td>60</td><td>2</td></tr>
</table>

Course Objectives:

- Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
- Equip students to study academic subjects more effectively and critically using The theoretical and practical components of English syllabus.
- Develop study skills and communication skills in formal and informal situations.

Course Outcomes

1. Use English Language effectively in spoken and written forms.
2. Comprehend the given texts and respond appropriately.
3. Communicate confidently in various contexts and different cultures.
4. Acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

Detailed Contents

UNIT-I

'The Raman Effect' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

Vocabulary Building: The Concept of Word Formation --The Use of Prefixes and Suffixes.
Grammar:Identifying Common Errors in Writing with Reference to Articles andPrepositions.
Reading: Reading and Its Importance- Techniques for Effective Reading.
Basic Writing Skills: Sentence Structures -Use of Phrases and Clauses in Sentences
Importance of Proper Punctuation- Techniques for writing precisely – Paragraph writing – Types, Structures and Features of a Paragraph - Creating Coherence-Organizing Principles of Paragraphs in Documents.

UNIT-II

'Ancient Architecture in India' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

Vocabulary: Synonyms and Antonyms.
Grammar: Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.
Reading: Improving Comprehension Skills – Techniques for Good Comprehension
Writing: Format of a Formal Letter-Writing Formal Letters E.g.., Letter of Complaint,
Letter of Requisition, Job Application with Resume.

UNIT-III

'Blue Jeans' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

Vocabulary: Acquaintance with Prefixes and Suffixes from Foreign Languages in English to form Derivatives-Words from Foreign Languages and their Use in English.

Grammar: Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.

Reading: Sub-skills of Reading- Skimming and Scanning.

Writing: Nature and Style of Sensible Writing- Defining- Describing Objects, Places and Events – Classifying- Providing Examples or Evidence.

UNIT-IV

'What Should You Be Eating' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

Vocabulary: Standard Abbreviations in English

Grammar: Redundancies and Clichés in Oral and Written Communication.

Reading: Comprehension- Intensive Reading and Extensive Reading.

Writing: Writing Practices--Writing Introduction and Conclusion - Essay Writing-Précis Writing.

UNIT-V

'How a Chinese Billionaire Built Her Fortune' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

Vocabulary: Technical Vocabulary and their usage

Grammar: Common Errors in English

Reading: Reading Comprehension-Exercises for Practice

Writing: Technical Reports- Introduction – Characteristics of a Report – Categories of Reports Formats- Structure of Reports (Manuscript Format) -Types of Reports - Writing a Report.

Text Books

- Sudarshana, N.P. and Savitha, C. (2018). English for Engineers. Cambridge University Press.

References

1. Swan, M. (2016). Practical English Usage. Oxford University Press.
2. Kumar, S and Lata, P.(2018). Communication Skills. Oxford University Press.
3. Wood, F.T. (2007).Remedial English Grammar. Macmillan.
4. Zinsser, William. (2001). On Writing Well. Harper Resource Book.
5. Hamp-Lyons, L. (2006).Study Writing. Cambridge University Press.
6. Exercises in Spoken English. Parts I –III. CIEFL, Hyderabad. Oxford University Press.

Course Code	Course Title					Course Type
HS1801	English Language Lab					HSMC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	0	0	2	40	60	1

Course Objectives

- To facilitate computer-assisted multimedia instruction enabling individualized and independent language learning.
- To sensitize students to the nuances of English speech sounds, word accent, intonation and rhythm.
- To bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking.
- To improve the fluency of students in spoken English and neutralize their mother tongue influence.
- To train students to use language appropriately for public speaking and interview.
- To enable students to develop their listening skills so that they may appreciate its role in the LSRW skills approach to language and improve their pronunciation.
- To equip students with necessary training in listening so that they can comprehend the speech of people of different backgrounds and regions Students should be given practice in listening to the sounds of the language, to be able to recognize them and find the distinction between different sounds, to be able to mark stress and recognize and use the right intonation in sentences.
    - Listening for general content.
    - Listening to fill up information.
    - Intensive listening.
    - Listening for specific information.

Speaking Skills :

- To involve students in speaking activities in various contexts.
- To enable students to express themselves fluently and appropriately in social and professional contexts.
- Oral practice: Just A Minute (JAM) Sessions.
- Describing objects/situations/people.
- Role play – Individual/Group activities.

Course Outcomes

1. Better understanding of nuances of English language through audio- visual experience and group activities.
2. Neutralization of accent for intelligibility.
3. Speaking skills with clarity and confidence which in turn enhances their employability.

Detailed Contents

UNIT-I

Understand: Listening Skill- Its importance – Purpose- Process- Types- Barriers of Listening - Communication at WorkPlace- Spoken vs. Written language.

Practice: Introduction to Phonetics – Speech Sounds – Vowels and Consonants -Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.

UNIT-II

Understand: Structure of Syllables – Word Stress and Rhythm– Weak Forms and Strong Forms in Context- Features of Good Conversation – Non-verbal Communication.

Practice: Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms inContext-Situational Dialogues – Role-Play- Expressions in Various Situations –Making Requests and Seeking Permissions - Telephone Etiquette.

UNIT-III

Understand: Intonation-Errors in Pronunciation-the Influence of Mother Tongue (MTI)- How to make Formal Presentations.

Practice: Common Indian Variants in Pronunciation – Differences in British and American Pronunciation- Formal Presentations.

UNIT-IV

Understand: Listening for General Details-Public Speaking – Exposure to Structured Talks.

Practice: Listening Comprehension Tests- Making a Short Speech – Extempore

UNIT-V

Understand: Listening for Specific Details- Interview Skills.

Practice: Listening Comprehension Tests- Mock Interviews.

References

1. Clarity English Success - Software.
2. Connected Speech- Software.
3. Issues in English 2- Software.
4. http://www.clarityenglish.com/program/practicalwriting/
5. http://www.clarityenglish.com/program/roadtoielts/
6. http://www.clarityenglish.com/program/clearpronunciation1/
7. http://www.clarityenglish.com/program/resultsmanager/

Course Code	Course Title					Course Type
MA1201	Differential Equations and Vector Calculus					BSC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	1	0	40	60	4

Course Objectives

- Methods of solving the differential equations of first and higher order.
- To study the methods of solving improper integrals and the concepts of multiple integrals.
- The basic properties of vector valued functions and their applications to line, surface and volume integrals.
- To study numerical methods to analyze experimental data.

On Completion of this course the students will be able to:

1. Explain the relationship between the derivative of a function as a function and the notion of the derivative as the slope of the tangent line to a function at a point.
2. Compare and contrast the ideas of continuity and differentiability.
3. To inculcate to solve algebraic equations and inequalities involving the sequence root and modulus function
4. Calculate directional derivatives and gradients.
5. Apply gradient to solve problems involving normal vectors to level surfaces.
6. Explain the concept of a vector integration in a plane and in space.

Detailed Contents

UNIT-I

Ordinary Differential Equations of first order: Exact first order differential equation, finding integrating factors, linear differential equations, Bernoulli's ,Riccati , Clairaut's differential equations, finding orthogonal trajectory of family of curves, Newton's Law of Cooling, Law of Natural growth or decay.

UNIT-II

Ordinary Differential Equations of higher order: Second order linear differential equations with constant coefficients: Non-Homogeneous terms of the type eax,$\sin(ax)$,$\cos(ax)$, polynomials in$x$,$eaxV(x)$,$xV(x)$; method of variation of parameters; Equations reducible to linear ODE with constant coefficients: Legendre's equation, Cauchy-Euler equation.

UNIT-III

Integral Calculus: Evaluation of the double integrals (Cartesian and Polar), change of order of integration (only Cartesian form), Evaluation of Triple integrals. Change of variables (Cartesian to polar) in case of double integrals (Cartesian to spherical and cylindrical) in case of Triple Integrals-Jacobians of transformations. Differentiation of integrals with variable limits - Leibnitz rule.

Applications: Finding Areas (using double integrals) and volumes (using double and Triple Integrals),

Centre of mass, Centre of gravity for constant and variable densities by double and triple integrals (applications involving cubes, Sphere and rectangular parallelepiped).

UNIT-IV

Vector Differentiation: Vector point functions and scalar point functions. Gradient, Divergence and Curl. Directional derivatives, Tangent plane and normal line. Vector Identities. Scalar potential functions. Solenoidal and Irrotational vectors.

UNIT-V

Vector Integration: Line, Surface and Volume Integrals. Theorems of Green, Gauss and Stokes (without proofs) and their applications.

Numerical Methods: Introduction and motivation about numerical methods, True value, approximate value, error, error percentage, algebraic equations, transcendental equations, Newton-Raphson method, Bisection method.

Text Books

- R. K. Jain and S. R. K. Iyengar, "Advanced Engineering Mathematics," 3rd ed., New Delhi, India: Narosa Publishing House, 2007.

References

1. E. Kreyszig, "Advanced Engineering Mathematics," 8th ed., New Delhi, India: Wiley-India, 2017.
2. M. D. Raisinghania, "Ordinary and Partial Differential Equations," 17th ed., New Delhi, India: S. Chand & Company Ltd., 2014.

Course Code	Course Title					Course Type
PH1201	Engineering Physics					BSC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	0	0	40	60	3

Course Objectives

- To acquire skills allowing the student to identify and apply formulas of physics using course literature.
- To be able to identify and illustrate physical concepts and terminology used and to be able to explain them in appropriate detail.
- To be able to make approximate judgments of physical aspects and other phenomena when necessary.
- To acquire skills allowing the student to organize and plan simpler laboratory course experiments and to prepare an associated oral and written report.

Course Outcomes

1. The basic laws of physics, their corollaries, and comprehension of how they can be applied to explain specific natural phenomena within the five key topic-areas* as described in the mission statement of the physics undergraduate program.
2. Use of critical thinking, hypothesis building, and application of the scientific method to physics concepts, theoretical models and calculations, and laboratory experimentation.
3. Problem solving skills and relevant mathematical methods to approach, conceptualize, and achieve analytical or numerical solutions to physics problems within important sub-categories of the five topic-areas*.
4. Laboratory skills and exposure to a variety of important experiments at appropriate levels that illustrate phenomena discussed in the lecture classes. Instrumentation and experimental techniques; methods for quantitative analysis of data and measurement uncertainty.
5. General knowledge of the development of physics and the nature of scientific inquiry, particularly the progression from classical physics to the modern physics ideas of quantum mechanics, statistical mechanics, and relativity.
6. Contemporary areas of physics inquiry as introduced in upper-level physics and interdisciplinary elective courses, as well as in faculty-mentored undergraduate research available to all majors who seek this experience.
7. Written and oral communication skills for dissemination of scientific results in report, article, or oral presentation formats; standard citation methods; ethics in science and scholarship and its importance to scientific inquiry and professionalism.

   (*key-topic areas as given in the Mission Statement of the physics undergraduate program are:
   i) Electrodynamics; ii) Quantum Mechanics; iii) Electron Structure of Solids;
   iv) Semiconductor Physics; v) experimental methods.

Detailed Contents

UNIT-I

Electrodynamics Gradient, Divergence, Curl and its applications, Line, surface and volume integrals, Stokes and Gauss theorem: Applications, Curvilinear Coordinates: Polar, Cylindrical and spherical coordinates, Problems. Electrodynamics before Maxwell, Fixing of Ampere's Law, Maxwell Equations in Matter, Boundary Conditions, Continuity Equation, Poynting Theorem, Wave equation for E and B, Monochromatic Plane Waves, Energy and Momentum in EM Waves.Propagation in Linear Media, Reflection and Transmission at Normal Incidence.

UNIT-II

Quantum Mechanics Introduction to Quantum Mechanics, De-Broglie's waves auncertainty principle, Wave Function and its Significance, Time dependent and time independent Schrodinger wave equations, Particle in a box - Problems.

UNIT-III

Electron Structure of Solids Introduction to Crystallography, Bravais Lattices and crystal systems, Atomic Packing, Atomic Radii, Crystal Structures (SC, BCC and FCC), Miller Indices, Classical Free electron Theory, Kronig Penny model (E vs K), Band theory of solids.

UNIT-IV

Semiconductor Physics Intrinsic and extrinsic semiconductors, Fermi level and carrier- concentration, Effect of temperature on Fermi level. Mobility of charge carriers and effect of temperature on mobility.

UNIT-V

Optics Interference- Introduction and examples, Young's; double slit experiment, Diffraction – Types, Single Slit, Double Slit, Diffraction Grating.

Text Books

- H.K. Malik and Singh, "Engineering Physics," New Delhi, India: Tata McGraw-Hill Education, 2018.

References

1. D.J. Griffiths, "Introduction to Electrodynamics," 4th ed., Upper Saddle River, NJ: Prentice Hall, 2012.
2. Aruldha, "Quantum Mechanics," New Delhi, India: McGraw-Hill Education, 2018.
3. C. Kittel, "Introduction to Solid State Physics," 8th ed., Hoboken, NJ: Wiley, 2005.

Course Code	Course Title					Course Type
PH1801	Engineering Physics Lab					BSC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	0	0	3	40	60	1.5

Course Objectives

- To gain practical knowledge by applying experimental methods to correlate with the theory.
- Apply the analytical techniques and graphical analysis to the experimental data.
- To develop intellectual communication skills and discuss the basic understanding of various experimental principles involved.

Course Outcomes

1. Prepare and perform individually a wide spectrum of experiments.
2. Present experimental data in various appropriate forms like tabulation and plots.
3. Analyze, interpret and summarize the experimental results.
4. Communicate clearly the understanding of various experimental principles, instruments/setup, and procedure.

List of experiments:

1. Photoelectric effect.
2. Hall effect.
3. Ultrasonic Interferometer.
4. Melde's Experiment.
5. Four probe Method.
6. Frank hertz Experiment.
7. Seebeck and Peltier effect.
8. Solar cell.
9. Couple pendulum.
10. Dispersive power of prism.
11. Diffraction Grating.
12. Flywheel.

Course Code	Course Title					Course Type
EE1202	Basic Electrical and Electronics Engineering					ESC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	0	0	40	60	3

Course Objectives

- Electrical DC and AC circuits, basic laws of electricity and methods to solve the electrical networks
- Construction operational features of energy conversion devices i.e. transformers, DC motors and induction motors.
- Basics of electronics, semiconductor devices and their characteristics and operational features.

Course Outcomes

1. Understand the basic concept of electrical circuits under DC and AC excitation and solve basic electrical circuit problems.
2. Understand basic concept and performance of transformers and motors used as various industrial drives.

Detailed Contents

UNIT- I

DC CIRCUIT ANALYSIS :**Electrical circuit elements:** R-L-C Parameters, V–I relationship for Passive elements, Diode, Voltage and Current Independent and Dependent Sources .

Circuit analysis:Kirchoff's Laws, Network reduction techniques – series, parallel, series parallel, star–to-delta, delta-to-star transformation, Source Transformation, Mesh Analysis and Nodal Analysis **Network Theorems** - Thevenin's, Norton's, Maximum Power Transfer, Superposition .

Step response of RL,RC and RLC circuits

UNIT- II

AC CIRCUIT ANALYSIS :Single Phase AC Circuits - R.M.S. and Average values, Form Factor, steady state analysis of series, Parallel and Series parallel Combinations of R, L and C with Sinusoidal excitation, concept of reactance, Impedance, Susceptance and Admittance – phase and phase difference, Concept of Power Factor, j-notation, complex and Polar forms of representation.

Resonance – Series resonance and Parallel resonance circuits.

UNIT- III

THREE PHASE AC CIRCUITS

Three phase ac circuits -Three phase EMF generation, delta and Y connections, line and phase quantities, solution of three phase circuits, balanced supply voltage and balanced load, phasor diagram, measurement of power in three phase circuits.

UNIT- IV

Basic Electronics

Introduction to electronics and electronic systems, Diode and Rectifier circuits (Half and Full wave), BJT, Transistor biasing. Small signal transistor amplifiers (CE), Operational amplifiers and their basic application, Introduction to digital circuits.

UNIT- V

Electrical Machines

Transformers : Construction, EMF equation, ratings, phasor diagram on no load and full load, equivalent circuit, regulation and efficiency calculations, open and short circuit test , applications.

DC machines: Construction, EMF and Torque equations, Characteristics of DC generators and motors, applications.

Induction motors: The revolving magnetic field, principle of orientation, ratings, equivalent circuit, Torque-speed characteristics, application.

Text Books

- Hughes, Edward, and John H. Brown. Electrical Technology. Prentice Hall, 7th edition.
- Smith, S. Parker. Problems In Electrical Engineering. 9th edition.
- Boylestad, R.L., and Louis Nashelsky. Electronic Devices and Circuits. PEI/PHI, 9th Ed, 2006.
- Millman, J., and C.C. Halkias. Millman's Electronic Devices and Circuits. Satyabratajit, TMH, 2/e, 1998.
- Hayt, William, and Jack E. Kemmerly. Engineering Circuit Analysis. McGraw Hill Company, 6th edition.
- Nagrath, I.J., and D.P. Kothari. Electric Machines. Tata McGraw Hill, 7th Edition, 2005.

References

1. Kishore, K. L. (2005). Electronic Devices and Circuits. B.S. Publications, 2nd Edition.
2. Maini, A. K., & Agarwal, V. (2009). Electronic Devices and Circuits. Wiley India Pvt. Ltd., 1st Edition.
3. Jagan, N. C., & Lakshminarayana, C. (n.d.). Network Theory. B.S. Publications.
4. Sudhakar, C., & Palli, S. M. (n.d.). Network Theory. Tata McGraw-Hill.
5. Bhimbra, P. S. (n.d.). Electrical Machines. Khanna Publishers.

Course Code	Course Title					Course Type
EE1802	Basic Electrical and Electronics Engineering Lab					ESC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	0	0	2	40	60	1

Course Objectives

- To expose the students to the concepts of electrical and electronics circuits and their applications.
- To expose the students to the operation of dc machines and transformers and give them experimental skills.

Course Outcomes

1. Understand principles of measuring instruments of voltage, current and power.
2. Analyze the characteristics of semiconductor devices and understand their applications.
3. Analyze the characteristics and evaluate performance of DC machines and transformers.

LIST OF EXPERIMENTS

1. Introduction to Lab:
    a. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
    b. Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winging - slip ring arrangement) and single-phase induction machine.
2. Measuring the steady-state and transient time-response of R-L, R-C, and R-L-C circuits to a step change in voltage (transient may be observed on a storage oscilloscope). Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification. Observation of phase differences between current and voltage. Resonance in R-L-C circuits.
3. Transformers: Observation of the no-load current waveform on an oscilloscope (non sinusoidal wave-shape due to B-H curve nonlinearity should be shown along with a discussion about harmonics). Loading of a transformer: measurement of primary and secondary voltages and currents, and power.
4. Open circuit & short circuit test on single phase transformer.
5. Verification of KCL&KVL.
6. Characteristics of the lamps (Tungsten, Fluorescent and Compact Fluorescent Lamps).
7. Verification of Network Theorems.
8. V-I characteristics of Diodes and BJT.
9. Half-wave and full-wave rectifiers, rectification with capacitive filters, zener diode.
10. Studies on logic gates.

Course Code	Course Title					Course Type
CS1202	Data Structures and Algorithms					PCC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	0	0	40	60	3

Course Objectives

- To develop proficiency in the specification, representation, and implementation of abstract data types and data structures.
- To get a good understanding of applications of data structures.
- To solve advanced computer science problems by making appropriate choice for intended applications.

Course Outcomes

1. Students will be able to represent and manipulate linear and non-linear data structures using the C programming language.
2. Students will be able to apply different searching and sorting algorithms to solve problems.
3. Students will understand the concepts of binary trees and search trees, and be able to perform operations on them.
4. Students will be able to implement stack and queue ADTs using both array and linked representations.
5. Students will understand the basics of graph theory, including graph traversals such as BFS and DFS.

Detailed Contents

UNIT-I

Basic Concepts - Algorithm specification, Introduction, Recursive algorithms. Introduction to Linear and non-linear Data structures. Representation of single and two dimensional arrays, Singly Linked List Operations- Insertion, Deletion, Concatenating Single Linked Lists, Circular Linked List, Doubly Linked list.

UNIT-II

Stack ADT- definitions, Operations, array and linked representation in C, application- infix to postfix conversion, postfix expression evaluation, recursion implementation.

Queue ADT- definitions and operations, circular queues, double ended queue array and linked representation.

UNIT-III

Trees- Terminology, Representation of Trees, Binary tree ADT, Properties of Binary trees, array and linked representation of Binary trees, Max Heap, Min Heap.

Graph- Introduction, Definition and terminology, Graph traversals- BFS and DFS.

UNIT-IV

Searching and sorting – Linear and Binary Search, Sorting – Insertion, Bubble, Selection, Radix, Quick , Merge, Heap sorts. Comparisons of Sorting Algorithms.

Hashing: Hash Table Representation, hash functions, collision resolution-separate chaining, open addressing-linear probing, quadratic probing, double hashing, rehashing, extendible hashing.

UNIT-V

Search Trees- Binary search Trees-operations, AVL Trees-height of AVL, operations. Tree operations on B Trees and B+ trees. Red Black trees-Definition and Representation and application .

Text Books

- N. Karumanchi, "Data Structures and Algorithms Made Easy," CareerMonk Publications, 2011.

References

1. Horowitz, E., Sahni, S., & Freed, S. A. (2007). Fundamentals of Data Structures in C, 2nd Edition. Universities Press.
2. Tanenbaum, A. S., Langsam, Y., & Augenstein, M. J. (2011). Data Structures Using C. Pearson Education India.
3. M. A. Weiss, "Data Structures and Algorithm Analysis in C++," 3rd ed., Pearson Education, 2006.
4. M. T. Goodrich, R. Tamassia, D. Mount, "Data Structures and Algorithms in C++," 2nd ed., Wiley India Pvt. Ltd, 2004.

Course Code	Course Title					Course Type
CS1802	Data Structures and Algorithms Lab					PCC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	0	0	3	40	60	1.5

Course Objectives

- To provide experience on design, testing, and analysis of Algorithms and DataStructures.
- To acquaint the students with the Data Structures used in the Computer Science field.

Course Outcomes

1. Students will understand and be able to represent different data structures using arrays and linked lists.
2. Students will be able to apply different operations on data structures such as polynomial operations, sparse matrices, stacks, queues, double ended queues, priority queues, binary trees, graphs, and string representation.
3. Students will be able to apply various sorting and searching algorithms to solve problems.
4. Students will be able to implement different pattern matching algorithms to solve problems related to string representation.
5. Students will be able to use B-tree and B+ tree data structures for database management and indexing.

Experiments:

1. Representation of Polynomials using Arrays and Linked List and the different operations that can be performed on Polynomials
2. Representation of Sparse Matrix using Arrays and Linked List and the different operations that can be performed on Sparse Matrices
3. Representation of Stacks using Arrays and Linked List and the different operations that can be performed on Stacks
4. Representation of Queues using Arrays and Linked List and the different operations that can be performed on Queues
5. Representation of Double Ended Queue using Arrays and Linked List and the different operations that can be performed on Double Ended Queue
6. Representation of Priority Queues using Arrays and Linked List and the different operations that can be performed on Priority Queues
7. Representation of Binary Trees using Arrays and Linked List and the different operations that can be performed on Binary Trees
8. Representation of Graphs using Arrays and Linked List and the different operations that can be performed on Graphs
9. Infix, Postfix and Prefix conversions.
10. Different Sorting and Searching methods.

11. String representation using Arrays and Linked List and different pattern matching algorithms
12. Implementation and operations on B-Tree and B+ Tree For the detailed list of programs refer to the lab manual.

Course Code	Course Title					Course Type
BS 1201	Environmental Science					MC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	0	0	40	60	0

Course Objectives

- To introduce students to the multidisciplinary nature of environmental studies and its scope and importance.
- To create awareness among students about the need for conservation and sustainable use of natural resources.
- To educate students about the structure, function, and value of ecosystems and biodiversity, as well as the threats they face and methods for their conservation.
- To familiarize students with the causes, effects, and control measures of different types of pollution and the legal framework for environmental protection.
- To sensitize students to the social issues related to the environment and their role in promoting sustainable development.

Course Outcomes

1. Students will be able to understand the complex interrelationships between different components of the environment and their impact on human well-being.
2. Students will develop an appreciation for the importance of conservation and sustainable use of natural resources and become aware of their individual and collective responsibilities towards the environment.
3. Students will be able to understand the functioning of different ecosystems and their role in maintaining the ecological balance.
4. Students will be able to identify different types of pollution and their causes, effects, and control measures, and develop an understanding of the legal framework for environmental protection.
5. Students will become aware of the social issues related to the environment and the role of education, technology, and individual actions in promoting sustainable development.

Detailed Contents

UNIT-I

Multidisciplinary Nature Of Environmental Studies:

Definition, scope and importance, need for public awareness.

UNIT-II

Natural Resources:

Renewable and non-renewable resources: Natural resources and associated problems.

a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.

b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over

water, dams-benefits and problems.
c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
e) Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources.
f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

UNIT-III

Ecosystems & Biodiversity: Concept of an ecosystem. Structure and function of an ecosystem. Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids.

Introduction, types, characteristic features, structure and function of the following ecosystems:-
a. Forest ecosystem, b. Grassland ecosystem, c. Desert ecosystem, d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).
b. Biodiversity- Definition : genetic, species and ecosystem diversity. Biogeographical classification of India Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values.
c. Biodiversity at global, National and local levels. India as a mega-diversity nation Hot-sports of biodiversity.
d. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT-IV

Environmental Pollution: Definition, Cause, effects and control measures of: - Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards
Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
Role of an individual in prevention of pollution
Disaster management: floods, earthquake, cyclone and landslides.
Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies.
Environment Protection Act., Air (Prevention and Control of Pollution) Act. Water Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act.

UNIT-V

Social Issues & The Environment: Human Rights. Value Education. HIV/AIDS. Women and Child Welfare. Role of Information Technology in Environment and human health.
Field work: Visit to a local area to document environmental assets river/forest/grassland/hill/mountain Visit to a local polluted site Urban/Rural/Industrial/Agricultural Study of common plants, insects, birds. Study of simple ecosystems-pond, river, hill slopes, etc.

References

1. Agarwal, K.C. (2001). Environmental Biology. Nidi Publ. Ltd. Bikaner.

- Prof. Erach Bharucha, Director Bharati Vidyapeeth, Institute of Environment Education & Research, Pune
- Prof. C. Manoharachary Department of Botany Osmania University Hyderabad
- Prof. S. Thayumanavan Director Centre for Environmental Studies Anna University, Chennai
- Prof. D.C. Goswami Head, Dept. Of Environment Science Gauhati University Guwahati-781 014
- Shri R. Mehta Director EE Division Ministry of Environment & Forest Prayavaran Bhawan, CGO Complex Lodhi Road, New Delhi-110 003 UGC OFFICIALS
- Dr. N. K. Jain Joint Secretary UGC, New Delhi.

Engineering 2 - Semester 1

Course Code	Course Title					Course Type
BM2101	Managerial Economics & Financial Analysis					HSMC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	1	0	40	60	3

Course Objectives:

- To equip the students with the basic inputs of managerial economics and demand concepts.
- To understand the concepts of production and cost for various business decision.
- To understand the different types of market, market structures & pricing strategies and their applications in business decision making.
- To understand the concept of Capital, Capital Budgeting and the techniques used to Evaluate Capital Budgeting proposals.

Course Outcomes:

After completion of the course, students will be able to

CO1: Understand the nature and scope of managerial economics and the concepts of demand analysis.

CO2: To be equipped with the knowledge of estimating the Demand, demand elasticity and the concepts of demand forecasting for a product.

CO3: Understand the concepts of production and cost analysis

CO4: To understand the nature of different markets and Price Output determination under various market conditions.

CO5: To evaluate various investment project proposals with the help of capital budgeting techniques for decision making.

Detailed Content:

Unit-1: Introduction to Managerial Economics:

- Definition- Nature of Managerial Economics- Scope of Managerial Economics - Basic economic principles: the concept of scarcity- opportunity concept- Marginal concept- incremental concept- discounting principle concept- risk and uncertainty.

Unit–II: Theory of Demand and Supply:

- Introduction to Demand: Definition of Demand-Law of Demand- Determinants of Demand-Types of Demand: Consumer Goods Demand v/s Producer Goods Demand, Perishable Goods Demand v/s Durable Demand, Firm Demand v/s Industry Demand, Autonomous Demand v/s Derived Demand, Total Market Demand v/s Market Segmentation Demand- Elasticity of Demand: Types of Elasticity (Price, Income and cross)-Types of Price Elasticity, Demand Forecasting: Methods of Demand Forecasting; Supply: Law of Supply.

Unit-III: Theory of Production and Cost Analysis:

- **Production Analysis**: Meaning of Production-Production function-Production function with one variable- Production function with two variables- Isoquants and Isocosts- Marginal Rate of Technical Substitution- Returns to Scale.

  Cost concepts: Definition of Costs-Meaning of Costs-Types of Costs.

Unit – IV: Market Structures and Pricing Strategies:

- Definition of Market-Classification of Market Structures -competitive situations –Perfect Competition- Features of Perfect Competition Market-Price-Output determination under Perfect competition- Monopoly Market- Price determination under Monopoly Market-Monopolistic competition and Oligopoly features- Pricing Strategies.

Unit-V: Capital and Capital Budgeting:

Capital: Introduction of Capital; Definition of Capital; Sources of Capital.

Capital Budgeting: Meaning and Definition of Capital Budgeting-Significance of Capital Budgeting-Need for capital budgeting decisions-Capital Budgeting decisions-Kinds of capital budgeting Decisions-Methods of Capital Budgeting-Traditional Methods-Payback period and Accounting rate of return methods, Discounted Cash flow methods- Net present value method.

Text Books

- Dr.A. R.Aryasri–Managerial Economics and Financial Analysis, TMH 2011.
- Dr. N. Appa Rao, Dr. P. Vijay Kumar: 'Managerial Economics and Financial Analysis', Cengage Publications, New Delhi – 2011.
- Prof.J.V. Prabhakara rao, Prof.P.Venkatarao. 'Managerial Economics and Financial Analysis', Ravindra Publication.
- Managerial Economics and Financial Analysis, Aryasri, McGraw Hill Education
- Managerial Economics and Financial Analysis, P.Vijaya Kumar, N.Appa Rao, Cengage Publications.

Reference Books:

1. V.Maheswari: Managerial Economics, Sultan Chand.
2. Suma Damodaran: Managerial Economics, Oxford 2011.
3. Dr.B.Kuberuduand , Dr.T.V.Ramana: Managerial Economics & Financial Analysis, Himalaya Publishing House 2011.
4. Vanitha Agarwal: Managerial Economics, Pearson Publications2011.
5. Sanjay Dhameja: Financial Accounting for Managers, Pearson.
6. Maheswari: Financial Accounting, Vikas Publications.
7. S.A.Siddiqui & A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International Publishers, 2012.

Web links:

1. www.managementstudyguide.com
2. www.tutorialspoint.com
3. www.lecturenotes.in

Course Code	Course Title					Course Type
EC2105	Digital Electronic Circuits					ESC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	0	0	40	60	3

Course Objectives

- This course aims at through understanding of binary number system, logic gates, combination logic and synchronous and asynchronous logic.

Course Outcomes

After studying this course the students would gain enough knowledge

1. Have a thorough understanding of the fundamental concepts and techniques used in digital electronics.
2. To understand and examine the structure of various number systems and its application in digital design.
3. The ability to understand, analyze and design various combinational and sequential circuits.
4. Ability to identify basic requirements for a design application and propose a cost effective solution.
5. The ability to identify and prevent various hazards and timing problems in a digital design.
6. To develop skill to build, and troubleshoot digital circuits.

Detailed Contents

UNIT-I

IntroductionDigital & analog signals, Number System, BCD & its arithmetic, Binary, Decimal, Octal, Hexadecimal, Negative numbers & its arithmetic, Number base conversions.

UNIT-II

Logic Realization & Simplification:Boolean Algebra and De Morgan's Theorem, SOP & POS forms Canonical forms, Karnaugh maps up to 6 variables, Binary codes,Code Conversion. Logic Gates and its realization.

UNIT-III

Combinational Logic Design:MSI devices like Comparators, Multiplexers, Encoder, Decoder, Driver & Multiplexed Display, Half and Full Adders, Subtractors, Serial and Parallel Adders, BCD Adder, Barrel shifter and ALU, parity generator, checker.

UNIT-IV

Sequential Logic Design:Building blocks like S-R, JK and Master-Slave JK FF, T-FF, D-FF and Flip-Flop Conversions. Shift Registers (SISO, SIPO, PISO, PIPO), universal shift register. Synchronous and Asynchronous counters and its realization. Programmable logicFamilies: PAL, PLA.PROM.

UNIT-V

Finite State Machines:Design of synchronous FSM, Mealy model, Moore model, state diagrams and state reduction method, overlapping & Non-overlapping models. Designing synchronous circuits like Pulse train generator, Pseudo Random Binary Sequence generator.

Text Books :

- M. M. Mano, "Digital Design - Third Edition," Pearson Education/PHI, 2002.

References

1. A. P. Malvino and D. P. Leach, "Digital Principles and Applications," TATA McGraw Hill Edition, 2007.
2. C. H. Roth, Jr., "Fundamentals of Logic Design," 5th ed., Thomson, 2004.
3. Kohavi, Z. (1978). Switching and finite automata theory. Tata McGraw Hill.
4. Rao, C. V. S. (2002). Switching and logic design. Pearson Education.
5. Givone, D. D. (2003). Digital principles and design. Tata McGraw Hill Education.
6. Rafiquzzaman, M. (2005). Fundamentals of digital logic and microcomputer design (5th ed.). John Wiley & Sons.

Course Code	Course Title					Course Type
EC2702	Digital Electronic Circuits Lab					PCC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	0	0	2	40	60	1

Course Objectives:

- To introduce the basics of digital electronics and the concepts of gates and logic circuits.
- To provide hands-on experience in designing and testing digital circuits.
- To impart the knowledge of digital components such as flip flops, registers, and counters.
- To teach the design and implementation of complex digital circuits such as encoders, decoders, and multiplexers.

Course Outcomes

1. Students will be able to understand the working of basic digital components such as gates and their application in logic circuits.
2. Students will be able to design and test simple digital circuits such as full adders, subtractors, and comparators.
3. Students will be able to design and test more complex digital circuits such as shift registers, flip flops, and counters.
4. Students will be able to design and implement digital circuits using multiplexers, decoders, and encoders.
5. Students will have hands-on experience in testing and debugging digital circuits using simulation software and hardware.

Detailed Contents

LIST OF EXPERIMENTS:

1. I/O characteristics of a Universal, Basic, Arithmetic gates.
2. Design of a digital comparator.
3. Check the functionality of a 1 bit full adder circuit and subtractor.
4. Develop 4 bit RCA.
5. Realize the functionalities of encoders and decoder.
6. Design sr-latch and flip flop.
7. Design jk-latch and flip flop.
8. Functioning of shift register, master slave flip flop, ALU.
9. Design of asynchronous and synchronous counters.
10. Verify the functionality of a n*1 multiplexer and 1*n demultiplexer.
11. Design of a 7-segment LED display.

Course Code	Course Title					Course Type
CS2101	Database Management System					PCC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	0	0	40	60	3

Course Objectives

- To understand the basic concepts and the applications of database systems.
- To master the basics of SQL and construct queries using SQL.
- Topics include data models, database design, relational model, relational algebra, transaction control, concurrency control, storage structures and access techniques.
- Gain knowledge of fundamentals of DBMS, database design and normal forms.
- Master the basics of SQL for retrieval and management of data.
- Be acquainted with the basics of transaction processing and concurrency control.
- Familiarity with database storage structures and access techniques.

Course Outcomes

1. Understand the historical perspective of database systems and the difference between file systems and DBMS.
2. Perform conceptual design with the ER model and understand the relational model and its constraints.
3. Query relational data and perform logical database design using SQL.
4. Understand transaction concepts and their implementation, including locking, timestamps, and validation-based protocols.
5. Understand file organization and indexing, including cluster, primary, and secondary indexes, hash-based indexing, and B+ trees.

Detailed Contents

UNIT - I

Database System Applications: A Historical Perspective, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS

Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design With the ER Model.

UNIT - II

Introduction to the Relational Model: Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical database design, introduction to views, destroying/altering tables and views. Relational Algebra, Tuple relational Calculus, Domain relational calculus.

UNIT - III

SQL: QUERIES, CONSTRAINTS, TRIGGERS: form of basic SQL query, UNION, INTERSECT, an EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active databases.Schema Refinement: Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, First, Second, Third normal forms, BCNF, lossless join decomposition, multivalued dependencies, Fourth normal form, Fifth normal form.

UNIT - IV

Transaction Concept: Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for serializability, Lock Based Protocols, Timestamp Based Protocols, Validation- Based Protocols, Multiple Granularity, Recovery and Atomicity, Log–Based Recovery, Recovery with Concurrent Transactions.

UNIT - V

Data on External Storage: File Organization and Indexing, Cluster Indexes,Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree based Indexing, Comparison of File Organizations, Indexes- Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM),B+ Trees: A Dynamic Index Structure.

Database Security: Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection.

Text Books

- A. Silberschatz, H. F. Korth, and S. Sudarshan, "Database System Concepts," 3rd ed., McGraw Hill, 1997.
- R. Krishnan and J. Gehrke, "Database Management Systems," 3rd ed., Tata Mc Graw Hill, 2002.

References

1. Rob, P. & Coronel, C. Database Systems design, Implementation, and Management, 7th ed., Cengage Learning, 2016.
2. Elmasri, R. & Navathe, S. B. Fundamentals of Database Systems, Pearson, 2016.
3. Date, C. J. Introduction to Database Systems, Pearson, 2015.
4. The X Team, Shah, S. & Shah, V. Oracle for Professionals, SPD, 2004.
5. Shah, Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, PHI, 2015.
6. Gillenson, M. L. Fundamentals of Database Management Systems, Wiley, 2011.

Course Code	Course Title					Course Type
CS 2701	Database Management System Lab					PCC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	0	0	3	40	60	1.5

Course Objectives

- This lab enables the students to practice the concepts learnt in the subject DBMS by developing a database.
- The student is expected to practice the designing, developing and querying a database.
- Students are expected to use the "Mysql/Oracle" database.

Course Outcomes

1. Ability to design and implement a database schema for given problem.
2. Apply the normalization techniques for development of application software to realistic problems.
3. Ability to formulate queries using SQL DML/DDL/DCL commands.
4. Case Studies
    a. university database
    b. online ticket booking system
    c. library management systems

Detailed Contents

Week 1: E-R Model

Analyze the problem carefully and Identify the entities, attributes etc. Identify the primary keys for all the entities. Identify the other keys like candidate keys, partial keys.

Concept design with E-R Model

Relate the entities appropriately. Apply cardinalities for each relationship. Identify strong entities and weak entities (if any). Indicate the type of relationships (total / partial). Try to incorporate generalization, aggregation, specialization etc wherever required.

Week 2: DDL and DML commands

In this week you are going to practice DDL commands, DML commands, Constraints and Data Query Language.

Week 3: SQL Special operators

In this week you are going to practice Convert ER Diagrams into tables and SQL Special operators like, (in between, is null, not, exist, not Exists ANY, ALL, IN, set operators, Constraints etc.

Week 4: Aggregate functions
You are going to practice queries using Aggregate functions (COUNT, SUM, AVG, and MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.

Week 5: Functions
This week you are going to practice queries on String/Character,Date/Time Functions,Numeric Functions,Math Functions.

Week 6: SQL Joins
In this week you are going to practice queries on different Joins in SQL.

Week 7: Sub Queries
In this week you are going to practice queries on Nested Queries, Correlated Subqueries.

Week 8: DCL and TCL commands
In this week you are going to practice queries on DCL Commands, TCL Commands.

Week 9: Sequences and views
In this week you are going to practice queries onCreate sequences and views, Top N Analysis.

Week 10: Triggers
In this week you are going to work on Triggers. Creation of insert trigger, delete trigger, update trigger. Practice triggers using the above database.

Week 11: Procedures
In this session you are going to learn Creation of stored procedure, Execution of procedure and modification of procedure.

Week 12: Cursors
In this week you need to do the following: Declare a cursor that defines a result set. Open the cursor to establish the result set. Fetch the data into local variables as needed from the cursor, one row at a time. Close the cursor when done.

References

1. R. Elmasri and S. Navathe, "Fundamentals of Database Systems," 5th ed., Pearson Education, 2006.
2. A. Silberschatz, H. F. Korth, and S. Sudarshan, "Database System Concepts," 6th ed., McGraw-Hill, 2010.

Course Code	Course Title					Course Type
CS2102	Object Oriented Programming					PCC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	0	0	40	60	3

Course Objectives

- To introduce object-oriented programming principles and apply them in solving problems.
- To introduce the implementation of packages and interfaces.
- To introduce the concepts of exception handling and multithreading.
- To introduce the design of Graphical User Interface using swing controls.

Course Outcomes

1. Able to solve real world problems using OOP techniques.
2. Able to solve problems using java collection framework and I/O classes.
3. Able to develop multithreaded applications with synchronization.
4. Able to design GUI based applications.

Detailed Contents

UNIT - I

Foundations of Java: History of Java, Java Features,Java Virtual Machine (JVM), Java Environment, JDK, API.

Introduction to Java : Types of java program, Creating and Executing a Java program, Java Tokens, Constants, Variables, Data types, Scope of variables, Operators, Keywords, Character set, Identifiers, Literals, Separator, Command Line Arguments, Comments in Java program, Type casting, Expressions – Evaluation of Expressions.

Decision making and Branching: Simple if statement, if, else statement, Nesting if, else, else if Ladder, switch statement, Decision making and Looping: While loop, do-While loop, for loop, break, labeled loop, continue Statement, Simple programs

Arrays: One Dimensional Array, Creating an array, Array processing, Multidimensional Array, Vectors, Wrapper classes, Simple programs

UNIT – II

Strings: Exploring String class, String Class Methods, String Buffer Class, Simple programs

Class and objects: Defining a class, Methods, Creating objects, Accessing class members, Constructors, Static members, Nesting of Methods, this keyword, Command line input.

Polymorphism – Static Polymorphism, Dynamic Polymorphism, Method overloading, Polymorphism

with Static Methods, Private Methods and Final Methods.

Inheritance: Defining a subclass, Deriving a subclass, Single Inheritance, Multilevel Inheritance, Hierarchical Inheritance, Overriding methods, Final variables and methods, Final classes, Finalizer methods, Abstract methods and classes, Visibility Control: Public access, Private access, default and protected.

UNIT – III

Abstract classes & Interfaces - Interfaces vs Abstract classes, defining an interface, implementing interfaces, accessing implementations through interface references, extending interfaces. Inner classes - uses of inner classes, local inner classes, anonymous inner classes, static inner classes, examples.

Packages- Java API Packages, System Packages, Naming Conventions, Creating & Accessing a Package, Adding Class to a Package.

Collections: Collections overview, Collection Interfaces, Collections Implementation Classes, Sorting in Collections, Comparable and Comparator Interfaces.

UNIT – IV

Exception Handling: Limitations of Error handling, Advantages of Exception Handling, Types of Errors, Basics of Exception Handling, try blocks, throwing an exception, catching an exception, finally statement
Multi threading: Creating Threads, Life of a Thread, Defining & Running Thread, Thread Methods, Thread Priority, Synchronization, Implementing runnable interface, Thread scheduling.
Files and I/O Streams: The file class, Streams, The Byte Streams, Filtered Byte Streams, The Random Access File class.
Java Database connection: JDBC, ODBC Drivers, JDBC ODBC Bridges, Seven Steps to JDBC, Importing java SQL Packages, Loading & Registering the drivers, Establishing connection. Creating & Executing the statement.

UNIT - V

AWT Components and Event Handlers: Abstract window toolkit, Event Handlers, Event Listeners, AWT Controls and Event Handling: Labels, TextComponent, ActionEvent, Buttons, CheckBoxes, ItemEvent, Choice, Scrollbars, Layout Managers- Input Events, Menus, Programs
GUI Programming with Java - Introduction to Swing, limitations of AWT, Swing vs AWT, MVC architecture, Hierarchy for Swing components, Containers - JFrame, JApplet, JDialog, Jpanel. Overview of some swing components Jbutton, JLabel, JTextField, JtextArea, simple swing applications.

Text Books:

- H. Schildt, "Java: The Complete Reference, 7th ed.," Tata McGraw-Hill, 2014.
- E. Balagurusamy, "Programming with Java," Tata McGraw-Hill, 2007.

References:

1. J. Nino and F.A. Hosch, "An Introduction to programming and OO Design using Java," John wiley & Sons.
2. Y. Daniel Liang, "Introduction to Java Programming," Pearson Education.
3. A. Johnson-Thompson, "An Introduction to Java programming and Object Oriented Application Development."

4. Dr. G. Thampi, "Object oriented Programming in Java."
5. Yashavant Kanetkar, "Let us Java," BPB Publications, New Delhi, 2012.
6. Dr. R. Nageswara Rao, "Core Java, An Integrated Approach."
7. C. Thomas WU, "An Introduction to Oops with Java," TataMc-Graw Hill, New Delhi, 4th Edition.
8. ISRD Group, "Object oriented Programming through Java," TataMc-Graw Hill, New Delhi, Eight Reprint 2011

Course Code	Course Title					Course Type
CS2702	Object Oriented Programming Lab					PCC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	0	0	3	40	60	1.5

Course Objectives

1. To understand basic Java programming concepts and syntax.
2. To develop Java applications using control structures, arrays, and object-oriented programming concepts.
3. To implement Java applications using Strings, Wrapper classes, and file I/O.
4. To apply inheritance, polymorphism, and exception handling in Java programming.
5. To develop multi-threaded Java applications and understand the concept of threading.

Course Outcomes

At the end of the course the students will be able to

1. Understand basic Java programming concepts and syntax, Develop simple Java applications.
2. Use control structures and arrays in Java programs.
3. Implement object-oriented programming concepts in Java.
4. Develop Java applications using Strings and Wrapper classes.
5. Implement various types of inheritance, polymorphism and Use exception handling in Java.
6. Develop Java applications using file I/O.
7. Understand the concept of threading and implement multi-threaded Java applications.

LIST OF EXPERIMENTS:

Week-I

1. Write a Java program print “Hello World”
2. Write a Java program that prints all real and imaginary solutions to the quadratic equation ax2 + bx + c = 0. Read in a, b, c and use the quadratic formula
3. Write a Java program to implement calculator operations
4. Write a java program to find prime factors of given number
5. Write a java program to find whether given number is Palindrome or not
6. Write an application that declares 5 integers, determines and prints the largest and smallest in the group.

Week-II

1. Write a Java program to sort a given list of numbers.
2. Write a Java program to implement linear search.
3. Write a Java program to implement binary search.

4. Write a java program to add two given matrices.
5. Write a java program to multiply two given matrices.
6. Write a java program for sorting a given list of names.
7. Write a Java program to give an example for command line arguments.

Week-III

1. Write a program to display details of the required employee based on his Id. The details of employees includes, Emp_name, Emp_age, Emp_gender, Emp_designation, Emp_salary, Emp_Address etc.

2. A mail-order house sells five products whose retail prices are as follows : Product 1 : Rs. 99.90 , Product 2 : Rs. 20.20 , Product 3 : Rs. 6.87 , Product 4 : Rs. 45.50 and Product 5:Rs. 40.49 . Each product has Prdouct_Id, Product_Name,Product_Quantity, Product_Price. Write an application that reads a series of pairs of numbers as follows :

    a. product Id

    b. quantity sold. your program should calculate and display the total retail value of all products sold

3. Write a java program that inputs 5 numbers, each between 10 and 100 inclusive. As each number is read display it only if it's not a duplicate of any number already read display the complete set of unique values input after the user enters each new value

4. Write a java program : rolling a pair of dice 10 times [each attempt should be delayed by 10000 ms] and count the number Successful attempts. successful attempt : If the pair of Dice results in the same values.

5. Implement the following case study using OOP concepts in Java.E-Book stall : Every book has Properties i.e. Book_Name, Book_Author, Book_Count ; Every Customer has properties as : Customer_Id, Customer_Name,Customer_Address and he can buy Books from the E-Book stall by giving book name, author name and number of books he/she want to buy .Write a Program which will display the list books bought by the customer and remaining text books in the E-book stall with the the count.

Week -IV:

1. Write an application that uses the String method *"compareTo"* to compare two strings defined by the user.

2. Write an application that uses the String method equals and equalsIgnoreCase to test any two string objects for equality.

3. Write an application that uses String method indexOf to determine the total number of occurrences of any given alphabet in a defined text.

4. Write an application that uses String method concat to concatenate two defined strings.

5. Write a Java program to print all vowels in given string and count number of vowels and consonants present in given string
6. Write an application that finds the length of a given string.
7. Write an application that uses the String method charAt to reverse the string.
8. Write an application that finds the substring from any given string using substring method and startsWith & endsWith methods.
9. Write an application that changes any given string with uppercase letters, displays it, changes it back to lowercase letters and displays it.

Week-V

1. Write a Java Program to implement Wrapper classes and their methods.
2. Write an application that prompts the user for the radius of a circle and uses a method called circleArea to calculate the area of the circle and uses a method circlePerimeter to calculate the perimeter of the circle.
3. Write a JAVA program for the following.
    a. Call by value
    b. Call by object
4. Create a class Account with an instance variable balance (double). It should contain a constructor that initializes the balance, ensuring that the initial balance is greater than 0.0. Acct details: Acct_Name, Acct_acctno, Acct_Bal, Acct_Address.Create two methods namely credit and debit, getBalance. The Credit adds the amount (passed as parameter) to balance and does not return any data. Debit method withdraws money from an Account. GetBalance displays the amount. Ensure that the debit amount does not exceed the Account's balance. In that case the balance should be left unchanged and the method should print a message indicating"Debit amount exceeded account balance".
5. Write Java program for the following
    a. Example for this operator and the use of this keyword.
    b. Example for super keywords.
    c. Example for static variables and methods.

Week-VI

1. Write a Java program to find Area and Circle of different shapes using polymorphism concept
2. Write a Java program which can give example of Method overloading and overriding
3. Write an application to create a super class Employee with information first name & last name and methods getFirstName(), getLastName() derive the subclasses ContractEmployee and

RegularEmployee with the information about department, designation & method displayFullName() , getDepartment(), getDesig() to print the salary and to set department name & designation of the corresponding sub-class objects respectively.

4. Derive sub-classes of ContractEmployee namely HourlyEmployee & WeeklyEmployee with information number of hours & wages per hour, number of weeks & wages per week respectively & method calculateWages() to calculate their monthly salary. Also override getDesig () method depending on the type of contract employee.

5. Write an application to create a superclass Vehicle with information vehicle number,insurance number,color and methods getConsumption() displayConsumption(). Derive the sub-classes TwoWheeler and FourWheeler with method maintenance() and average() to print the maintenance And average of the vehicle.

6. Extend the above Two Wheeler class with methods getType() and getName() which gives the information about the type and the name of the company.Crea sub-classes Geared and Non Geared with method average() to print the average of a geared and non-geared two wheeler.

Week-VII

1. Create an abstract class Shape which calculates the area and volume of 2-d and 3-d shapes with methods getArea() and getVolume(). Reuse this class to calculate the area and volume of square ,circle ,cube and sphere.

2. Create an abstract class Employee with methods getAmount() which displays the amount paid to employees. Reuse this class to calculate the amount to be paid to WeeklyEmployee and HourlyEmployee according to no. of hours for HourlyEmployee and no. of weeks for WeeklyEmployee.

3. Create an Interface payable with method getAmount ().Calculate the amount to be paid to Invoice and Employee by implementing Interface.

4. Create an Interface Vehicle with methods getColor(),getNumber(), getConsumption() calculate the fuel consumed, name and color for TwoWheeler and Four Wheeler By implementing interface Vehicle.

5. Create an Interface Fare with method getAmount() to get the amount paid for fare of traveling. Calculate the fare paid by bus and train implementing interface Fare.

6. Create an Interface StudentFee with methods getAmount(), getFirstName(), getLastName() , getAddress(), getContact(). Calculate the amount paid by the Hostler and Non Hostler student by implementing interface Student Fee

Week-VIII

1. Write a Program to create your own package. Package should have more than two classes.write a Program that uses the classes from the package.

2. Create a package named org.shapes. Create some classes in the package representing some common geometric shapes like Square, Triangle, Circle and so on. write a Program that uses the classes from the package.

3. Write a Java program to create a package called dept. Create four classes as CSE, ECE, ME and CE adds methods in each class which can display subject names of your respective year. access this package classes from main class

4. Write a Calculator program : Include all calculator operations as classes in a Package "Calculator" and import it to the main class.

5. 5. Write a program for the following

    a. Example to use interfaces in Packages.

    b. Example to create a sub package in a package.

Week-IX

1. Program for demonstrating the use of throw, throws & finally - Create a class with a main( ) that

   throws an object of class Exception inside a try block. Give the constructor for Exception a String argument. Catch the exception inside a catch clause and print the String argument. Add a finally clause and print a message to prove you were there.

2. Write a program that shows that the order of the catch blocks is important. If you try to catch a superclass exception type before a subclass type, the compiler should generate errors.

3. Write a program to rethrow an exception – Define methods one() & two(). main() should call one() and Method one() should call two(), Method two should throw an exception. Method one() should catch the exception and rethrow it to main() and main() should catch the rethrown exception.

4. Exception Handling program for ClassNotFoundException--thrown if a program can not find a class it depends on at runtime (i.e., the class's ".class" file cannot be found or was removed from the CLASSPATH).

5. Exception Handling program for NumberFormatException--thrown if a program is attempting to convert a string to a numerical data type, and the string contains inappropriate characters (i.e. 'z' or 'Q').

6. Create your own exception class using the extends keyword. Write a constructor for this class that takes a String argument and stores it inside the object with a String reference.Write a method that prints out the stored String. Create a try- catch clause to exercise your new exception.

Week-X

1. Write a program to create MyThread class with run() method and then attach a thread to this MyThread class object.

2. Write a program where the consumer thread checks the data production status [is over or not] for every 10 ms.

3. Write a Program using Threads to simulate a traffic light. The Signal lights should glow after each 10 seconds, one by one. For example: Firstly Red, then after 10 seconds, red will be put off and yellow will start glowing and then accordingly green.

4. Write a Program using Threads for the following case study: Movie Theatre To watch a movie

5. the following process is to be followed, at first get the ticket then show the ticket. Assume that N persons are trying to enter the Theatre hall all at once, displaying their sequence of entry into the theater. **Note:** The person should enter only after getting a ticket and showing it to the boy.

6. Write a Program using Threads for the following case study: Train Reservation system To reserve a berth the following process need to be followed, at first check the number of available berths with the requested berths, if the number of requested berths are less than or equal to available berths then allot berth and print ticket or else display no berths are available.Assume that N persons are trying to reserve the berth, display their sequence of reservation status along with the number of available berths. **Note** : The person can print a ticket only if the berth is confirmed.

Week-XI

1. Write a program for the following.
    a. display a frame with title MyFrame
    b. draw a horizontal line.
    c. Draw one line perpendicular to the other and One line parallel to the other.
2. Create an application to display a circle within rectangle and fill different colors in the circle & rectangle
3. Write an application that displays any string. Choose color from combo box to change the color of this displayed string and choose its size & type respectively from another two combo boxes.
4. Write a small application with a default date 01/01/2000 and three combo boxes displaying valid days, months & years (1990 – 2050). Change the displayed date with the one chosen by the user from these combo boxes.
5. Create a GUI with title STUDENT which has labels roll no., name, course, gender, class, address with textboxes for taking input from the user(without any functionality) and checkboxes for selecting the course, radio buttons for selecting gender with appropriate background color.
6. Create a GUI application to display a calculator using grid Layout (You do not have to provide functionality).

Week-XII

1. Write a program to create a frame by creating an object to Jframe class and include a close
2. button to terminate the application of the frame.
3. Write a program for the following.
    a. Display text in the frame by overriding the PaintComponent() method of Jpanel class.
    b. Display some text in the frame with the help of a Label.
4. Write a program to create a push button , when the button is clicked an image is displayed in the frame.
5. Write a program to create a menu with several menu items.
6. Create an application Form for University Enrollment with the following Fields.
    a. Check box b. Text area c. List box d. Display text e. Push buttons
    b. Combo box. g. Radio buttons. h. Background color

Week-XIII

1. Write a program to insert data into the Student Table.
2. Write a program to retrieve the data from the table Student.
3. Create a Form to insert and retrieve the data from the Database as users prefer.
4. Write a program to store an Image and retrieve an image from Database
5. Write a program to Store and retrieve file content from the Database.

Course Code	Course Title					Course Type
CS2103	Computer Organization and Architecture					PCC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	0	0	40	60	3

Course Objectives

- To understand how Computer Systems work & its basic principles
- To learn how to analyze the system performance
- To understand the concepts behind advanced pipelining technique
- To learn the current state of art in memory system design
- To understand how I/O devices are being accessed and its principles
- To provide the knowledge on Instruction Level Parallelism

Course Outcomes

1. Understand the theory and architecture of the central processing unit.
2. Analyze some of the design issues in terms of speed, technology, cost, performance.
3. Learn the concepts of parallel processing, pipelining and interprocessor communication.
4. Understand the architecture and functionality of the central processing unit.
5. Exemplify in a better way the I/O and memory organization.
6. Define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation.

Detailed Contents

Unit-I

Basic functional blocks of a computer, Basic Functional blocks – CPU, Memory, Input-output, Control unit, Instructions and Instruction execution cycle,Instruction set architecture-Elements Of machine instructions, Instruction representation, Instruction types, classification based on number of addresses, Data types, Types of operations-Data transfer, Arithmetic, Logical, Conversion, Input-output, system, Control and transfer of control operations, Addressing modes, Case Study of 8086 instruction set.

Unit-II

Data Representation and Arithmetic Data Representation: Signed number representation, fixed and floating point representations, character representation.Converting Between different bit lengths; Integer Arithmetic: Negation, integer addition and subtraction, ripple carry adder,carry look ahead adder,etc.multiplication shift-and-add, and Booth multiplier. Division non-restoring and restoring techniques, floating point: floating point representation and floating point arithmetic: Addition, Subtraction, Division,Multiplication.

Unit-III

CPU control unit design Micro operations: fetch, indirect, interrupt, execute, Instruction cycle, ControlSignals: inputs and outputs, HardWired ControlUnit; Microinstructions: horizontal and vertical instruction formats, Microprogram, Micro programmed control unit, Advantages and Disadvantages of hard wired and Micro programmed control unit; Pipelining: Parallel processing, pipelining, Arithmetic pipelining, Instruction pipelining, RISC pipelining, throughput and speedup, pipeline hazards and solutions.

Unit-IV

Input-output organization External devices, Input-outputInterface: I/O Bus and interface Modules, I/O Versus memory Bus, I/O Modules structure and their functions.Modesof Transfer: Programmed I/O, Interrupt driven I/O, Direct Memory Access: DMA Controller and Transfer, DMA Configurations, Privileged and Non-privileged instructions, Software Interrupts and exceptions.

Unit-V

Semiconductor main memory & Memory organization Memory Hierarchy; MainMemory: Semiconductor main memory, Organization of memory cell, RAM:DRAM, SRAM and ROM Chips, Memory Connection to CPU. Auxiliary memory: Disks, Read and write mechanisms, Data organization and formatting, Physical Characteristics, Disk performance parameters, Overview of optical disc, Memory Organization: Memory Interleaving, Cache memory, Cache memory principles, Mapping functions: Direct mapping, Associative mapping function, Set Associative mapping function, Replacement Algorithms,Write policy.

Text Books

- William Stallings, "Computer Organization & Architecture," 6th edition, Pearson Education Asia.
- M. Morris Mano, "Computer System Architecture," 3rd edition, Pearson Education Asia.

References

1. D. A. Patterson and J. L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface", 5th ed., Elsevier, 2014.
2. C. Hamacher, Z. G. Vranesic, and S. G. Zaky, "Computer Organization", McGraw Hill, 2011.
3. C. Hamacher, "Computer Organization and Embedded Systems", 6th ed., McGraw Hill, Higher Education, 2011.

Course Code	Course Title					Course Type
HS2101	**Essence of Indian Traditional Knowledge**					**MC**
Prerequisite	**Contact Hours per Week**			**Internal**	**External**	**Credits**
	L	**T**	**P**			
	2	0	0	40	60	0

Course Objectives

- To provide an overview of the Indian knowledge system and its various components
- To explore the relationship between modern science and the Indian knowledge system
- To introduce the schools of Indian philosophy
- To cover the Indian linguistic tradition and the artistic traditions of India

Course Outcomes

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

1. Understand the basic structure of the Indian knowledge system
2. Identify the different types of Vedas, Upavedas, and Vedangas
3. Recognize the major philosophical traditions of India, including orthodox and heterodox schools
4. Gain knowledge about the Indian linguistic and artistic traditions
5. Appreciate the relationship between modern science and the Indian knowledge system
6. Develop a broader understanding of India's cultural heritage and traditions.

Detailed Contents

UNIT –I

Basic Structure of Indian Knowledge System:
Veda –Definition – Kinds –Upavedas (Ayurveda, Gandharva veda, Shilpa veda, Artha veda)- Vedangas (Shiksha, Kalapa, Chhanda, Niruktha, Vyakarana, Jyothishya),
Dharma Shastra, Mimansa, Purana, Tarka Shastra

UNIT – II

Modern Science and Indian Knowledge System. Yoga Holistic Health Care

UNIT – III

Indian Philosophical Tradition
A) Orthodox School: Samkya, Yoga, Nyaya, Vaisheshika, Purva Mimansa, Vedantha
B) Heterodox School: Jainism, Buddhism, Ajivika, Anjana, Charvaka

UNIT-IV

Indian Linguistic Tradition

UNIT –V

Indian Artistic Tradition:

Chithra Kala (Painting), Sangeetha Kala (Music), Nruthya Kala (Dance)
Text Books ● "Indian Knowledge Systems" by Dr. K. Ramakrishna Rao ● "Indian Philosophy: A Very Short Introduction" by Sue Hamilton

Engineering 2 - Semester 2

Course Code	Course Title					Course Type
MA2202	Probability and Statistics					BSC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	1	0	40	60	4

Course Objectives

- To understand the concept of random variables and expectation.
- To learn various distributions and their applications.
- To study the properties of convergence of random variables.
- To know the concepts of statistics applicable in estimation and testing.

Course Outcomes

1. Use basic counting techniques (multiplication rule, combinations, permutations) to compute probability and odds.
2. Compute conditional probabilities directly and using Bayes' theorem, and check for independence of events.
3. Set up and work with discrete random variables. In particular, understand the Bernoulli, binomial, geometric and Poisson ,Negative Binomial, Hypergeometric distributions
4. Work with continuous random variables. In particular, know the properties of uniform, normal and exponential distributions.
5. Understand the law of large numbers and the central limit theorem.
6. Understand the difference between probability and likelihood functions, and find the maximum likelihood estimate for a model parameter.

Detailed Contents

UNIT-I

Basic concepts of Probability: Review of Random experiment, Sample space, Mutually exclusive events.Properties based on axiomatic definition of probability. Conditional probability. Independent events.

Random Variables: Definition of random variables. Properties of discrete and continuous random variable. Definition and properties of probability mass function and probability density function. Definition of cumulative distribution function and its properties for discrete and continuous distributions.
Multivariate Distributions: Definition and properties of multivariate distribution (continuous and discrete). Joint probability distributions. Marginal probability distributions. Conditional probability distributions.

UNIT-II

Mathematical Expectation: Concept of mathematical expectation of functions of random variables and their significance.

Discrete Distributions: Properties of various discrete distributions: Binomial, Poisson, Negative Binomial, Geometric, Hypergeometric and Discrete uniform distributions.
Continuous Distributions: Properties of various continuous distributions:Uniform, Exponential, Normal, Gamma distributions.

UNIT-III
Functions of Random Variables: Evaluating probability distribution of functions of random variables using CDF technique. Determination of joint probability distribution of functions of random variables using transformations. Using transformations to evaluate the distribution of functions of random variables.
Moments and Moment Generating Functions: Moments about origin, Central moments. Moment generating functions of random variables and its properties.

UNIT-IV
Covariance and Correlation: Definition and properties of covariance and correlation. Definition of bivariate normal distributions. Properties of its marginal distributions.
Inequalities and Limit Theorems: Chebyshev's inequality, Cauchy Schwarz inequality. Convergence in probability. Central limit theorem.
Ordered Statistics: Probability distributions of ordered statistics and their properties.

UNIT-V
Measures of Central Tendency: Mean median and mode for grouped and ungrouped data. Quartiles, variance and percentiles for given data.
Sampling and Estimation of Parameters: Concepts of sampling and estimation of mean and variance of a distribution form the sample.
Linear Regression: Linear regression for relationship between two variables.
Hypothesis Testing: Formulation of hypothesis and alternate hypothesis. One-sided and two-sided tests. Comparison of means.

Text Books

- Gupta, S.C., Kapoor V.K., Fundamentals of Mathematical Statistics (11th Edition), Sultan Chand & Sons, 2002.
- Ross, S.M., Introduction to Probability and Statistics for Engineers and Scientists (4th Edition), Academic Press, 2011.
- Gupta, A., Groundwork of Mathematical Probability and Statistics (5th Edition), Academic Publishers, 2002.

References

1. Miller, I., Miller, M., John E. Freund's Mathematical Statistics with Applications (7th Edition), Pearson Education, Inc., 2009.
2. Feller, W., An Introduction to Probability Theory and its Applications, Volume 1 (3rd Edition), John Wiley & Sons, Inc., 1967.
3. Feller, W., An Introduction to Probability Theory and its Applications, Volume 2 (2nd Edition), John Wiley & Sons, Inc., 1971.

Course Code	Course Title					Course Type
CE2804	Engineering Graphics					ESC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	1	0	4	40	60	3

Course Objectives

- To introduce the students to the "Universal Language of Engineers" for effective communication through drawing.
- To understand the basic concepts of drawing through modern techniques.
- To impart knowledge about standard principles of projection of objects.
- To provide the visual aspects of Engineering drawing using Auto-CAD.

Course Outcomes

- At the end of the course, the student will be able to
- Use Engineering principles and techniques to understand and interpret engineering drawings.
- Understand the concepts of Auto-CAD.
- Draw orthographic projections of lines, planes and solids using Auto-CAD.
- Use the techniques, skills and modern engineering tools necessary for engineering practices.

Detailed Contents

UNIT-I

Introduction to Engineering Drawing: Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, types of lines and Dimensioning.Over view of Auto-CAD: Theory of CAD software (The Menu System, ToolBars, drawing area,Dialogue boxes, Shortcut Menu, the command lines, Select and erase objects, Introduction to layers etc.) Drawing simple figures- lines, planes, solids.

UNIT-II

Geometrical constructions: Construction of regular polygons.Conic sections: Construction of Ellipse, Parabola, Hyperbola (General method only), Cycloid, Epicycloid,Hypocycloid and Involutes.
Scales: Construction of Plain, Diagonal and Vernier scales.

UNIT-III

Orthographic projections: Principles of Orthographic Projections
Projections of Points: Projections of Points placed in different quadrants
Projection of lines: lines parallel and inclined to both the planes (Determination of true lengths and true inclinations and traces) Projection of planes: Planes inclined to both the reference planes.

UNIT-IV

Projection of Solids: Projection of solids whose axis is parallel to one of the reference planes and inclined to the other plane, axis inclined to both the planes Electronics and Communication Engineering Page 42 Projection of sectioned solids: Sectioning of simple solids like prism, pyramid, cylinder and cone in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining the true shape of the section.

UNIT-V **Development of surfaces**:Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone Isometric Projections: Principles of Isometric projection – Isometric Scale, Isometric Views of planes and simple solids

Perspective projections: Basic concepts of perspective views.

Text Books

- Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
- Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Stores, Bangalore, 2007.

References

1. Shah, M.B.& Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
2. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age publications
3. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
4. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers(Corresponding set of) CAD Software Theory and User Manuals

Course Code	Course Title					Course Type
CS2203	Design and Analysis of Algorithms					PCC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	0	0	40	60	3

Course Objectives

- Introduces the notations for analysis of the performance of algorithms.
- Describes major algorithmic techniques (divide-and-conquer, backtracking, dynamic programming, greedy, branch and bound methods) and mention problems for which each technique is appropriate;
- Describes how to evaluate and compare different algorithms using worst-, average-, and best-case analysis.
- Explains the difference between tractable and intractable problems, and introduces the problems that are P, NP and NPcomplete.

Course Outcomes

1. Students will understand the basic concepts of algorithm design and analysis.
2. Students will be able to analyze and evaluate algorithm performance using asymptotic notations.
3. Students will learn to apply various algorithmic techniques such as divide and conquer, dynamic programming, and greedy method.
4. Students will gain proficiency in solving problems using backtracking and branch and bound methods.
5. Students will gain an understanding of NP-hard and NP-complete problems and their implications in the real world.

Detailed Contents

UNIT-I

Introduction:

Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem Types – Fundamentals of the Analysis of Algorithmic Efficiency –Asymptotic Notations and their properties. Analysis Framework – Empirical analysis – Mathematical analysis for Recursive and Non-recursive algorithms – Visualization

UNIT-II

Brute Force – String Matching , Closest-Pair and Convex-Hull Problems.
Exhaustive Search – Traveling Salesman Problem, Knapsack Problem , Assignment problem.

Divide and conquer: General method, applications-Binary search, Quick sort, Merge sort, Strassen's matrix multiplication,convex hull,closest pair, large integer multiplication.

UNIT-III

Dynamic programming – Principle of optimality,Chain Matrix Multiplication, Computing a Binomial Coefficient , Floyd's algorithm , Multistage graph , Optimal Binary Search Trees , Knapsack Problem and Memory functions.

Greedy Technique –Prim's algorithm and Kruskal's Algorithm , Fractional Knapsack problem, Optimal Merge pattern – Huffman Trees.

UNIT-IV

Backtracking: General method, applications−n-queen problem, sum of subsets problem,graph coloring, Hamiltonian cycles.

Branch and Bound: General method, applications - Traveling Salesperson Problem, 0/1 knapsack problem, Assignment problem - LC Branch and Bound solution, FIFO Branch and Bound solution.

UNIT-V

NP-Hard and NP-Complete problems: NP Hard and NP completeness: Basic concepts, cook's theorem, NP-hard graph problems and scheduling problem, NP- hard code generation problems, Clique Decision problem, Node covering problem, scheduling problem, NP hard code generation problem.

Approximation Algorithms for NP-Hard Problems – Traveling Salesman problem,Knapsack problem.

Text Books

- Horowitz, E., Sahni, S., and Rajasekaran, S. (2019). Fundamentals of Computer Algorithms. University Press.
- Cormen, T. H., Leiserson, C. E., Rivest, R. L., and Stein, C. (2001). Introduction to Algorithms, Second Edition. Pearson Education.

References

1. A. V. Levitin, "Introduction to the Design and Analysis of Algorithms," Addison-Wesley Longman Publishing Co., Inc., Boston, MA, USA.
2. A. Aho, J. Ullman, and M. Hopcroft, "Design and Analysis of Algorithms," Pearson Education.
3. M. T. Goodrich and R. Tamassia, "Algorithm Design: Foundations, Analysis and Internet Examples," John Wiley and Sons.

Course Code	Course Title					Course Type
CS2803	Design and Analysis of Algorithms Lab					PCC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	0	0	3	40	60	1.5

Course Objectives

- To develop proficiency in programming algorithms using C/C++.
- To introduce the fundamental concepts of data structures and algorithms.
- To provide practical experience in implementing various data structures and algorithms.
- To understand the techniques used in solving various computational problems.
- To develop problem-solving skills and logical reasoning.

Course Outcomes

At the end of the course the students will have the

1. Ability to write C/C++ programs for various algorithms and data structures.
2. Knowledge of fundamental concepts and terminology related to data structures and algorithms.
3. Proficiency in implementing basic data structures such as linked lists, trees, and graphs.
4. Ability to analyze the time and space complexity of algorithms using asymptotic notations.
5. Problem-solving skills using different algorithmic paradigms such as divide-and-conquer, dynamic programming, greedy algorithms, and backtracking.

List of Experiments:

All the problems have to be implemented either writing C programs or writing C++ programs. Elementary Problems:

1) Using a stack of characters, convert an infix string to a postfix string.
2) Implement polynomial addition using a single linked list
3) Implement insertion, deletion, searching of a BST, Also write a routine to draw the BST horizontally.
4) Implement binary search and linear search in a program
5) Implement heap sort using a max heap.
6) Implement DFS/ BFS routine in a connected graph
7) Implement Dijkstra's shortest path algorithm using BFS
8) Greedy Algorithm (Any Two)
    a) Given a set of weights, form a Huffman tree from the weight and also find oot the code corresponding to each weight.
    b) Take a weighted graph as an input, find out one MST using Kruskal/ prim's algorithm
    c) Given a set of weight and an upper bound M – Find out a solution to the Knapsack problem
9) Divide and Conquer Algorithm (any Two)
    a) Write a quick sort routine, run it for a different input sizes and calculate the time of running. Plot in graph paper input size versus time.

b) Implement two way merge sort and calculate the time of sorting

c) Implement Strassen's matrix multiplication algorithm for matrices whose order is a power of two.

10) Dynamic programming

a. Given two sequences of character, find out their longest common subsequence using dynamic programming

Course Code	Course Title					Course Type
CS2201	Web Technologies					PCC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	0	0	40	60	3

Course Objectives

- To understand the basics of Web Designing using HTML, DHTML, and CSS
- To learn the basics about Client side scripts and Server side scripts

Course Outcomes

At the end of the course the students will have the

1. Ability to design and develop client side scripting techniques
2. Ability to build real world applications using client side and server side scripting languages

Detailed Contents

Unit – I

HTML- List, Tables, Images, Forms, Frames, Cascading Style sheets. XML- Document type definition, XML Schemas, Document Object model

Unit – II

Java Script -Control statements, Functions, Arrays, Objects, Events, Dynamic HTML with Java Script, Ajax

Unit – III

Web servers – IIS (XAMPP, LAMPP) and Tomcat Servers. Java Web Technologies- Servlets, JavaServer Pages, Java Server Faces, Web Technologies in Netbeans, Building a Web Application in Netbeans, JSF Components, Session Tracking, Cookies

Unit – IV

PHP- Basics, String Processing and Regular Expressions, Form Processing and Business Logic, Using Cookies, Dynamic Content, Operator Precedence Chart

Unit – V

Database Connectivity with MySQL - Servlets, JSP, PHP. Case Studies- Student information system,

Health Management System
Text Books ● Paul J. Deitel, Harvey M. Deitel, Abbey Deitel, “Internet & World Wide Web How to Program”, Deitel series, 5th edition, 2012 ● Jason Gilmore, “Beginning PHP and MySQL From Novice to Professional”, 4th Edition, Apress Publications, 2010
References 1. Robert W. Sebesta, “Programming with World Wide Web”, Pearson, 4th edition, 2008 2. David William Barron, “The World of Scripting Languages”, Wiley Publications, 2000

Course Code	Course Title					Course Type
CS2801	Web Technologies Lab					PCC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	0	0	3	40	60	1.5

Course Objectives

1. To learn the basics in web designing using HTML, CSS, and XML
2. To develop web applications using JSP, Servlets, PHP, and Net Beans

Course Outcomes

At the end of the course the students will have the

1. Ability to design and develop web pages using HTML, CSS, and XML
2. Ability to design and deploy real world applications using client side and server side scripting languages

List of Experiments

- Designing static web pages using HTML
- Designing dynamic web pages using different cascading style sheets
- Designing XML Schemas
- Programs using Java Script
- Programs using Java servlets and JSP
- Designing web applications using PHP
- Designing web applications in Net Beans Environment
- Database Connectivity with MySQL using Java Servlets, JSP, and PHP

Course Code	Course Title					Course Type
CS2202	Operating System					PCC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	0	0	40	60	3

Course Objectives

- To learn the fundamentals of Operating Systems.
- To learn the mechanisms of OS to handle processes and threads and their communication
- To learn the mechanisms involved in memory management in contemporary OS
- To gain knowledge on distributed operating system concepts that includes architecture, Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols
- To know the components and management aspects of concurrency management.

Course Outcomes

1. Create processes and threads.
2. Develop algorithms for process scheduling for a given specification of CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time.
3. For a given specification of memory organization develop the techniques for optimally allocating memory to processes by increasing memory utilization and for improving the access time.
4. Design and implement a file management system.
5. For a given I/O devices and OS (specify) develop the I/O management functions in OS as part of
6. a uniform device abstraction by performing operations for synchronization between CPU and I/O controllers.

Detailed Contents

UNIT-I

Introduction: Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services, System Calls, Structure of an OS – Layered, Monolithic, Microkernel Operating Systems, Concept of Virtual Machine. System call interface for process management-fork, exit, wait, waitpid, exec

Unit 2:

Processes: Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching. Thread: Definition, Various states, Benefits of threads, Types of threads, Concept of multi threads. Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time. Scheduling algorithms: Pre-emptive and Non-preemptive, FCFS, SJF, RR, Priority, Preemptive Priority, SRTF.

Unit 3:

Inter-process Communication: Critical Section, Race Conditions, Mutual Exclusion,Hardware Solution, Strict Alternation, Peterson's Solution, The Producer-Consumer Problem, Semaphores, Message Passing. Classical IPC Problems: Reader's & Writer Problem, Dining Philosopher Problem etc.Deadlocks: Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm(Safety & Resource request algorithm), Deadlock detection and Recovery.

Unit 4:

Memory Management: Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation – Fixed and variable partition– Internal and External fragmentation and Compaction; Paging: Principle of operation – Page allocation – Hardware support for paging, Protection and sharing, Disadvantages of paging. Virtual Memory: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page fault, Working Set, Dirty page/Dirty bit – Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Least Recently used (LRU).

Unit 5:

I/O Hardware: I/O devices, Device controllers, Direct memory access Principles of I/O Software: Goals of Interrupt handlers, Device drivers, Device independent I/O software, Secondary-Storage Structure: Disk structure, Disk scheduling algorithms

File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance. Disk Management: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN,LOOK,C-LOOK,Disk reliability, Disk formatting, Boot-block, Bad blocks.

Text Books:

- Silberschatz, A., Galvin, P.B., & Gagne, G. (2013). Operating System Concepts Essentials, 9th Edition. Wiley Asia Student Edition.

References

1. A. Silberschatz, P. Galvin, and G. Gagne, Operating System Concepts Essentials, 9th ed. Wiley Asia Student Edition.
2. W. Stallings, Operating Systems: Internals and Design Principles, 5th ed. Prentice Hall of India.
3. C. Crowley, Operating System: A Design-oriented Approach, 1st ed. Irwin.
4. G. J. Nutt, Operating Systems: A Modern Perspective, 2nd ed. Addison-Wesley.
5. M. Bach, Design of the Unix Operating Systems, 8th ed. Prentice-Hall of India.
6. D. P. Bovet and M. Cesati, Understanding the Linux Kernel, 3rd ed. O'Reilly and Associates.

Course Code	Course Title					Course Type
CS2802	IT Workshop					PCC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	0	0	3	40	60	1.5

Course Objectives

- The objective of this course is to teach students how to use various tools and technologies for scientific computing and data analysis. By the end of the course, students will have gained proficiency in manipulating and analyzing data, creating professional scientific documents, and presenting results visually. The course covers topics such as Unix commands, LaTeX, PHP, NumPy, Matplotlib, Scipy, and statistical analysis in Python using seaborn.

Course Outcomes

This course teaches students to:

1. Use Unix commands for file management and text processing.
2. Create professional-looking scientific documents using LaTeX.
3. Write PHP scripts for web development and connect to MySQL databases.
4. Use NumPy for scientific computing and perform numerical operations on arrays.
5. Create and customize plots using Matplotlib.
6. Process and manipulate images using NumPy and Scipy.
7. Conduct statistical analysis in Python using seaborn for visualization, and hypothesis testing, linear models, and analysis of variance.

Week1

Basic Unix commands

Week2

sed, grep, sort, ssh,awk,shutdown,ftp,service,chown,chmod

Week3

Latex:Introduction, Document Structure,Essentials ,Troubleshooting Creating a Title, Sections ,Labelling,Table of Contents. Typesetting Text: Font Effects, Coloured Text ,Font Sizes ,Lists ,Comments & Spacing,Special Characters.

Week4

Tables, Figures

Equations: Inserting EquationsMathematical Symbols,Practical Inserting References: Introduction,The BibTeX file ,Inserting the bibliography,Citing references,Styles,Practical

Week5

Introduction to PHP Declaring Variables,Data types, Arrays, Strings,Operators,Expressions,Control Structures, Functions, Reading data from Web forms,

Week6

Handling file uploads,Connecting to database (MySQL), Executing Sample Queries, Handling Results, Handling Sessions and Cookiess

Week7

The NumPy array object, What are NumPy and NumPy arrays, Creating arrays, Basic data types, Basic visualization, Indexing and slicing, Copies and views, Fancy indexing, Numerical operations on arrays Elementwise operations, Basic reductions, Broadcasting, Array shape manipulation, Sorting data

Week8

Matplotlib: plotting

Introduction, Simple plot, Figures, Subplots, Axes and Ticks, different types of Plots: examples and exercises

Week9

Image manipulation and processing using Numpy and Scipy

Opening and writing to image files,Displaying images, Basic manipulations- Statistical information, Geometrical transformations, Image filtering – Blurring/smoothing, Sharpening, Denoising, Mathematical morphology, Feature extraction- Edge detection, Segmentation

Week10

High-level scientific computing

File input/output, Special functions, Linear algebra operations, Interpolation: scipy.interpolate, Optimization and fit, Statistics and random numbers

Week 11

High-level scientific computing

Numerical integration, Fast Fourier transforms, Signal processing, Image manipulation

Week12

Statistics in Python, Data representation and interaction, Hypothesis testing: comparing two groups,Linear models, multiple factors, and analysis of variance, More visualization: seaborn for statistical exploration

References

- J. Peek, G. Todino, and J. Strang, "Learning the Unix Operating System," 5th ed., Sebastopol, CA, USA: O'Reilly Media, Inc., 2001.
- L. Lamport, "LaTeX: A Document Preparation System," 2nd ed., Reading, MA, USA: Addison-Wesley Professional, 1994.
- L. Ullman, "PHP and MySQL for Dynamic Web Sites," 5th ed., Berkeley, CA, USA: Peachpit Press, 2017.

- W. McKinney, "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython," 2nd ed., Sebastopol, CA, USA: O'Reilly Media, Inc., 2017.

Engineering 3 - Semester 1

Course Code	Course Title					Course Type
BM3102	**Fundamentals of Management for Engineers**					HSMC
Prerequisite	**Contact Hours per Week**			**Internal**	**External**	**Credits**
	L	**T**	**P**			
	3	0	0	40	60	3

Course Objective:

- To understand the Management Concepts, applications of Concepts in Practical aspects of business and development of Managerial Skills for Engineers.

Course Outcome:

- The students understand the significance of Management in their Profession. The various Management Functions like Planning, Organizing, Staffing, Leading, Motivation and Control aspects are learnt in this course. The students can explore the Management Practices in their domain area.

Detailed Contents:

UNIT– I:

Introduction to Management: Meaning and Definition of Management - Nature of Management- Characteristics of Management- Importance of Management- Evolution of Management Thought: Contributions of F.W Taylor- Henri Fayol's 14 principles of Management- Functions of Management- Levels of Management- Managerial skills.

UNIT-II:

Leading and Motivation: Leadership-Introduction to Leadership-Characteristics of Leader-Functions of a Leader-Leadership and Management –Styles of Leaders- Qualities of Good Leader. Motivation- Meaning and definition of Motivation- Characteristics of Motivation-Theories of Motivation (Maslow's Need Hierarchy, Hertzberg's Two Factor Theory, Mc Gregors Theory X and Theory Y).

UNIT– III:

Human Resource Management: Introduction- Definition of HRM- Functions of HRM-HR Planning- Recruitment: Sources of Recruitment- Selection: Process of selection-Training & Development: Methods of Training (on-the job training & off- the job training methods) - Placement-Performance appraisal: Methods of performance Appraisal-Job satisfaction.

UNIT– IV:

Introduction to Operations Management: Meaning and Definition of operations Management-Plant Location: Factors affecting Plant Location-Plant Layout; Objectives of Plant layout; Principles of layout; Types of Plant Layout (Product layout, Process layout, Fixed position layout)- Production

:Methods of Production (Job, Batch and Mass production) –Work Study: Method study and Work Measurement.

UNIT– V:

Marketing Management: Introduction to Marketing- -Functions of Marketing-Marketing vs. Selling- Marketing Mix - Marketing Strategies - Product Life Cycle - Market Segmentation - Channels of Distribution.

TEXTBOOKS:

1. Management Essentials, Andrew DuBrin, 9e, Cengage Learning,2012.
2. Fundamentals of Management, Stephen P.Robbins, Pearson Education, 2009.
3. Essentials of Management, Koontz K leihrich, Tata Mc-Graw Hill.
4. Management Fundamentals, Robert N Lussier,5e,Cengage Learning,2013.
5. Industrial Engineering and Management: Including Production Management, T.R.Banga,S.C. Sharma, Khanna Publishers.

Course Code	Course Title					Course Type
CS3101	Computer Networks					PCC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	0	0	40	60	3

Course Objectives

- To Introduce The Fundamental Various Types Of Computer Networks.
- To Demonstrate The TCP/IP And OSI Models With Merits And Demerits.
- To Introduce UDP And TCP Models.

Course Outcomes

1. Students should understand and explore the basics of Computer Networks and Various Protocols. He/She will be in a position to understand the World Wide Web concepts.
2. Students will be in a position to administer a network and flow of information further he/she can easily understand the concepts of network security, Mobile and ad hoc networks.

Detailed Contents

UNIT-I

Introduction- Hardware And Software, Data Communication, Networking, Protocol, Layering Scenario,TCP/IP Protocol Suite: The OSI Model, Internet History Standards And Administration; Comparison Of The OSI And TCP/IP Reference Model, Digital And Analog Data And Signals.
Physical Layer: Guided Transmission Media, Wireless Transmission Media.

UNIT-II

Data Link Layer: Design Issues, CRC Codes, Elementary Data Link Layer Protocols, Sliding Window Protocol, Flow Control. Error Detection And Error Control. HDLC And Other Data Link Protocols.**Multi Access Protocols:** ALOHA, CSMA, Collision Free Protocols, Ethernet- Physical Layer, Ethernet Mac Sublayer, Data Link Layer Switching & Use Of Bridges, Learning Bridges, Spanning Tree Bridges, Repeaters, Hubs, Bridges, Switches, Routers And Gateways.

UNIT-III

Network Layer: Network Layer Design Issues, Store And Forward Packet Switching Connection Less And Connection Oriented Networks-Routing Algorithms-Optimality Principle, Shortest Path, Flooding, Distance Vector Routing, Control To Infinity Problem, Hierarchical Routing, Congestion Control Algorithms, Admission Control.

UNIT-IV

Internetworking: Tunneling, Internetwork Routing, Packet Fragmentation, Ipv4, Ipv6 Protocol, IP Addresses, CIDR, IMCP, BOOTP, ARP, RARP, DHCP, Network Address Translation(NAT) Internetworking

Transport Layer: TCP Introduction, Reliable/Un- Reliable Transport ,Connection Establishment, Connection Release, Crash Recovery, Intra-Domain Routing: Distance-Vector, Intra-Domain Routing: Link- State, Wireless Networks: 802.11 MAC, Efficiency Considerations

UNIT-V

The Internet Transport Protocols: UDP-RPC, Real Time Transport Protocols, The Internet Transport Protocols- Introduction To TCP, The TCP Service Model, The TCP Segment Header, The TCP Congestion Control, The Future Of TCP.

Application Layer: Introduction, Providing Services, Applications Layer Paradigms, Client Server Model, Standard Client-Server Application-HTTP, FTP, Electronic Mail, TELNET, DNS, SSH,SNMP,WWW.

Text Books :

- B. A. Forouzan, "Data and Communications and Networking," 4th ed., USA: McGraw-Hill Education, 2006.
- A. S. Tanenbaum, "Computer Networks," PHI, 5th ed., India: Pearson Education India, 2010.

References Books:

1. B. A. Forouzan, "Data Communications and Networking," 5th ed., TMH, India: Tata McGraw-Hill Education, 2013.
2. A. S. Tanenbaum, "Computer Networks," 4th ed., Pearson Education, India: Pearson Education India, 2003.
3. S. Keshav, "An Engineering Approach to Computer Networks," 2nd ed., Pearson Education, India: Pearson Education India, 2009.
4. W. A. Shay, "Understanding Communications and Networks," 3rd ed., Cengage Learning, USA: Cengage Learning, 2012.
5. C.-H. Wu and J. D. Irwin, "Introduction to Computer Networks and Cybersecurity," CRC Press, USA: CRC Press, 2017.
6. L. L. Peterson and B. S. Davie, "Computer Networks," 4th ed., ELSEVIER, USA: Morgan Kaufmann Publishers, 2007.
7. J. F. Kurose and K. W. Ross, "Computer Networking: A Top-Down Approach Featuring the Internet," 3rd ed., Pearson Education, USA: Pearson Education, 2005.

Course Code	Course Title					Course Type
CS3701	Computer Networks Lab					PCC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	0	0	3	40	60	1.5

Course Objectives

- To understand the working principle of various communication protocols.
- To analyze the various routing algorithms.
- To know the concept of data transfer between nodes.

Course Outcomes

1. Identify and use various networking components Understand different transmission media and design cables for establishing a network .
2. Implement any topology using network devices Analyze performance of various communication protocols.
3. Compare routing algorithms.
4. Understand the TCP/IP configuration for Windows and Linux.
5. Implement device sharing on the network.
6. Learn the major software and hardware technologies used on computer networks.

List of Experiments:

1. Study of different types of Network cables and Practically implement the cross-wired cable and straight through cable using crimping tool.
2. Study of Network Devices in Details
3. Study of network IP.
4. Connect the computers in the Local Area Network.
5. Study of basic network command and Network configuration commands.
6. Performing an Initial Switch Configuration.
7. Performing an Initial Router Configuration.
8. Configuring and Troubleshooting a Switched Network.
9. Connecting a Switch.
10. Configuring WEP on a Wireless Router.
11. Using the Cisco IOS Show Commands.
12. Examining WAN Connections.
13. Interpreting Ping and Traceroute Output.
14. Demonstrating Distribution Layer Functions.
15. Placing ACLs.
16. Exploring Different LAN Switch Options.
17. Implementing an IP Addressing Scheme.
18. Examining Network Address Translation (NAT).
19. Observing Static and Dynamic Routing.

20. Configuring Ethernet and Serial Interfaces.
21. Configuring a Default Route.
22. Configuring Static and Default Routes.
23. Configuring RIP.

Course Code	Course Title					Course Type
CS3102	Cloud Computing					PCC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	0	0	40	60	3

Course Objectives

- This course provides an insight into cloud computing.
- Topics covered include- distributed system models, different cloud service models, service oriented architectures, cloud programming and software environments, resource management.

Course Outcomes

1. Ability to understand various service delivery models of a cloud computing architecture.
2. Ability to understand the ways in which the cloud can be programmed and deployed.
3. Understanding cloud service providers.

Detailed Contents

UNIT-I

Computing Paradigms: High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing, Bio computing, Mobile Computing, Quantum Computing, Optical Computing, Nano computing.

UNIT-II

Cloud Computing Fundamentals: Motivation for Cloud Computing, The Need for Cloud Computing, Defining Cloud Computing, Definition of Cloud computing, Cloud Computing Is a Service, Cloud Computing Is a Platform, Principles of Cloud computing, Five Essential Characteristics, Four Cloud Deployment Models

UNIT-III

Cloud Computing Architecture and Management: Cloud architecture, Layer, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications, on the Cloud, Managing the Cloud, Managing the Cloud Infrastructure Managing the Cloud application, Migrating Application to Cloud, Phases of Cloud Migration Approaches for Cloud Migration.

UNIT-IV

Cloud Service Models: Infrastructure as a Service, Characteristics of IaaS. Suitability of IaaS, Pros and Cons of IaaS, Summary of IaaS Providers, Platform as a Service, Characteristics of PaaS, Suitability of PaaS, Pros and Cons of PaaS, Summary of PaaS Providers, Software as a Service, Characteristics of SaaS, Suitability of SaaS, Pros and Cons of SaaS, Summary of SaaS Providers, Other Cloud Service Models.

UNIT-V

Cloud Service Providers: EMC, EMC IT, Captiva Cloud Toolkit, Google, Cloud Platform, Cloud Storage, Google Cloud Connect, Google Cloud Print, Google App Engine, Amazon Web Services, Amazon Elastic Compute Cloud, Amazon Simple Storage Service, Amazon Simple Queue ,service, Microsoft, Windows Azure, Microsoft Assessment and Planning Toolkit, SharePoint, IBM, Cloud Models, IBM Smart Cloud, SAP Labs, SAP HANA Cloud Platform, Virtualization Services Provided by SAP, Sales force, Sales Cloud, Service Cloud: Knowledge as a Service, Rack space, VMware, Manjra soft, Aneka Platform.

Text Books

- K. Chandrasekharan, "Essentials of Cloud Computing," CRC Press, USA: CRC Press, 2014.

References

1. R. Buyya, J. Broberg, and A. M. Goscinski, "Cloud Computing: Principles and Paradigms," Wiley, USA: John Wiley & Sons, Inc., 2011.
2. K. Hwang, G. C. Fox, and J. J. Dongarra, "Distributed and Cloud Computing," 1st ed., Elsevier, USA: Morgan Kaufmann Publishers, 2012.
3. T. Mather, S. Kumaraswamy, and S. Latif, "Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance," O'Reilly, USA: O'Reilly Media, Inc., 2011.

Course Code	Course Title					Course Type
CS3702	Cloud Computing Lab					PCC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	0	0	3	40	60	1.5

Course Objectives

- To develop web applications in cloud.
- To learn the design and development process involved in creating a cloud based application.

Course Outcomes

1. Configure various virtualization tools such as Virtualbox, VMware workstation.
2. Design and deploy a web application in a PaaS environment.
3. Learn how to simulate a cloud environment to implement new schedulers.
4. Install and use a generic cloud environment that can be used as a private cloud.
5. Manipulate large data sets in a parallel environment.

LIST OF EXPERIMENTS:

1. Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of windows.
2. Install web server and setup reverse proxy with NGINX to Python Flask Backend. NodeJS Backend.
3. Install Google App Engine. Create a hello world app and other simple web applications using python/java. Connect with domain.
4. Use GAE launcher to launch the web applications.
5. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
6. Find a procedure to transfer the files from one virtual machine to another virtual machine.
7. Find a procedure to launch a virtual machine using trystack (Online Openstack Demo Version).
8. Install Hadoop single node cluster and run simple applications like wordcount.
9. Can include Google Qwiklab tracks, AWS S3 Bucket concepts

Course Code	Course Title					Course Type
CS3103	Artificial Intelligence					PCC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	0	0	40	60	3

Course Objectives

- Students should be able to know various AI search algorithms like uninformed, informed, heuristic and genetic algorithms.
- Understand the fundamentals of knowledge representation and different types of AI agents.
- To apply knowledge representation, reasoning, and machine learning techniques to real-world problems.
- Students should be able to know how to build simple knowledge-based systems.

Course Outcomes

After completing the course, the students will be able to

1. Understand and Explore knowledge representation techniques and problem solving strategies to common AI applications.
2. Analyze and find appropriate idealizations for converting real world problems into AI search problems that are formulated using the appropriate search algorithm.
3. Design good evaluation functions for different problem solving strategies.
4. Apply knowledge representation techniques and problem solving strategies to common AI applications.

Detailed Contents

UNIT-I

Introduction to Artificial Intelligence: Definition, Foundation, History, Applications of AI. Intelligent Agents: Structure and types of Agents, Types of Environments. Problem-solving agents: Problem formulation-PEAS description, State space (graph) representation, Example problems; Uninformed search strategies- DFS, BFS, Depth limited Search, Iterative Deepening, Uniform Cost Search, Bidirectional Search

UNIT-II

Informed Search: GBFS and A* search algorithms, Constraint Satisfaction Problems (CSPs)- Backtracking search for CSPs, local search, Structure of Problems. Adversarial search: Games; Optimal decisions in games using minimax trees; Alpha-Beta pruning, Imperfect Real Time Decisions- Evaluation functions, cutting off search.

UNIT-III

Knowledge and Reasoning: Knowledge Based Agents, Propositional Logic: Syntax, Semantics, simple knowledge base and inference, Reasoning patterns in propositional logic: Resolution- CNF, resolution algorithm, forward and backward chaining, Wumpus world example.

UNIT-IV

First-Order Logic (FOL): Representations revisited; Syntax and semantics of first-order logic; Knowledge Engineering process in FOL, Unification and lifting, Resolution: Conjunctive Normal Form, resolution inference rule, Example problems.

UNIT-V

Uncertainty: Acting under certainty; Inference using full joint distributions; Independence; Baye's rule and its use. Probabilistic Reasoning: Representing knowledge in an uncertain domain; the semantics of Bayesian networks; efficient representation of conditional distributions; exact inference in Bayesian networks

Text Books

- Stuart Russell, Peter Norvig, "Artificial Intelligence: : A Modern Approach ", Second Edition,Prentice Hall Series, Pearson Education International. ISBN 0-13-080302-2, 2003

References

1. E. Rich and K. Knight, "Artificial Intelligence," 3rd ed., Tata McGraw Hill, India: Tata McGraw-Hill Education, 2009.
2. M. Stanescu, N. A. Barriga, and M. Buro, "Hierarchical Adversarial Search Applied to Real-Time Strategy Games," in Proceedings of the Tenth Annual AAAI Conference on Artificial Intelligence and Interactive Digital Entertainment (AIIDE 2014), 2014.
3. B. Bickel, A. Witzlack-Makarevich, K. K. Choudhary, M. Schlesewsky, and I. Bornkessel-Schlesewsky, "The Neurophysiology of Language Processing Shapes the Evolution of Grammar: Evidence from Case Marking," PLoS One, vol. 10, no. 8, 2015, doi: 10.1371/journal.pone.0132819.

Course Code	Course Title					Course Type
CS3104	Software Engineering					PCC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	0	0	40	60	3

Course Objectives

- The aim of the course is to provide an understanding of the working knowledge of the techniques for estimation, design, testing and quality management of large software development projects.
- Topics include process models, software requirements, software design, software testing, software process/product metrics, risk management, quality management and UML diagrams

Course Outcomes

- Ability to translate end-user requirements into system and software requirements, using e.g.
- UML, and structure the requirements in a Software Requirements Document (SRD).
- Identify and apply appropriate software architectures and patterns to carry out high level design of a system and be able to critically compare alternative choices.
- Will have experience and/or awareness of testing problems and will be able to develop a simple testing report

Detailed Contents

UNIT - I

Introduction to Software Engineering: The evolving role of software, changing nature of software, software myths. A Generic view of process: Software engineering- a layered technology, a process framework, the capability maturity model integration (CMMI). Process models: The waterfall model, Spiral model and Agile methodology

UNIT - II

Software Requirements: Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document.
Requirements engineering process: Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management.

UNIT - III

Design Engineering: Design process and design quality, design concepts, the design model.
Creating an architectural design: software architecture, data design, architectural styles and patterns, architectural design, conceptual model of UML, basic structural modeling, class diagrams, sequence diagrams, collaboration diagrams, use case diagrams, component diagrams.

UNIT - IV

Testing Strategies: A strategic approach to software testing, test strategies for conventional software,

black-box and white-box testing, validation testing, system testing, the art of debugging.
Metrics for Process and Products: Software measurement, metrics for software quality.

UNIT - V

Risk management: Reactive Vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM. Quality Management: Quality concepts, software quality assurance, software reviews, formal technical reviews, statistical software quality assurance, software reliability, the ISO 9000 quality standards

Text Books

- Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition, McGraw Hill International Edition.
- Software Engineering- Sommerville, 7th edition, Pearson Education.

References

1. The unified modeling language user guide Grady Booch, James Rambaugh, Ivar Jacobson, Pearson Education.
2. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiley.
3. Software Engineering principles and practice- Waman S Jawadekar, The McGraw-Hill Companies.
4. Fundamentals of object-oriented design using UML Meiler page-Jones: Pearson Education

Course Code	Course Title					Course Type
CS3113	Data Analytics					PCC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	0	0	40	60	3

Course Objectives

- To understand the fundamentals of analytics and its importance in decision making.
- To learn different types of data measurement scales, data visualization techniques and probability distributions.
- To comprehend the concept of hypothesis testing, sampling, and estimation, and use them to make decisions based on data.
- To explore correlation and regression analysis, and use them to model relationships between variables.
- To introduce the concept of forecasting techniques and learn different methods to model time series data.

Course Outcomes

- Students will be able to explain the importance of analytics and its application in various industries.
- Students will be able to identify different types of data measurement scales, and analyze data using appropriate visualization techniques.
- Students will be able to understand different probability distributions and use them to make decisions based on data.
- Students will be able to perform hypothesis testing and estimate population parameters with confidence intervals.
- Students will be able to use correlation and regression analysis to model relationships between variables, and forecast future trends using time series data.

Detailed Contents

UNIT-I

Introduction to Analytics: why analytics, types of analytics, framework for data driven decision making. Descriptive Analytics: types of data measurement scales, population, sample, measures of central tendency, measures of variation, shape, data visualization techniques.Probability distributions: Random variables, Probability Density Function, Cumulative. Distribution Function, PMF, Discrete distributions- binomial, Poisson, geometric distributions, Continuous distributions- uniform, exponential, normal distribution and other distributions(chi-square, t, F)

UNIT-II

Hypothesis testing-I: sampling & estimation- sampling, types of sampling, sampling distribution, central limit theorem, sample size estimation, estimation of population parameters, confidence intervals-

Confidence intervals for population mean, population proportion. Introduction to hypothesis testing-basics, z-test, t-test, one tailed & two-tailed tests, type-I error, type-II error.

UNIT-III

Hypothesis Testing-II: Comparing two populations –two sample z-test & t-test, hypothesis test for difference in population proportion, hypothesis test for equality of population variances, chi-square test, goodness of fit test, F-test, analysis of variance(ANOVA) –multiple t-tests for comparing several means, one way ANOVA.

UNIT-IV

Correlation & Regression: Introduction to correlation, correlation coefficient, correlation Vs Causation, coefficient of determination. Simple linear regression – model building, estimation of parameters using ordinary least squares, validation of regression model. Multiple linear regression-ordinary least square estimation of MLR, validation.

Logistic regression- Introduction to classification, Binary logistic Regression, estimation and interpretation of parameters in logistic regression,classification table, sensitivity and specificity- Accuracy, sensitivity, specificity and precision, Receiver Operating Characteristic(ROC) curve, Area Under ROC(AUC) curve.

UNIT-V

Forecasting Techniques: introduction to time series data and components of time series data. Mean Absolute Error(MAE), Mean Absolute Percentage Error (MAPE), Mean Square Error(MSE), Root Mean Square Error(RMSE), Auto-Regressive(AR), Moving Average(MA), Auto-Regressive Moving Average(ARMA), Auto-Regressive Integrated Moving Average(ARIMA), ARIMA(p, d, q) Model Building.

Text Books

- U. D. Kumar, Business Analytics - The Science of Data-Driven Decision Making, 1st ed. Hoboken, NJ, USA: John Wiley & Sons, Inc., 2019.

References

5. J. L. Kenkel, Basic Business Statistics: Concepts and Applications, 13th ed. Mason, OH, USA: South-Western Cengage Learning, 2016.
6. Business Statistics: A First Course, by D. C. Sweeney, T. A. Williams, and D. M. Anderson, 7th ed., Pearson, 2018.
7. Statistical Inference, by G. Casella and R. L. Berger, 2nd ed., Duxbury Press, 2002.
8. Data Analysis Using Regression and Multilevel/Hierarchical Models, by A. Gelman and J. Hill, Cambridge University Press, 2007.
9. Time Series Analysis and Its Applications: With R Examples, by R. H. Shumway and D. S. Stoffer, 3rd ed., Springer, 2010.

Course Code	Course Title					Course Type
CS3901	Mini Project 1					SIP
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	-	-	2	40	60	1

Course Objectives

- To have hands-on experience in developing a software project by using various software engineering principles and methods in each of the phases of software development.

Course Outcomes

- Ability to translate end-user requirements into system and software requirements
- Ability to generate a high-level design of the system from the software requirements
- Will have experience and/or awareness of testing problems and will be able to develop a simple testing report

Detailed Contents

Do the following seven exercises for any one project given in the list of sample projects or any other Projects:

1. Development of problem statements.
2. Preparation of Software Requirement Specification Document, Design Documents and Testing Phase related documents.
3. Preparation of Software Configuration Management and Risk Management related documents.
4. Study and usage of any Design phase CASE tool
5. Performing the Design by using any Design phase CASE tools.
6. Develop test cases for unit testing and integration testing
7. Develop test cases for various white box and black box testing techniques.

Sample Projects:

1. Passport automation System
2. Book Bank
3. Online Exam Registration
4. Stock Maintenance System
5. Online course reservation system
6. E-ticketing
7. Software Personnel Management System
8. Credit Card Processing
9. E-book management System.
10. Recruitment system

Engineering 3 - Semester 2

Course Code	Course Title					Course Type
HS3203	Soft Skills					HSMC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	0	0	2			1

Course Objectives

- To enable students to speak effectively in formal and informal situations.
- To equip the students with necessary writing skills in order to face the corporate world.
- To strengthen the writing skills of the students and help them in documentation.
- To enable students to sharpen their communication skills towards writing a persuasive resume and effective job application letters.
- To equip students with pre-presentation steps, to understand the structure of a good presentation, and devise various techniques for delivering a successful presentation.
- To make students understand the importance of teamwork and group presentations and group discussions.

Course Outcomes

Students will be able

1. Communicate effectively in formal and informal situations.
2. Understand the structure and mechanics of writing resumes, reports, documents and E-mails.
3. Present effectively in academic and professional contexts.
4. Develop communication in writing for a variety of purposes.
5. Identify areas of evaluation in Group Discussions conducted by organizations as part of the selection procedure.
6. Overcome stage fear and tackle questions.

Detailed Contents

UNIT-I

Activities on Fundamentals of Interpersonal CommunicationStarting a conversation - responding appropriately and relevantly - using the right body language-Role Play in different situations & Discourse Skills using visuals.

UNIT-II

Activities on Reading Comprehension General Vs Local comprehension- reading for facts- guessing meanings from context- scanning- skimming- inferring meaning- critical reading – surfing Internet

UNIT-III

Activities on Writing Skills Structure and presentation of different types of writing- Resume writing/ e-

correspondence/ Technical report writing- planning for writing - improving one's writing.

UNIT-IV

Activities on Presentation Skills Oral presentations (individual and group) through JAM sessions/seminars/PPTs and written presentations

UNIT-V

Activities on Group Discussion, Debate and Interview Skills - Dynamics of group discussion-intervention- summarizing-modulation of voice-body language-relevance-fluency and organization of ideas and rubrics for evaluation- Concept and process-pre-interview planning-opening strategies-answering strategies- interview through tele-conference & video-conferencing - Mock Interviews

Text Books

- Soft Skills Training: A workbook to Develop Skills for Employment – By Frederick H.

References

1. Wentz Everyone Communicates, Few People Connect: What the Most Effective.
2. People do Differently – By John C. Maxwell
3. How to Talk to Anyone: 92 Little Tricks to Have Big success in Relationships – By Leil Lowndes.
4. Teamwork101: What Every Leader Needs to Know – By John C. Maxwell.
5. AdaptAbility: How to Survive Change You Didn't Ask For- By M.J. Ryan.
6. Conflict Communication: A New Paradigm in Conscious Communication – By Rory Miller.

Course Code	Course Title					Course Type
EC3203	Introduction to Internet of Things					ESC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	0	0	40	60	3

Course Objectives

- Students will understand the concepts of Internet of Things and be able to build IoT applications.

Course Outcomes

1. The Student is expected to design and develop an IoT real-world application in a specific domain armed with knowledge of Python and choosing hardware for specific application.

Detailed Contents

UNIT-I

Introduction & Concepts Introduction & Concepts: Introduction to Internet of Things- Definitions & Characteristics of IoT, Physical Design of IOT-Things in IoT, IoT Protocols, Logical Design of IOT-IoT Functional Blocks, IoT Communication Models, IoT Communication APIs, IOT Enabling Technologies-Wireless Sensor Networks, Cloud Computing, Big Data Analytics,Communication Protocols, Embedded Systems, IOT Levels & Deployment Templates.

UNIT-II

Domain Specific IoTs and M2M IoT applications for Home Automation, Cities, Environment, Energy,Retail, Logistics, Agriculture, Industry, health and Lifestyle IoT and M2M – Introduction to M2M, Similarities and Differences between IoT and M2M.

UNIT-III

IoT Platforms Design Methodology Introduction, IoT Design Methodology Steps-Purpose and Requirements Specification, Process Specification, Domain Model Specification, Information Model Specification, Service Specifications, IoT Level Specification, Functional View Specification, Operational View R22, Electronics and Communications Engineering Page 165 Specification, Device and Component Integration, Application Development, Case Study on IoT System for Weather Monitoring.

UNIT-IV

Introduction to Python Motivation for using Python for designing IoT systems, Language features of Python, Data types- Numbers, Strings, Lists, Tuples, Dictionaries, Type Conversions, Data Structures: Control of flow-if, for, while, range, break/continue, pass, functions, modules, packaging, file handling, data/time operations, classes, Exception handling, Python packages of Interest for IoT - JSON, XML, HTTPLib, URLLib, SMTPLib

UNIT-V

IoT Physical Devices and End Points Basic building blocks of an IoT device, Rasberry Pi-About theRasberry Pi board, Rasberry Pi interfaces-Serial, SPI,I2C, Interfacing an LED and switch with RPi and controlling. Other IoT Devices- pcDuino, BeagleBone Black, CubieboardIoT

Text Books

- Misra, S., Mukherjee, A., & Roy, A. (2022). Introduction to IoT. Wiley.

References

1. V. Madisetti and A. Bahga, "Internet of Things (A Hands-on-Approach)," 1st ed., VPT, USA: VPT, 2014.
2. F. daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything," 1st ed., Apress, USA: Apress Publications, 2013.

Course Code	Course Title					Course Type
CS3201	DevOps					PCC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	0	0	60	40	3

Course Objectives

- Understand the skill sets and high-functioning teams involved in Agile, DevOps and related
- methods to reach a continuous delivery capability.
- Implement automated system update and DevOps lifecycle

Course Outcomes

At the end of the course, student will be able to

1. Understand the various components of the DevOps environment.
2. Identify Software development models and architectures of DevOps
3. Use different project management and integration tools.
4. Select an appropriate testing tool and deployment model for project.

UNIT-I

Introduction to DevOps:

Introduction, Agile development model, DevOps and ITIL. DevOps process and Continuous Delivery, Release management, Scrum, Kanban, delivery pipeline, identifying bottlenecks.

UNIT-II

Software development models and DevOps:

DevOps Lifecycle for Business Agility, DevOps, and Continuous Testing. DevOps influence on Architecture: Introducing software architecture, The monolithic scenario, Architecture rules of thumb, The separation of concerns, Handling database migrations, Micro services and the data tier, DevOps, architecture, and resilience.

UNIT-III

Introduction to project management:

The need for source code control, the history of source code management, Roles and code, source code management system and migrations, shared authentication, Hosted Git servers, Different Git server implementations, Docker intermission, Gerrit, The pull request model, GitLab.

UNIT-IV

Integrating the system:

Build systems, Jenkins build server, Managing build dependencies, Jenkins plugins, and file system layout, The host server, Build slaves, Software on the host, Triggers, Job chaining and build pipelines, Build servers and infrastructure as code, Building by dependency order, Build phases, Alternative build servers, Collating quality measures.

UNIT-V

Testing Tools and Deployment:

Various types of testing, Automation of testing Pros and cons, Selenium - Introduction, Selenium features, JavaScript testing, Testing backend integration points, Test-driven development, REPL-driven development. Deployment of the system: Deployment systems, Virtualization stacks, code execution at the client, Puppet master and agents, Ansible, Deployment tools: Chef, Salt Stack and Docker

Text Books

- Joakim Verona., Practical DevOps, Packt Publishing, 2016

References

1. Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint. Wiley
2. publications.
3. 2. Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. Addison
4. Wesley

Course Code	Course Title					Course Type
CS3801	DevOps Lab					PCC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	0	0	3	40	60	1.5

Course Objectives

- Develop a sustainable infrastructure for applications and ensure high scalability. DevOps aims to shorten the software development lifecycle to provide continuous delivery with high-quality.

Course Outcomes

1. Understand the need of DevOps tools
2. Understand the environment for a software application development
3. Apply different project management, integration and development tools
4. Use Selenium tool for automated testing of application

List of experiments:

1. Write code for a simple user registration form for an event.
2. Explore Git and GitHub commands.
3. Practice Source code management on GitHub. Experiment with the source code in exercise 1.
4. Jenkins installation and setup, explore the environment.
5. Demonstrate continuous integration and development using Jenkins.
6. Explore Docker commands for content management.
7. Develop a simple containerized application using Docker.
8. Integrate Kubernetes and Docker
9. Automate the process of running containerized application for exercise 7 using Kubernetes.
10. Install and Explore Selenium for automated testing.
11. Write a simple program in JavaScript and perform testing using Selenium.
12. Develop test cases for the above containerized application using selenium.

Course Code	Course Title					Course Type
CS3202	Machine Learning					PCC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
Knowledge on statistical methods	3	0	0	40	60	3

Course Objectives

- To provide an introduction to the field of machine learning and its applications
- To teach the fundamental concepts of linear regression, decision trees, instance-based learning, and clustering
- To enable students to understand the basics of artificial neural networks and support vector machines
- To introduce students to ensemble learning techniques and recommender systems
- To provide hands-on experience in implementing machine learning algorithms using Python

Course Outcomes

1. Understand the basic concepts of machine learning and its applications
2. Apply linear regression and decision tree learning techniques to real-world problems
3. Understand and apply instance-based learning and clustering algorithms
4. Implement artificial neural networks and support vector machines
5. Apply ensemble learning techniques and develop recommender systems
6. Use Python to implement machine learning algorithms and evaluate their performance

Detailed Contents

UNIT I

Introduction: Introduction to Machine Learning: Introduction. Different types of learning, Hypothesis space and inductive bias, Evaluation. Training and test sets, cross validation, Concept of over fitting, under fitting, Bias and Variance.

Linear Regression: Introduction, Linear regression, Simple and Multiple Linear regression, Polynomial regression, evaluating regression fit.

UNIT II

Decision tree learning: Introduction, Decision tree representation, appropriate problems for decision tree learning, the basic decision tree algorithm, hypothesis space search in decision tree learning, inductive bias in decision tree learning, issues in decision tree learning, Python exercise on Decision Tree.

Instance based Learning: K nearest neighbor, the Curse of Dimensionality, Feature Selection: forward search, backward search, univariate , multivariate feature selection approach, Feature reduction (Principal Component Analysis) , Python exercise on kNN and PCA.

Recommender System: Content based system, Collaborative filtering based.

UNIT III

Probability and Bayes Learning: Bayesian Learning, Naïve Bayes, Python exercise on Naïve Bayes, Logistic Regression.

Support Vector Machine: Introduction, the Dual formulation, Maximum margin with noise, nonlinear SVM and Kernel function, solution to dual problem.

UNIT IV

Artificial Neural Networks: Introduction, Biological motivation, ANN representation, appropriate problem for ANN learning, Perceptron, multilayer networks and the back propagation algorithm,

UNIT V

Ensembles: Introduction, Bagging and boosting, Random forest, Discussion on some research papers.

Clustering: Introduction, K-mean clustering, agglomerative hierarchical clustering, Python exercise on k-mean clustering.

Text Books

- Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012.

References

1. T. Mitchell, "Machine Learning," First Edition, McGraw-Hill, 1997.
2. E. Alpaydin, "Introduction to Machine Learning," MIT Press, 2020.
3. C. Bishop, "Pattern Recognition and Machine Learning," Springer, 2007.

Course Code	Course Title					Course Type
CS3802	Machine Learning Lab					PCC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	0	0	3	40	60	1.5

Course Objectives

- The objective of this lab is to get an overview of the various machine learning techniques and can able to demonstrate them using python.

Course Outcomes

After the completion of the course the student can able to:

1. Understand complexity of Machine Learning algorithms and their limitations;
2. Understand modern notions in data analysis-oriented computing;
3. Be capable of confidently applying common Machine Learning algorithms in practice and implementing their own;
4. Be capable of performing experiments in Machine Learning using real-world data.

List of Experiments

1. Basic exercises on Python Machine Learning Packages such as Numpy, Pandas and matplotlib.
2. Given a dataset. Write a program to compute the Covariance, Correlation between a pair of attributes. Extend the program to compute the Covariance Matrix and Correlation Matrix.
3. Given a set of sample points in N dimensional feature space. Write a program to fit the points with a hyper plane using Linear Regression. Calculate sum of residual error.
4. Write a program that provides option to compute different distance measures between two points in the N dimensional feature space. Consider some sample datasets for computing distances among sample points.
5. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
6. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Python ML library classes can be used for this problem.
7. Write a program to implement feature reduction using Principle Component Analysis
8. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
9. Given a dataset for classification task. Write a program to implement Support Vector Machine and estimate its test performance.
10. Write a program to implement perceptron for different learning tasks.
11. Write programs to implement ADALINE and MADALINE for a given learning task.
12. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.
13. Write a program to implement K means clustering algorithm. Select your own dataset to test the program. Demonstrate the nature of output with varying value of K.

Course Code	Course Title					Course Type
CS3203	Automata Theory and Compiler Design					PCC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	1	0	40	60	4

Course Objectives

- To introduce the fundamental concepts of formal languages, grammars and automata theory.
- To understand deterministic and non-deterministic machines and the differences between decidability and undecidability.
- Introduce the major concepts of language translation and compiler design and impart the knowledge of practical skills necessary for constructing a compiler.
- Topics include phases of compiler, parsing, syntax directed translation, type checking use of symbol tables, intermediate code generation

Course Outcomes

1. Able to employ finite state machines for modeling and solving computing problems.
2. Able to design context free grammars for formal languages.
3. Able to distinguish between decidability and undecidability.
4. Demonstrate the knowledge of patterns, tokens & regular expressions for lexical analysis.
5. Acquire skills in using lex tool and design LR parsers

Detailed Contents

UNIT-I

Introduction: Alphabet, Languages and grammars, productions and derivations, Chomsky hierarchy of languages. Regular Languages and finite automaton: Regular Expressions and languages, deterministic finite automaton and Equivalence with regular expressions, Non deterministic finite automaton (NFA) and Equivalence with DFA, minimization of finite automata.

Regular languages: regular grammars and equivalence with finite automata, properties of regular languages, pumping lemma for regular languages.

UNIT-II

Context free languages: Context free grammars (CFG) and languages (CFL), Chomsky and Greibach normal forms, pumping lemma for context free languages, parse trees, ambiguity in CFG, closure properties of CFLs.

Pushdown automata: Deterministic Push down automata (PDA), non deterministic Push down automata (PDA) Context sensitive languages, Context sensitive grammars.

UNIT-III

Turing Machine: Basic model for TM, Turing recognizable (recursively enumerable) and Turing-decidable(recursive) languages and their closure properties, variants of Turing Machines, Non deterministic TMs .

Undicidability: Church-Turing thesis, universal turing machine, the universal and diagnolization languages, undecidable problems about languages.

Introduction – Language Processors, Structure of a compiler- phases of compiler design and overview. Applications of compiler Technology.

Lexical analysis: The role of Lexical Analyzer, Input Buffering, Specification of Tokens, Recognition of Tokens, Lexical errors, error recovery in lexical analysis phase, The Lexical-Analyzer Generator Lex.

UNIT-IV

Syntax Analysis –Top-Down parsing: Brute Forcing, Recursive Descent parsing, LL (1) parsing, Bottom-Up parsing : Shift reduce parsing, conflicts during shift reduce parsing, Introduction to LR Parsing: LR(0), simple LR, powerful LR parsers: CLR, LALR, conflicts, Parser Generators – Yacc. Error Recovery: Introduction, Error detecting and Reporting, Syntax Errors handling.

UNIT-V

Semantic Analysis – Introduction, semantic errors, attribute grammars

Syntax Directed Translation – Syntax Directed Definitions, Evaluation Orders for SDDs. Applications of Syntax Directed Translation. Symbol Table Organization

Intermediate code generation – Variants of syntax trees, Three-Address Code, Types and Declarations, Translation of Expressions, Type Checking.

Run time Environment – storage organization, Stack allocation of space, activation records, and Access to non local data.

Code Generation – Issues in the Design of a Code Generator, the Target Language, Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks. Peephole Optimization, Register Allocation and Assignment, Instruction Scheduling. Machine Independent Optimizations – The Principal Sources of Optimizations.

Text Books

- J. E. Hopcroft and J. D. Ullman, Introduction to Automata Theory, Languages, and Computation, Pearson education Asia.
- K. D. Cooper and L. Torczon, Engineering a Compiler, Morgan Kaufman, 2012.

References

1. A.V. Aho, Monica Lam, Ravi Sethi, and J.D. Ullman, "Compilers: Principles, Techniques, and Tools," 2nd ed., Addison-Wesley, 2007.
2. Harry R Lewis and Christos H Papadimitriou, "Elements of the Theory of Computation," Pearson education Asia.
3. Dexter C Kozen, "Automata and Computability," Undergraduate Texts in Computer Science, Springer.
4. Michael Sipser, "Introduction to the Theory of Computation," PWS publishing.
5. John Martin, "Introduction to Languages and the Theory of Computation," McGraw-Hill Education, 2003.
6. K.C. Louden, "Compiler Construction: Principles and Practice," Cengage Learning, 1997.
7. D. Brown, J. Levine, and T. Mason, "LEX and YACC," O'Reilly Media, 1992.

Course Code	Course Title					Course Type
CS3225	Human Computer Interaction					PEC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	0	0	40	60	3

Course Objectives

- To gain an overview of Human-Computer Interaction (HCI), with an understanding of user interface design in general, and alternatives to traditional "keyboard and mouse" computing;
- become familiar with the vocabulary associated with sensory and cognitive systems as relevant to task
- performance by humans.
- Be able to apply models from cognitive psychology to predicting user performance in various human-computer interaction tasks and recognize the limits of human performance as they apply to computer operation.
- Appreciate the importance of a design and evaluation methodology that begins with and maintains a focus on the user.
- Be familiar with a variety of both conventional and non-traditional user interface paradigms, the latter including virtual and augmented reality, mobile and wearable computing, and ubiquitous computing; and understand the social implications of technology and their ethical responsibilities as engineers in the design of technological systems.
- Finally, working in small groups on a product design from start to finish will provide you with invaluable team-work experience.

Course Outcomes

1. Ability to apply HCI and principles to interaction design.
2. Ability to design certain tools for blind or PH people.

Detailed Contents

UNIT-I

Introduction: Importance of user Interface – definition, importance of good design. Benefits of good design. A brief history of Screen design.

The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.

UNIT-II

Design process – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions.

Screen Designing: Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information

retrieval on web – statistical graphics – Technological consideration in interface design.

UNIT-III

Windows – New and Navigation schemes selection of window, selection of devices based and screen-based controls. Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.

UNIT-IV

HCI in the software process, The software life cycle Usability engineering Iterative design and prototyping Design Focus: Prototyping in practice Design rationale Design rules Principles to support usability Standards Golden rules and heuristics HCI patterns Evaluation techniques, Goals of evaluation, Evaluation through expert analysis, Evaluation through user participation, Choosing an evaluation method. Universal design, Universal design principles Multi-modal interaction.

UNIT-V

Cognitive models Goal and task hierarchies Design Focus: GOMS saves money Linguistic models The challenge of display-based systems Physical and device models Cognitive architectures Ubiquitous computing and augmented realities Ubiquitous computing applications research Design Focus: Ambient Wood – augmenting the physical Virtual and augmented reality Design Focus: Shared experience Design Focus: Applications of augmented reality Information and data visualization Design Focus: Getting the size right.

Text Books

- The essential guide to user interface design, Wilbert O Galitz, Wiley Dream Tech. Units 1, 2, 3
- Human – Computer Interaction. Alan Dix, Janet Fincay, Gre Goryd, Abowd, Russell Bealg, Pearson Education Units 4,5

References

1. Designing the user interface. 3rd Edition Ben Shneidermann, Pearson Education Asia.
2. Interaction Design Prece, Rogers, Sharps. Wiley Dreamtech.
3. User Interface Design, Soren Lauesen , Pearson Education.
4. Human –Computer Interaction, D. R. Olsen, Cengage Learning.
5. Human –Computer Interaction, Smith - Atakan, Cengage Learning.

Course Code	Course Title					Course Type
CS3232	Adhoc Sensor Networks					PEC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	0	0	40	60	3

Prerequisites:

1. A course on "Computer Networks".
2. A course on "Mobile Computing".

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

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

Detailed Contents

UNIT-I

Introduction to Ad Hoc Networks - Characteristics of MANETs, Applications of MANETs andChallenges of MANETs.Routing in MANETs - Criteria for classification, Taxonomy of MANET routing algorithms, Topology-based routing algorithms-Proactive: DSDV; Reactive: DSR, AODV; Hybrid: ZRP; Position-based routing algorithms-Location Services-DREAM, Quorum-based; Forwarding Strategies:Greedy Packet, Restricted Directional Flooding-DREAM, LAR.

UNIT-II

Data Transmission - Broadcast Storm Problem, Rebroadcasting Schemes-Simple-flooding, Probability-based Methods, Area-based Methods, Neighbor Knowledge-based: SBA, Multipoint Relaying, AHBP. Multicasting: Tree-based: AMRIS, MAODV; Mesh-based: ODMRP, CAMP; Hybrid: AMRoute, MCEDAR.

UNIT-III

Geocasting: Data-transmission Oriented-LBM; Route Creation Oriented-GeoTORA, MGR. TCP over Ad Hoc TCP protocol overview, TCP and MANETs, Solutions for TCP over Ad hoc.

UNIT-IV

Basics of Wireless, Sensors and Lower Layer Issues: Applications, Classification of sensor networks, Architecture of sensor network, Physical layer, MAC layer, Link layer, Routing Layer.

UNIT-V

Upper Layer Issues of WSN: Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs, Sensor Networks and mobile robots.

Text Books

- Corderio, C., & Aggarwal, D. P. (2006). Ad Hoc and Sensor Networks – Theory and Applications. World Scientific Publications. ISBN: 981-256-681-3.
- Zhao, F., & Guibas, L. (2004). Wireless Sensor Networks: An Information Processing Approach. Morgan Kauffman/Elsevier Science. ISBN: 978-1-55860-914-3.

References

1. C. Siva Ram Murthy and B.S. Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols," 2nd ed., Pearson Education, 2010.
2. Ivan Stojmenovic, "Handbook of Sensor Networks: Compact Wireless and Wired Sensing Systems," CRC Press, 2005.
3. Ian F. Akyildiz, Weilian Su, Yogesh Sankarasubramaniam, and Erdal Cayirci, "Wireless Sensor Networks: A Survey," Computer Networks, vol. 38, no. 4, pp. 393-422, 2002.
4. Mohammad Ilyas, "The Handbook of Ad Hoc Wireless Networks," CRC Press, 2003.
5. Jun Zheng and Abbas Jamalipour, "Wireless Sensor Networks: A Networking Perspective," Wiley, 2009.

Engineering 4 - Semester 1

Course Code	Course Title					Course Type
BM4106	Intellectual Property Rights					HSMC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	1	0	40	60	3

Course Objectives: At the end of the course the student will be able to

- To introduce fundamental aspects of Intellectual property Rights to students who are going to play a major role in development and management of innovative projects in industries.
- To disseminate knowledge on patents, patent regime in India and abroad and registration aspects
- To disseminate knowledge on copyrights and its related rights and registration aspects
- To disseminate knowledge on trademarks and registration aspects.
- To disseminate knowledge on Design, Geographical Indication (GI), Plant Variety and Layout Design Protection and their registration aspects.
- To aware about current trends in IPR and Govt. steps in fostering IPR.

Course Outcomes:

1. Upon completion of this course the students shall get adequate knowledge on patent and copyright for their innovative research works.
2. During their career, the knowledge gained through this course shall provide useful insights on the novelty of their idea from a state-of-the-art patent search. This provides a further way for developing their idea or innovations.
3. This course shall pave the way for the students to catch up Intellectual Property (IP) as a career option.

Detailed Contents:

Unit-1:

Introduction to IPR: Definition of Intellectual Property, Meaning of Intellectual Property,

Evolution of IPR, Kinds of Intellectual Property Rights - Patents, Trademarks, Copy Rights, Industrial Design, Trade Secrets, Geographical Indications, Agencies responsible for Intellectual Property Rights- USPTO, INTA, WIPO, TRIPS, International Conventions- Patent treaty, Madrid Protocol, Berne Convention.

UNIT-II:

Patent Rights: Introduction, Definition of Patent, Importance of Patents, Types of Patents, Patentable Inventions, Non- Patentable Inventions, Persons entitled to apply for Patent, Who can apply for a Patent, Expiry of a Patent, Rights of patentee, Registration of patent.

Unit-III:

Industrial designs: Definitions of Designs, Essentials of a Design, Who can file for Design Registration, Term of Design, Registration of Designs, Cancellation of a Registered designs, Restoration of a lapsed design.

Unit-IV:

Trademarks: Introduction to Trademark, Meaning of Trademark, Types of Trademark, Features of Trademarks, Functions of Trademarks, Objectives of Trademarks, What to avoid when selecting a Trademark, Trademark Registration procedure, Infringement of Trademarks, Passing off.

Unit-V:

Copy Right: Introduction, Subject matter of Copy Right, Objectives of Copy Rights, Rights of a copyright holder, Works covered under Copy Right, Works not covered under Copy Right, Duration of Copy Right, and Registration of Copy Right.

Case studies are discussed wherever applicable.

Text Books

- Cornish.W.R, "Intellectual Property Patents", CopyRight and Trademarks and Allied rights, Sweet & Maxwell 1993.
- P.Narayanan: Intellectual Property Law, Eastern Law House, 2nd edition 1997.
- Roy Chowdhary, S.K. & Other: Law of Trademark, Copyrights, Patents and Designs, Kamal Law House, 1999.
- Dr.G.B.Reddy, Intellectual Property Rights and theLaw5thEd.2005GogiaLawAgency.
- B.L.Wadhera: Intellectual Property Law, UniversalPublishers,2nd Ed.2000.

Course Code	Course Title					Course Type
CS4101	Cryptography and Network Security					PCC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	0	0	40	60	3

Course Objectives

- Explain the objectives of information security
- Explain the importance and application of each of confidentiality, integrity, authentication and availability
- Understand various cryptographic algorithms.
- Understand the basic categories of threats to computers and networks
- Describe public-key cryptosystem.
- Describe the enhancements made to IPv4 by IPSec
- Understand Intrusions and intrusion detection
- Discuss the fundamental ideas of public-key cryptography.
- Generate and distribute a PGP key pair and use the PGP package to send an encrypted e-mail message.
- Discuss Web security and Firewalls

Course Outcomes

4. Student will be able to understand basic cryptographic algorithms, message and web authentication and security issues.
5. Ability to identify information system requirements for both of them such as client and server.
6. Ability to understand the current legal issues towards information security.

Detailed Contents

UNIT-I

Security Concepts: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security, Cryptography Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.

UNIT-II

Symmetric key Ciphers: Block Cipher principles, DES, AES, Blowfish, RC5, IDEA, Block cipher operation, Stream ciphers, RC4.

Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Elgamal Cryptography, Diffie-Hellman Key Exchange, Knapsack Algorithm.

UNIT-III

Cryptographic Hash Functions: Message Authentication, Secure Hash Algorithm (SHA-512), Message authentication codes: Authentication requirements, HMAC, CMAC, Digital signatures, Elgamal Digital Signature Scheme.

Key Management and Distribution: Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public – Key Infrastructure

UNIT-IV

Transport-level Security: Web security considerations, Secure Socket Layer and Transport Layer Security, HTTPS, Secure Shell (SSH)

Wireless Network Security: Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN, IEEE 802.11i Wireless LAN Security

UNIT-V

E-Mail Security: Pretty Good Privacy, S/MIME IP Security: IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, Combining security associations, Internet Key Exchange

Case Studies on Cryptography and security: Secure Multiparty Calculation, Virtual Elections, Single sign On, Secure Inter-branch Payment Transactions, Cross site Scripting Vulnerability.

Text Books

- Stallings, W. (2013). Cryptography and Network Security – Principles and Practice. Pearson Education. 6th Edition.
- Kahate, A. (2012). Cryptography and Network Security. Mc Graw Hill. 3rd Edition.

References

1. Shyamala, C. K., Harini, N., & Padmanabhan, T. R. (n.d.). Cryptography and Network Security. Wiley India.
2. Forouzan, B. A., & Mukhopadhyay, D. (2010). Cryptography and Network Security. Mc Graw Hill.
3. Stamp, M. (2011). Information Security, Principles, and Practice. Wiley India.
4. Conklin, W. A., White, G., & Cothren, D. (2018). Principles of Computer Security. McGraw-Hill Education.
5. Krawetz, N. (2008). Introduction to Network Security. Cengage Learning.
6. Menezes, A. J. (2011). Network Security and Cryptography. Cengage Learning.

Course Code	Course Title					Course Type
CS4701	Cryptography and Network Security Lab					PCC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	0	0	3	40	60	1.5

Course Objectives

- Explain the objectives of information security.
- Explain the importance and application of confidentiality, integrity, authentication and availability.
- Understand various cryptographic algorithms.

Course Outcomes

1. Understand basic cryptographic algorithms, message and web authentication and security issues.
2. Identify information system requirements for both of them such as client and server.
3. Understand the current legal issues towards information security

List of Experiments:

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 display 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
   a. Ceaser cipher b. Substitution cipher c. Hill Cipher
4. Write a C/JAVA program to implement the DES algorithm logic.
5. Write a C/JAVA program to implement the Blowfish algorithm logic.
6. Write a C/JAVA program to implement the Rijndael algorithm logic.
7. Write the RC4 logic in Java Using Java cryptography; encrypt the text "Hello world" using
8. Blowfish. Create your own key using Java key tool.
9. Write a Java program to implement the RSA algorithm.
10. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript.
11. Calculate the message digest of a text using the SHA-1 algorithm in JAVA.
12. Calculate the message digest of a text using the MD5 algorithm in JAVA

Course Code	Course Title					Course Type
CS4144	Natural Language Processing with Deep Learning					PEC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	0	0	40	60	3

Course Objectives

- Introduce NLP and DL models for NLP
- Cover various NLP tasks and DL models such as feedforward neural networks, RNNs, and attention mechanisms
- Discuss advanced NLP topics and recent advances in the field

Course Outcomes

1. Understand NLP and DL models for NLP
2. Preprocess textual data and generate word embeddings
3. Build and train RNNs for sequence modeling and use them for NLP tasks
4. Use attention mechanisms and Transformer models for sequence-to-sequence tasks
5. Explore advanced NLP topics and recent advances in the field
6. Identify open research problems in NLP and DL for NLP.

Detailed Contents

UNIT-I

Introduction to Natural Language Processing and Deep Learning: Overview of natural language processing (NLP) and deep learning (DL), Introduction to NLP tasks (e.g. sentiment analysis, named entity recognition, machine translation), Overview of DL models for NLP (e.g. feedforward neural networks, recurrent neural networks, convolutional neural networks), Text preprocessing techniques (e.g. tokenization, stemming, stopword removal)

UNIT-II

Word Embeddings: Introduction to distributed representations of words, Word2Vec and GloVe models for generating word embeddings, Training and evaluating word embeddings, Applications of word embeddings in NLP tasks,

UNIT-III

Sequence Modeling with Recurrent Neural Networks

Introduction to recurrent neural networks (RNNs), Training and evaluating RNNs for sequence modeling, Applications of RNNs in NLP tasks (e.g. language modeling, text generation, sentiment analysis)

UNIT-IV

Attention and Transformer Models

Introduction to attention mechanisms in DL models, Transformer model architecture for sequence-to-sequence tasks, Applications of Transformer models in NLP tasks (e.g. machine translation, summarization)

UNIT-V

Advanced NLP Topics

Introduction to advanced NLP topics (e.g. deep reinforcement learning for NLP, multi-task learning for NLP), Recent advances in NLP and DL for NLP, Open research problems in NLP and DL for NLP

Text Books

- Goldberg, Y. (2017). Neural Network Methods for Natural Language Processing. Morgan & Claypool Publishers.
- Jurafsky, Daniel, and James H. Martin. Speech and Language Processing. 3rd ed., Pearson Education, Inc., 2019.

References

1. Bird, Steven, Ewan Klein, and Edward Loper. Natural Language Processing with Python. O'Reilly Media, Inc., 2009.
2. "Deep Learning" by Ian Goodfellow, Yoshua Bengio, and Aaron Courville
3. "Natural Language Processing with PyTorch" by Delip Rao and Brian McMahan
4. "Deep Learning for Natural Language Processing" by Palash Goyal, Sumit Pandey, Karan Jain, and Karan Narula

Course Code	Course Title					Course Type
CS4154	Software Testing Methodologies					PEC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	0	0	40	60	3

Course Objectives

- To study fundamental concepts 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, and 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.
- To understand software test automation problems and solutions.
- To learn how to write software test documents and communicate with engineers in various forms.

Course Outcomes

1. 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.
2. Design and conduct a software test process for a software project Analyze the needs of software test automation
3. Use various communication methods and skills to communicate with their teammates to conduct their practice-oriented software testing projects.
4. Basic understanding and knowledge of contemporary issues in software testing, such as component-based, web based and object oriented software testing problems.
5. Write test cases for given software to test it before delivery to the customer and write test scripts for both desktop and web based applications.

Detailed Contents

UNIT-I

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.

UNIT-II

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.

UNIT-III

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.

UNIT-IV

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.

UNIT-V

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

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

References

1. A.P. Mathur, Foundations of Software Testing, 2nd ed. Pearson, 2008.
2. B. Beizer, Software Testing Techniques, 2nd ed. Dreamtech, 2003.
3. M.G. Limaye, Software Testing: Principles, Techniques and Tools, TMH, 2011.
4. W.E. Perry, Effective Methods for Software Testing, 3rd ed. Wiley, 2011.

Program Elective Courses (PEC's)

Course Code	Course Title					Course Type
CS3111	**Advanced Algorithms**					
Prerequisite	**Contact Hours per Week**			**Internal**	**External**	**Credits**
	L	**T**	**P**			
	3	**0**	**0**	**40**	**60**	**3**

Course Objectives

- Introduces the recurrence relations for analyzing the algorithms.
- Introduces the graphs and their traversals.
- Describes major algorithmic techniques (divide-and-conquer, greedy, dynamic programming, Brute Force, Transform and Conquer approaches) and mention problems for which each technique is appropriate.
- Describes how to evaluate and compare different algorithms using worst-case, average-case and best-case analysis.
- Introduces string matching algorithms.
- Introduces linear programming.

Course Outcomes

1. Ability to analyze the performance of algorithms.
2. Ability to choose appropriate data structures and algorithm design methods for a
3. specified application.
4. Ability to understand how the choice of data structures and the algorithm design
5. Methods impact the performance of programs.

Detailed Contents

UNIT-I

Introduction: Role of Algorithms in computing, Order Notation, Recurrences, Probabilistic Analysis and Randomized Algorithms. Sorting and Order Statistics: Heap sort, Quick sort and Sorting in Linear Time. Advanced Design and Analysis Techniques: Dynamic Programming- Matrix chain Multiplication, Longest common Subsequence and optimal binary Search trees.

UNIT-II

Greedy Algorithms - Huffman Codes, Activity Selection Problem. Amortized Analysis. Graph Algorithms: Topological Sorting, Minimum Spanning trees, Single Source Shortest Paths, Maximum Flow algorithms.

UNIT-III

Sorting Networks: Comparison Networks, Zero-one principle, bitonic Sorting Networks, Merging Network, Sorting Network.

Matrix Operations- Strassen's Matrix Multiplication, inverting matrices, Solving system of linear Equations.

UNIT-IV

String Matching: Naive String Matching, Rabin-Karp algorithm, matching with finite Automata, Knuth-Morris - Pratt algorithm.

UNIT-V

NP-Completeness and Approximation Algorithms: Polynomial time, polynomial time verification, NP-Completeness and reducibility, NP-Complete problems. Approximation Algorithms- Vertex cover Problem, Travelling Salesperson problem.

Text Books

- T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein, "Introduction to Algorithms," 3rd ed., Pearson Education, 2009.

References

1. E. Horowitz, S. Sahni, and R. Rajasekharam, Fundamentals of Computer Algorithms, Galgotia Publications Pvt. Ltd.
2. P. H. Dave and H. B. Dave, Design and Analysis Algorithms, Pearson.
3. M. T. Goodrich and R. Tomassia, Algorithm Design: Foundations, Analysis and Internet Examples, John Wiley and Sons.
4. A. Weiss, Data Structures and Algorithm Analysis in C++, 2nd Ed., Pearson Education.

Course Code	Course Title					Course Type
CS3112	Advanced Computer Architecture					PEC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	0	0			3

Course Objectives

- Applications and handheld devices play a major role in ensuring comfort in our day- today life.
- These applications run on handheld electronic gadgets with high-end microprocessor support. Modern CPU designers handle challenges imposed by these applications with cost effective architectural enhancements.
- This course provides a deeper insight into the design of high-end microprocessors that will support the future applications.

Course Outcomes

1. Demonstrate concepts of parallelism in hardware/software.
2. Discuss memory organization and mapping techniques.
3. Describe architectural features of advanced processors.

4 : Interpret performance of different pipelined processors.

Detailed Contents

Unit-I

Review of Basic Computer Organization, Performance Evaluation Methods, Introduction to RISC Instruction Pipeline, Instruction Pipeline and Performance.

Unit-II

Pipeline Hazards and Analysis, Branch Prediction, MIPS Pipeline for Multi-Cycle Operations. Compiler Techniques to Explore Instruction Level Parallelism, Dynamic Scheduling with Tomasulo's Algorithm and Speculative Execution.

Unit -III

Advanced Pipelining and Superscalar Processors, Exploiting Data Level Parallelism: Vector and GPU Architectures, Architectural Simulation using gem5.

Unit – IV

Introduction to Cache Memory, Block Replacement Techniques and Write Strategy, Design Concepts in Cache Memory. Basic and Advanced Optimization Techniques in Cache Memory, Cache Optimization using gem5.

Unit-V

Introduction to DRAM System, DRAM Controllers and Address Mapping, Secondary Storage Systems, Design Concepts in DRAM and Hard Disk. Tiled Chip Multicore Processors(TCMP), Routing Techniques

in Network on Chip(NoC), NoC Router Microarchitecture, TCMP and NoC: Design and Analysis, Future Trends in Computer Architecture Research.
Text Books ● S. R. Sarangi, "Advanced Computer Architecture," McGrawHill, 2021.
References 1. Patterson, D. A., Hennessy, J. L., & Goldberg, D. (1996). Computer Architecture: A Quantitative Approach (2nd ed.). Morgan Kaufmann Publishers.

Course Code	Course Title					Course Type
CS3114	Image Processing					PEC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	0	0	40	60	3

Course Objectives

- Study fundamental concepts of Image Processing and various Image Transforms.
- Learn Image Enhancement Techniques in Spatial and Frequency domain, Image Segmentation methods.
- Familiarize with fundamentals of Image compression, Lossy & Lossless Compression methods.
- Define concepts of Image Formation models.
- Understand general methodologies of 2 D Motion Estimation and Video coding methods.
- Understand general methodologies of 2 D Motion Estimation and Video coding methods.

Course Outcomes

1. Use different transforms for various applications like Image Enhancement Compression etc.
2. Use Spatial and Transform techniques to Enhance the given image and to extract the features of the image.
3. Use Lossless and Lossy compression techniques for real time applications.

Detailed Contents

UNIT-I

Digital Image through Scanner, Digital Camera. Concept of Gray Levels. Gray Level to Binary Image Conversion. Sampling and Quantization. Relationship between Pixels. Imaging Geometry. 2D Transformations-DFT, DCT, KLT and SVD.

UNIT-II

Image Enhancement in Spatial Domain Point Processing, Histogram Processing, Spatial Filtering, Enhancement in Frequency Domain, Image Smoothing, Image Sharpening.

UNIT-III

Image Restoration Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration, Interactive Restoration.

UNIT-IV

Image Segmentation Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region Oriented Segmentation.

UNIT-V

Image Compression Redundancies and their Removal Methods, Fidelity Criteria, Image Compression Models, Source Encoder and Decoder, Error Free Compression, Lossy Compression.

Text Books

- R.C. Gonzalez and R.E. Woods, "Digital Image Processing," Addison Wesley/Pearson Education, 2nd Ed, 2004.

References

1. A. K. Jain, "Fundamentals of Digital Image Processing," 1st ed., New Delhi, India: Prentice-Hall of India Private Limited, 1989.
2. R. C. Gonzalez, R. E. Woods, and S. L. Eddins, "Digital Image Processing Using MATLAB," 2nd ed., Gatesmark Publishing, 2009.
3. W. K. Pratt, "Digital Image Processing," 3rd ed., New York, NY, USA: John Wiley & Sons, Inc., 2001.

Course Code	Course Title					Course Type
CS3115	Graph Theory					PEC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	0	0	40	60	3

Course Objectives

- To develop an understanding the most fundamentals of Graphs, Subgraphs and Trees
- To be familiar with the concept of Spanning trees, Cut sets, Isomorphism, Network flows and Planar graphs.
- To determine chromatic number and partitioning, understand matching & Covering concepts.
- To learn about Directed graphs & its types, Euler graphs.
- To understand the fundamental principle of counting and to determine permutation & combination of objects.
- To state and prove Binomial Theorem
- To understand the principle of inclusion & exclusion & derangements
- To learn about generating functions & its methods and solving homogeneous and non-homogeneous recurrence relations.

Course Outcomes

1. Write precise and accurate mathematical definitions of objects in graph theory.
2. Use mathematical definitions to identify and construct examples and to distinguish examples from non-examples.
3. Validate and critically assess a mathematical proof.
4. Use a combination of theoretical knowledge and independent mathematical thinking in creative investigation of questions in graph theory.
5. Reason from definitions to construct mathematical proofs.

Detailed Contents

UNIT-I

Graphs – Introduction – Isomorphism – Sub graphs – Walks, Paths, Circuits – Connectedness – Components – Euler graphs – Hamiltonian paths and circuits – Trees – Properties of trees – Distance and centers in tree – Rooted and binary trees.

UNIT-II

Spanning trees – Fundamental circuits – Spanning trees in a weighted graph – cut sets – Properties of cut set – All cut sets – Fundamental circuits and cut sets – Connectivity and separability – Network flows – 1-Isomorphism – 2-Isomorphism – Combinational and geometric graphs – Planar graphs – Different

representation of a planer graph.

UNIT-III

Chromatic number – Chromatic partitioning – Chromatic polynomial – Matching – Covering – Four color problem – Directed graphs – Types of directed graphs – Digraphs and binary relations – Directed paths and connectedness – Euler graphs.

UNIT-IV

Fundamental principles of counting – Permutations and combinations – Binomial theorem – combinations with repetition – Combinatorial numbers – Principle of inclusion and exclusion – Derangements – Arrangements with forbidden positions.

UNIT-V

Generating functions – Partitions of integers – Exponential generating function – Summation operator – Recurrence relations – First order and second order – Non-homogeneous recurrence relations – Method of generating functions.

Text Books

- Narsingh Deo, "Graph Theory: With Application to Engineering and Computer Science", Prentice Hall of India, 2003.
- Grimaldi R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", Addison Wesley, 1994.

References

1. Clark J. and Holton D.A, "A First Look at Graph Theory", Allied Publishers, 1995.
2. Mott J.L., Kandel A. and Baker T.P. "Discrete Mathematics for Computer Scientists and Mathematicians" , Prentice Hall of India, 1996.
3. Liu C.L., "Elements of Discrete Mathematics", Mc Graw Hill, 1985.
4. Rosen K.H., "Discrete Mathematics and Its Applications", Mc Graw Hill, 2007.

Course Code	Course Title					Course Type
CS3221	Natural Computing					PEC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	0	0	40	60	3

Course Objectives

- Provide students an insight to the way Nature's computation happens to evolve for betterment. Various natural processes will be explored by which Nature solves problems and optimizes itself. This knowledge is expected to inspire the learners and research for solving various engineering problems, especially the ones dealing with computations.
- Along with Nature inspired techniques for problem solving, the course throws light on various computational aspects which help in simulation and emulation of Nature and its elements. This helps in understanding and analyzing Natural phenomenon.
- Finally, the course concludes by exploring how natural material like DNA and atomic and sub-atomic elements provide distinguished way of solving computational problems.

Course Outcomes

Students will be able to

1. Gain knowledge about the fundamentals of Nature's computation techniques
2. Learn a few algorithms inspired by Nature
3. Identify the basic techniques for simulating natural phenomenon
4. Appreciate the efficiency and effectiveness of computation using natural material like DNA, Atomic and Sub-atomic particles

Detailed Contents

UNIT-I

Introduction to Natural Computing: Motivation, three branches of natural computing, when to use natural computing approaches, General concepts and terminology.

Evolutionary Computing: Evolutionary Biology, Principles of genetics, Genetic Algorithm. Pattern recognition example.

UNIT-II

Neurocomputing: Biological nervous system, Artificial Neural Networks- artificial neuron, types of activation function, types of learning (supervised, unsupervised, reinforcement learning) and learning laws, backpropagation.

Swarm intelligence (Social Computing): Ant colonies, Simple Ant Colony Optimization algorithm (S-ACO), Social Adaptation of Knowledge - Particle swarm optimization algorithm

UNIT-III

Immuno Computing: The immune system, An artificial immune system algorithm, From natural to artificial immune systems, Scope of Artificial Immune Systems.

Particle Systems: Principles, basic model of particle systems, pseudo code and examples

UNIT-IV

Fractal Geometry of Nature: Self similarity, fractal dimension, example fractals.

Cellular Automata: Formal definition, one and two dimension cellular automata, Application-generating fractal patterns, scope. L-Systems: Generating words or strings, geometric interpretation, models of plant architecture, scope. Iterated Function Systems(IFS), Fractional Brownian Motion.

UNIT-V

DNA Computing: The DNA molecule, manipulating DNA, Formal models, Universal DNA computers, Classical vs DNA computing, Scope Quantum Computing: Principles of quantum mechanics, qubit, dirac notation, blochsphere notation, quantum gates, quantum parallelism, quantum circuit example – the swap circuit.

Text Books

- Leandro Nunes de Castro, "Fundamentals of Natural Computing: Basic Concepts, Algorithms, and Applications", Chapman & Hall/CRC, Taylor & Francis Group, 2007

References

1. D. Shiffman, "The Nature of Code – Simulating Natural Systems with Processing", self-published, 2012.
2. A. Brabazon, M. O'Neill, and S. McGarraghy, "Natural Computing Algorithms", Springer, 1st ed., 2015.

Course Code	Course Title					Course Type
CS3222	Computational Number Theory					PEC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	0	0	40	60	3

Course Objectives

- The emphasis of the course is on the application of the number theory in the design of cryptographic algorithms. Putting them together we will see how we can design several cryptographic algorithms.
- The course will start with the notion of time complexity and with several elementary number theoretic algorithms.
- Computational number theory is a very important area of mathematics that became more prominent in the 70's due to newly discovered applications to cryptography, coding theory, communications and other areas of applied science and technology. It is not an exaggeration that electronic commerce, for example, would be impossible without these recent advances.

Course Outcomes

1. On successful completion of this course, the student should be able to:Understand different number theory algorithms used for design of various cryptographic algorithms.
2. Understand different number theory algorithms used coding theory, communications and other areas of applied science and technology.

Detailed Contents

UNIT I

Divisibility

Introduction Divisibility primes the Binomial Theorem Congruence's Solutions of Congruences The Chinese Remainder Theorem Techniques of Numerical Calculations Public key Cryptography Prime power Moduli Prime Modulus Primitive Roots and power Residues Congruence of degree Two Prime Modulus Number Theory from Algebraic Viewpoint Groups, Rings and Fields.

UNIT II

Quadratic Reciprocity and Quadratic Forms Quadratic Residues Quadratic Reciprocity The Jacobi symbol Binary Quadratic Forms Equivalence and Reduction of Binary Quadratic Forms sum of Two squares positive Definite Binary Quadratic Forms Some Functions of Number Theory Greatest Integer Function Arithmetic Functions The Mobius Inversion Formula Recurrence Functions Combinatorial Number

Theory.

UNIT III

Some Diophantine Equations The Equation ax+by=c Simultaneous Linear Equations Pythagorean Triangles Assorted Examples ternary Quadratic Forms Relational Points on Curves Elliptic Curves Factorization Using Elliptic Curves Farey Fractions and Irrational Numbers Farey Sequences Rational Approximations Irrational numbers The Geometry of Numbers.

UNIT IV

Simple Continued Fractions The Euclidean Algorithm Uniqueness Infinite Continued Fractions Irrational Numbers Best Possible Continued Fractions Pells Equation Numerical Computation Primes and Multiplicative Number Theory Elementary Prime number Estimates Dirichlet series Estimates of Arithmetic Functions Primes in Arithmetic Functions.

UNIT V

Algebra Numbers Polynomials Algebraic Numbers Algebraic Numbers Fields Algebraic Integers Quadratic Fields Units in Quadratic Fields Primes in Quadratic Fields Having the Unique Factorization property The Partition Function Partitions Ferrers Graphs Formal Power series , Generating Functions and Identity Eulers Formula Bounds on Jacobi' Formula A Divisibility Property The Density of Sequences of Integers Asymptotic Density and Alpha Beta Theorem.

Text Books

- Niven, Ivan, and Herbert S. Zuckerman. An Introduction to the Theory of Numbers. 5th ed., John Wiley & Sons, Inc., 1991.

References

1. Shoup, Victor. A Computational Introduction to Number Theory and Algebra. Cambridge University Press, 2005.
2. Mignotte, Maurice. Mathematics for Computer Algebra. Springer-Verlag, 1992.
3. Niven, Ivan, Herbert S. Zuckerman, and Hugh L. Montgomery. An Introduction to the Theory of Numbers. John Wiley & Sons, 2019.
4. von zur Gathen, Joachim, and Jürgen Gerhard. Modern Computer Algebra. Cambridge University Press, 2013.
5. Lidl, Rudolf, and Harald Niederreiter. Introduction to Finite Fields and Their Applications. Cambridge University Press, 1994.
6. Menezes, Alfred J., editor. Applications of Finite Fields. Kluwer Academic Publishers, 1993.
7. Silverman, Joseph H., and John Tate. Rational Points on Elliptic Curves. Springer International Edition, 2015.
8. Hankerson, Darrel R., Alfred J. Menezes, and Scott A. Vanstone. Guide to Elliptic Curve Cryptography. Springer-Verlag, 2010.

e-Resources:

- https://nptel.ac.in/courses/106/103/106103015/
- https://nptel.ac.in/courses/111103020/
- https://academic.csuohio.edu/fmartins/courses/mth493/
- http://doc.sagemath.org/html/en/tutorial/
- http://doc.sagemath.org/html/en/reference/

Course Code	Course Title					Course Type
CS3223	Distributed Databases					PEC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	0	0	40	60	3

Course Objectives

- The purpose of the course is to enrich the previous knowledge of database systems and expose the need for distributed database technology to confront the deficiencies of the centralized database systems.
- Introduce basic principles and implementation techniques of distributed database systems.
- Equip students with principles and knowledge of parallel and object-oriented databases.
- Topics include distributed DBMS architecture and design; query processing and optimization; distributed transaction management and reliability; parallel and object database management systems.

Course Outcomes

1. Understand theoretical and practical aspects of distributed database systems.
2. Study and identify various issues related to the development of distributed database system.
3. Understand the design aspects of object-oriented database system and related development.

Detailed Contents

UNIT-I

Introduction; Distributed Data Processing, Distributed Database System, Promises of DDBSs,Problem areas. Distributed DBMS Architecture: Architectural Models for Distributed DBMS, DMBS Architecture. Distributed Database Design: Alternative Design Strategies, Distribution Design issues, Fragmentation, Allocation.

UNIT-II

Query processing and decomposition: Query processing objectives, characterization of query processors, layers of query processing, query decomposition, localization of distributed data.Distributed query Optimization: Query optimization, centralized query optimization, distributed query optimization algorithms.

UNIT-III

Transaction Management: Definition, properties of transaction, types of transactions, distributed concurrency control: serializability, concurrency control mechanisms & algorithms, time - stamped & optimistic concurrency control Algorithms, deadlock Management.

UNIT-IV

Distributed DBMS Reliability: Reliability concepts and measures, fault-tolerance in distributed systems, failures in Distributed DBMS, local & distributed reliability protocols, site failures and network partitioning

Parallel Database Systems: Parallel database system architectures, parallel data placement, parallel query processing, load balancing, database clusters.

UNIT-V

Distributed object Database Management Systems: Fundamental object concepts and models, object distributed design, architectural issues, object management, distributed object storage, object query Processing.

Object Oriented Data Model: Inheritance, object identity, persistent programming languages, persistence of objects, comparison OODBMS and ORDBMS

Text Books

- M. Tamer OZSU and Patuck Valduriez: Principles of Distributed Database Systems, Pearson Edn. Asia, 2001.
- Stefano Ceri and Giuseppe Pelagatti: Distributed Databases, McGraw Hill.

References

1. Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom: “Database Systems: The Complete Book”, Second Edition, Pearson International Edition

Course Code	Course Title					Course Type
CS3224	Computer Vision					PEC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	0	0	40	60	3

Course Objectives

- To introduce students the fundamentals of image formation and the major ideas, methods, and techniques of computer vision and pattern recognition;
- To develop an appreciation for various issues in the design of computer vision and object recognition systems
- To provide the student with programming experience from implementing computer vision and object recognition applications.

Course Outcomes

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

1. Identify basic concepts, terminology, theories, models and methods in the field of computer vision.
2. Describe basic methods of computer vision related to multi-scale representation, edge detection and detection of other primitives, stereo, motion and object recognition.
3. Study the image formation models and feature extraction for computer vision
4. Identify the segmentation and motion detection and estimation techniques
5. Develop small applications and detect the objects in various applications

Detailed Contents

UNIT–I

Image Formation Models: Monocular imaging system, Orthographic & Perspective Projection, Camera model and Camera calibration, Binocular imaging systems, Perspective, Binocular Stereopsis: Camera and Epipolar Geometry; Homography, Rectification, DLT, RANSAC, 3-D reconstruction framework; Auto-calibration. Apparel, Stereovision

UNIT–II

Feature Extraction: Image representations (continuous and discrete), Edge detection, Edge linking, corner detection,texture, binary shape analysis, boundary pattern analysis, circle and ellipse detection, Light at Surfaces; Phong Model; Reflectance Map; Albedo estimation; Photometric Stereo; Use of Surface Smoothness Constraint; Shape from Texture, color, motion and edges.

UNIT – III

Shape Representation and Segmentation: Deformable curves and surfaces, Snakes and active contours,

Level set representations, Fourier and wavelet descriptors, Medial representations, Multi-resolution analysis, Region Growing, Edge Based approaches to segmentation, Graph-Cut,Mean-Shift, MRFs, Texture Segmentation

UNIT – IV

Motion Detection and Estimation: Regularization theory, Optical computation, Stereo Vision, Motion estimation, Background Subtraction and Modelling, Optical Flow, KLT, Spatio-Temporal Analysis, Dynamic Stereo; Motion parameter estimation, Structure from motion,Motion Tracking in Video

UNIT – V

Object recognition: Hough transforms and other simple object recognition methods, Shape Correspondence and shape matching, Principal component analysis, Shape priors for recognition Applications of Computer Vision: Automated Visual Inspection, Inspection of Cereal Grains, Surveillance, In-Vehicle VisionSystems, CBIR, CBVR, Activity Recognition, computational photography, Biometrics, stitching and document processing

Text Books

- D. Forsyth and J. Ponce, "Computer Vision - A modern approach," Prentice Hall.
- R. Szeliksy, "Computer Vision: Algorithms and Applications," http://szeliski.org/Book/

References

1. B. K. P. Horn, "Robot Vision," McGraw-Hill.
2. Haralick& Shapiro, "Computer and Robot Vision," Vol II.
3. G. erardMedioni and Sing Bing Kang, "Emerging topics in computer vision."
4. Emanuele Trucco and Alessandro Verri, "Introductory Techniques for 3-D Computer Vision," Prentice Hall, 1998.
5. Olivier Faugeras, "Three-Dimensional Computer Vision," The MIT Press, 1993.

Course Code	Course Title					Course Type
CS3231	High Performance Computing					PEC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	0	0	40	60	3

Course Objectives

- To Improve the system performance
- To learn various distributed and parallel computing architecture
- To learn different computing technologies

Course Outcomes

1. Understanding the concepts in grid computing
2. Ability to set up cluster and run parallel applications
3. Ability to understand the cluster projects and cluster OS
4. Understanding the concepts of pervasive computing & quantum computing.

UNIT - I

Grid Computing: Data & Computational Grids, Grid Architectures And Its Relations To Various Distributed Technologies. Autonomic Computing, Examples Of The Grid Computing Efforts (Ibm).

UNIT - II

Cluster Setup & Its Advantages, Performance Models & Simulations; Networking Protocols & I/O, Messaging Systems. Process Scheduling, Load Sharing And Balancing; Distributed Shared Memory, Parallel I/O.

UNIT - III:

Example Cluster System – Beowlf; Cluster Operating Systems: Compas And Nanos Pervasive Computing Concepts & Scenarios; Hardware & Software; Human – Machine Interface.

UNIT- IV

Device Connectivity; Java for Pervasive Devices; Application Examples.

UNIT - V

Classical Vs Quantum Logic Gates; One, Two & Three Qubit Quantum Gates; Fredkin & Toffoli Gates; Quantum Circuits; Quantum Algorithms.

Text Books

- P. Padmanabham and M.B. Srinivas (Eds.), Selected Topics in Advanced Computing, Pearson Education, 2005.

References

1. J. Joseph & C. Fellenstien: 'Grid Computing', Pearson Education
2. J. Burkhardt et al: 'Pervasive Computing', Pearson Education
3. Marivesar: 'Approaching Quantum Computing', Pearson Education.
4. Raj Kumar Buyya: 'High Performance Cluster Computing', Pearson Education.
5. Nielsen & Chung L: 'Quantum Computing and Quantum Information', Cambridge University Press.
6. A Networking Approach to Grid Computing, Minoli, Wiley.

Course Code	Course Title					Course Type
CS3233	Social Network Analysis					PEC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	0	0	40	60	3

Course Objectives

- Formalize different types of entities and relationships as nodes and edges and represent this information as relationaldataPlan and execute network analytical computations
- Use advanced network analysis software to generate visualizations and perform empirical investigations of network dataInterpret and synthesize the meaning of the results with respect to a question, goal, or task
- Collect network data in different ways and from different sources while adhering to legalstandards and ethics standards

Course Outcomes

1. After completing the course student should:Know basic notation and terminology used in network science
2. Be able to visualize, summarize and compare networksIllustratebasic principles behind network analysis algorithms
3. Develop practical skills of network analysis in R programming languageBe capable of analyzing real work networks

Detailed Contents

UNIT-I
Social Network Analysis: Preliminaries and definitions, Erdos Number Project, Centrality measures, Balance and Homophily.

UNIT-II
Random graph models:Random graphs and alternative models, Models of network growth, Navigation in social Networks, Cohesive subgroups, Multidimensional Scaling, Structural equivalence, roles and positions.

UNIT-III
Network topology and diffusion, Contagion in Networks, Complex contagion, Percolation and information, Navigation in Networks Revisited.

UNIT-IV

Small world experiments, small world models, origins of small world, Heavy tails, Small Diameter, Clustering of connectivity, The ErdosRenyi Model, Clustering Models.

UNIT-V

Network structure -Important vertices and page rank algorithm, towards rational dynamics in networks, basics of game theory, Coloring and consensus, biased voting, network formation games, network structure and equilibrium, behavioral experiments, Spatial and agent-based models

References

1. S. Wasserman and K. Faust. “Social Network Analysis: Methods and Applications”, Cambridge University Press.2)D. Easley and J. Kleinberg, “Networks, Crowds and Markets: Reasoning about a highly connected world” , Cambridge University Press, 1st edition,2010
2. Maarten van Steen. “Graph Theory and Complex Networks. An Introduction”, 2010.2)Reza Zafarani, Mohammed Ali Abbasi, Huan Liu. “Social Media Mining: An Introduction”. Cambridge University Press 2014.3)Maksim Tsvetovat and Alexander Kouznetsov. “Social Network Analysis for Startups”. O’Reilly Media, 2011.

Course Code	Course Title					Course Type
CS3234	Text Mining and Analytics					PEC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	0	0	40	60	3

Course Objectives

- To learn the various techniques for analyzing text
- To learn the text classification and language models
- To learn the Natural Language processing
- To learn the Opinion Mining, Sentiment Analysis
- Theoretical techniques and applications in text analytics (e.g. social media)

Course Outcomes

1. Describe the various techniques for analyzing text to extract useful and relevant insights
2. Use the techniques to address the challenges in text mining
3. Explain and apply suitable text mining and analytics techniques in solving real-world problems

Unit-1

Introduction to Text Mining and Analytics ,text-mining applications,natural language processing techniques and text representation ,Natural Language Content Analysis and word association mining ,Paradigmatic Relation Discovery ,Syntagmatic Relation Discovery Entropy,Syntagmatic Relation Discovery Mutual Information

Unit-2

Topic Mining and Analysis Motivation ,Task Definition,Topic Mining and Analysis Term as Topic Probabilistic Topic Models,Overview of Statistical Language Models,Probabilistic Topic Models Mining One Topic,Mixture of Unigram Language Models ,Mixture Model Estimation,Probabilistic Topic Models Expectation Maximization Algorithm.

Unit-3

Probabilistic Latent Semantic Analysis PLSA,Latent Dirichlet Allocation LDA,Text Clustering Motivation,Text Clustering Generative Probabilistic Models Text Clustering Similarity based Approaches,Text Clustering Evaluation .

Unit-4

Text Categorization,ext Categorization Methods.Text Categorization Generative Probabilistic Models,Opinion Mining, Sentiment Analysis and Sentiment Classification,Ordinal Logistic Regression ,Latent Aspect Rating Analysis

Unit-5

Introduction to Text Based Prediction ,Contextual Text Mining ,Contextual Text Mining Contextual Probabilistic Latent Semantic Analysis ,Contextual Text Mining Mining Topics with Social Network Context,Time Series Supervision

Text Books

- Aggarwal, C. C., & Zhai, C. (Eds.). (2012). Mining text data. SpringercScience & Business Media.

References

1. Text mining classification ,clustering and Applications by Ashok N. Srivastava, Mehran Sahami,ISBN:-9781420059458, 1420059459.
2. Text Analytics with Python, A practitioner's guide to natural language processing,second edition by Dipanjan sarkar.
3. NLTK Book: https://www.nltk.org/book/
4. Liu, B. (2012). Sentiment analysis and opinion mining. Synthesis lectures on human language technologies, 5(1), 1-167.

Video Reference link:

https://www.youtube.com/watch?v=Uqs0GewlMkQ&list=PLLssT5z_DsK8Xwnh_0bjN4KNT81bekvtt&index=2

Coursera link: https://in.coursera.org/learn/text-mining

Course Code	Course Title					Course Type
CS3235	Information Retrieval					PEC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	0	0	40	60	3

Course Objectives

- Demonstrate genesis and diversity of information retrieval situations for text and hyper media.
- Describe hands-on experience store, and retrieve information from www using semantic approaches.
- Demonstrate the usage of different data/file structures in building computational search engines.

Course Outcomes

1. Ability to apply IR principles to locate relevant information large collections of data
2. Ability to design different document clustering algorithms
3. Implement retrieval systems for web search tasks.
4. Design an Information Retrieval System for web search tasks.

Detailed Contents

UNIT-I

Definition of Information Retrieval System, Objectives of Information Retrieval Systems, Functional Overview, Relationship to Database Management Systems, Digital Libraries and Data Warehouses .**Information Retrieval System Capabilities:**Search Capabilities, Browse Capabilities, Miscellaneous Capabilities.

UNIT-II

Cataloging and Indexing: History and Objectives of Indexing, Indexing Process, Automatic Indexing, Information Extraction

Data Structure: Introduction to Data Structure, Stemming Algorithms, Inverted File Structure, N-Gram Data Structures, PAT Data Structure, Signature File Structure, Hypertext and XML Data Structures, Hidden Markov Models.

UNIT-II

Automatic Indexing: Classes of Automatic Indexing, Statistical Indexing, Natural Language, Concept Indexing, Hypertext Linkages.

Document and Term Clustering: Introduction to Clustering, Thesaurus Generation, Item Clustering, Hierarchy of Clusters.

UNIT-IV

User Search Techniques: Search Statements and Binding, Similarity Measures and Ranking, Relevance Feedback, Selective Dissemination of Information Search, Weighted Searches of Boolean Systems, Searching the INTERNET and Hypertext.

Information Visualization: Introduction to Information Visualization, Cognition and Perception, Information Visualization Technologies.

UNIT-V

Text Search Algorithms: Introduction to Text Search Techniques, Software Text Search Algorithms, Hardware Text Search Systems.

Multimedia Information Retrieval: Spoken Language Audio Retrieval, Non-Speech Audio Retrieval, Graph Retrieval, Imagery Retrieval, Video Retrieval.

Text Books

1. Information Storage and Retrieval Systems – Theory and Implementation, Second Edition, Gerald J. Kowalski, Mark T. Maybury, Springer.

References

2. Frakes, W.B., Ricardo Baeza-Yates: Information Retrieval Data Structures and Algorithms, Prentice Hall, 1992.
3. Information Storage & Retrieval By Robert Korfhage – John Wiley & Sons.
4. Modern Information Retrieval By Yates and Neto Pearson Education.

Course Code	Course Title					Course Type
CS4141	Quantum Computing					PEC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	0	0	40	60	3

Course Objectives

The objective of this course is to provide the students an introduction to quantum computation. Much of the background material related to the algebra of complex vector spaces and quantum mechanics is covered within the course. Learners would understand the mathematical representation of quantum bits(qubits)and the basic operations that can be performed on qubits via the quantum gates. The quantum algorithms are covered to explore the efficiency of computing using quantum principles. The course also throws light on the basic idea of the existing techniques of physically realizing quantum computers**.**

Course Outcomes

Students will be able to

1. Gain knowledge about the fundamentals of quantum computing and quantum information
2. Know the background math and physics related to quantum mechanics
3. Appreciate the efficiency and effectiveness of quantum algorithms
4. Get a notion of techniques used for physical realizations of Quantum Computers

Detailed Contents

UNIT-I

Introduction to Quantum Computation: Quantum bits, Bloch sphere representation of a qubit, multiple qubits.

UNIT-II

Background Mathematics and Physics: Hilbert space, Probabilities and measurements, entanglement, density matrix representation, basics of quantum mechanics, Measurements in bases other than computational basis.

UNIT-III

Quantum Circuits: single qubit gates, multiple qubit gates, design of quantum circuits. Quantum Information: Bell states, Quantum teleportation, super dense coding, no cloning theorem.

UNIT-IV

Quantum Algorithms: Classical computation on quantum computers, Deutsch's algorithm,

Deutsch's-Jozsa algorithm, Quantum Fourier Transforms, Shor's factorization algorithm, Grover's search algorithm.

UNIT-V

Physical Realization: Guiding Principles and Conditions for quantum computation, Harmonic oscillator, Quantum dots, Ion Traps, Optical photon, Cavity Quantum Electrodynamics, Nuclear magnetic resonance.

Text Books

- .Nielsen, M., & Chuang, I. (2010). *Quantum Computation and Quantum Information: 10th Anniversary Edition*. Cambridge: Cambridge University Press. doi:10.1017/CBO9780511976667

References

1. "Qiskit Textbook", Digital Book - https://qiskit.org/textbook/preface.html.
2. "Fundamentals of Natural Computing. Basic Concepts, Algorithms and Applications", Leandro Nunes de Castro, Chapman & Hall/CRC, Taylor and Francis Group

Course Code	Course Title					Course Type
CS4142	**Machine Learning For Healthcare**					PEC
Prerequisite	**Contact Hours per Week**			**Internal**	**External**	**Credits**
	L	**T**	**P**			
1. Machine Learning	3	0	0	40	60	3

Course Objectives

The main objective is

To understand fundamental concepts and principles of machine learning as it applies to medicine and healthcare.

To understand how machine learning can improve patient outcomes and produce medical insights that were previously unavailable. It provides a way to validate reasoning and decisions through predictive algorithms.

Course Outcomes

The student will learn

1. How machine learning methods can be used for risk stratification, understanding disease and its progression, and specific clinical applications to mammography, pathology, and cardiology
2. Understanding practical subtleties of machine learning from clinical data, such as physiological time-series, clinical text, and image data
3. How to implement and analyze models for supervised prediction, clinical NLP, interpretability analysis, and causal inference from clinical data.
4. Machine learning approaches, medical use cases, metrics unique to healthcare, as well as best practices for designing, building, and evaluating machine learning applications in healthcare.

Detailed Contents

UNIT-I

Overview of Clinical Care & Data Introduction: What Makes Healthcare Unique? Translating Technology Into the Clinic; Overview of Clinical Care; Deep Dive Into Clinical Data

UNIT-II

ML for Risk Stratification & Diagnosis Risk Stratification; Survival Modeling; Learning from Noisy Labels; Detecting and Mitigating Dataset Shift

UNIT-III

ML with clinical text, imaging, and physiological data Physiological Time-Series; Clinical Natural Language Processing; Application of Machine Learning to Cardiac Imaging; Machine Learning for Pathology; Machine Learning for Mammography

UNIT-IV

Causal Inference & Reinforcement Learning Causal Inference from Observational Data; Off-Policy Reinforcement Learning

UNIT-V

Understanding disease, its progression and Human Factors Disease Progression Modeling and Subtyping; Precision Medicine; Automating Clinical Workflows; Regulation of ML / AI in the US; Fairness and Interpretability

Text Books

- V. Kumar, Healthcare Analytics Made Simple, 1st ed. New York, NY, USA: Apress, 2018.
- K. Ashley, Applied Machine Learning for Health and Fitness: A Practical Guide to Machine Learning with Deep Vision, Sensors, and IoT, 1st ed. Berkeley, CA, USA: Apress, 2020

References

1. Bikesh Kumar Singh, G.R. Sinha, Machine Learning in Healthcare, Fundamentals and Recent Applications,
2. Arjun Panesar, Machine Learning and AI for Healthcare
3. Coursera Link: https://in.coursera.org/learn/evaluations-ai-applications-healthcare

Course Code	Course Title					Course Type
CS4142	**Machine Learning For Finance**					PEC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
1. Machine Learning	3	0	0	40	60	3

Course Objectives

- To use Artificial Intelligence and Machine Learning in Finance.
- To learn different AI/ML methods
- To know applications of AI/ML in finance together with respective datasets and programming code
- To have knowledge of topics related to the use of AI/ML in finance (Regularization, Symmetric Risk, etc.)

Course Outcomes

The student will learn

1. Compare ML for Finance with ML in Technology (image and speech recognition, robotics, etc.)
2. Linear regression and classification models and methods of their evaluation in finance
3. Explain how Reinforcement Learning is used for stock trading
4. Popular approaches to modeling market frictions and feedback effects for option trading.

Detailed Contents

UNIT-I

Overview Introduction: What is Machine Learning in finance?; Data Preprocessing of German Credit Data and Data Generation

UNIT-II

Regression Algorithms on Finance Data Regression; Simple Regression, Multiple Linear Regression; Penalized Regression; Applications of Regression

UNIT-III

Classification Algorithms on Finance data Bayes & KNN Classifier; Maxima Margin Classifier; Support Vector Machines; Applications of Support Vector Machines

UNIT-IV

Decision Trees Introduction; Applications of Classification Trees; Boosted Classification Trees; Regression Trees

UNIT-V

Neural Networks Fitting Neural Networks for finance data; Applying Convolutional Neural Networks; Perceptron, Multi Layer Perceptrons, Step Functions in finance area
Text Books ● James G, Written D, Hastie T, Tibshirani R, An Introduction to Statistical Learning, 2nd Edition, 2021, Springer US. ● Hastie T, Tibshirani R, Friedman J, The Elements of Statistical Learning, 2nd Edition, 2009, Springer US. ● Hull J. C., Machine Learning in Business, 2nd Edition, 2019. ● Lopez de Prado M, Advances in Financial Machine Learning, 1st Edition 2018, Wiley.
References 1. Goodfellow I, Bengio Y, Courville A, Deep Learning, 1st Edition, 2016, MIT Press. 2. Matthew F. Dixon, Igor Halperin, Paul Bilokon, Machine Learning in Finance From Theory to Practice. 3. Coursera Course link: https://www.coursera.org/learn/fundamentals-machine-learning-in-finance?specialization=machine-learning-reinforcement-finance

Course Code	Course Title					Course Type
CS4143	Deep Learning					PEC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	0	0	40	60	3

Course Objectives

- To build the foundation of deep learning.
- To understand how to build the neural network.
- To enable the students to develop successful machine learning concepts.

Course Outcomes

1. Upon the Successful Completion of the Course, the Students would be able to:
2. Learn the fundamental principles of deep learning.
3. Identify the deep learning algorithms for various types of learning tasks in various domains.
4. Implement deep learning algorithms and solve real-world problems.

Detailed Contents

UNIT-I

Introduction: Feed forward Neural networks, Gradient descent and the back propagation algorithm,Unit saturation, the vanishing gradient problem, and ways to mitigate it. RelU Heuristics for avoiding bad local minima, Heuristics for faster training, Nestors accelerated gradient descent, Regularization,Dropout.

UNIT-II

Convolutional Neural Networks: Architectures, convolution / pooling layers, Recurrent NeuralNetworks: LSTM, GRU, Encoder Decoder architectures. Deep Unsupervised Learning: Autoencoders, Variational Auto-encoders, Adversarial Generative Networks, Auto-encoder and DBM Attention and memory models, Dynamic Memory Models.

UNIT-III

Applications of Deep Learning to Computer Vision: Image segmentation, object detection,automatic image captioning, Image generation with Generative adversarial networks, video to text with LSTM models, Attention models for computer vision tasks.

UNIT-IV

Applications of Deep Learning to NLP: Introduction to NLP and Vector Space Model of Semantics,Word Vector Representations: Continuous Skip-Gram Model, Continuous Bag-of-Words model(CBOW), Glove, Evaluations and Applications in word similarity.

UNIT-V

Analogy reasoning: Named Entity Recognition, Opinion Mining using Recurrent Neural

Networks:Parsing and Sentiment Analysis using Recursive Neural Networks: Sentence Classification using Convolutional Neural Networks, Dialogue Generation with LSTMs.
Text Books ● Goodfellow, Ian, Yoshua Bengio, and Aaron Courville. Deep Learning. MIT Press, 2016.
References 1. Hastie, Trevor, Robert Tibshirani, and Jerome Friedman. The Elements of Statistical Learning. Springer, 2009. 2. Koller, Daphne, and Nir Friedman. Probabilistic Graphical Models: Principles and Techniques. MIT Press, 2009.

Course Code	Course Title					Course Type
CS4145	Theory of Computation					PEC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	0	0	40	60	3

Course Objectives

- Introduce formal language theory and automata theory
- Cover regular languages and finite automata, and their operations
- Discuss context-free languages, grammars, and pushdown automata
- Explore Turing machines, Church-Turing thesis, and decidability
- Understand time complexity, P vs NP problem, and NP-completeness.

Course Outcome

1. Able to understand the concept of abstract machines and their power to recognize the languages.
2. Able to employ finite state machines for modeling and solving computing problems.
3. Able to design context free grammars for formal languages.
4. Able to distinguish between decidability and undecidability.
5. Able to gain proficiency with mathematical tools and formal methods.

Detailed Content

UNIT – I:

Regular Languages –Finite Automata, Formal definition of finite automaton, Examples of finite automata, Formal definition of computation, Designing finite automata, The regular operations, Non determinism, formal definition of nondeterministic finite automaton, equivalence of NFAs and DFAs, closure under the regular operations, Regular Expressions, formal definition of a regular expression, equivalence with finite automata, Nonregular languages, The pumping lemma for regular languages.

UNIT – II

Context-Free languages, Context-free grammars, formal definition of a Context-free grammar, Examples of context-free grammars, Designing context-free grammars, Ambiguity, Chomsky normal form, Pushdown Automata, Examples of pushdown Automata, Equivalence with context-free grammars, Non-context-free languages, The pumping lemma for context-free languages.

UNIT – III

The Church-Turing Thesis – Turing machines, Formal definition of turing machine, Examples of turing machines, Variants of turing machines, Multitape turing machines, Nondeterministic turing machine, Enumerators, Equivalence with other models, The definition of algorithm, Hilbert's problem Terminology of describing turing machines.

UNIT – IV

Decidability –Decidable languages, Decidable problems concerning regular languages, Decidable

problems concerning context-free languages, The halting problem, The diagonalization method, The halting method is undecidable, A turing –unrecognizable language, Reducibility – Undecidable problems for language theory, Reductions via computations histories, A simple undecidable problem, Mapping reducibility, computable functions, Formal definition of mapping reducibility.

UNIT – V

Time Complexity –Measuring complexity, Big – O and small-o notation, Analyzing algorithms, Complexity relationships among models, The class P, Polynomial time, examples of problems in P, The class NP, Examples of problems in NP, The P versus NP question, NP-Completeness, polynomial time reducibility, Definition of NP-Completeness, The Cook-Levin Theorem, Additional NP Complete problems, The vertex cover problem, The Hamiltonian path problem, The subset sum problem.

Text Books

- Introduction to the theory of computation, Micheal Sipser, Third Edition, Cengage Learning.

References

1. Introduction to Languages and The Theory of Computation, John C Martin, TMH.
2. Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley.
3. A Text book on Automata Theory, P. K. Srimani, Nasir S. F. B, Cambridge University Press.
4. Introduction to Formal languages Automata Theory and Computation Kamala Krithivasan, Rama R, Pearson.
5. Theory of Computer Science – Automata languages and computation, Mishra and Chandrashekaran, 2nd edition, PHI.

<table>
<tr><th>Course Code</th><th colspan="5">Course Title</th><th>Course Type</th></tr>
<tr><td>CS4151</td><td colspan="5">Introduction to Blockchain Technologies</td><td>PEC</td></tr>
<tr><td rowspan="2">Prerequisite</td><td colspan="3">Contact Hours per Week</td><td rowspan="2">Internal</td><td rowspan="2">External</td><td rowspan="2">Credits</td></tr>
<tr><td>L</td><td>T</td><td>P</td></tr>
<tr><td></td><td>3</td><td>0</td><td>0</td><td>40</td><td>60</td><td>3</td></tr>
<tr><td colspan="7">Course Objectives</td></tr>
<tr><td colspan="7">Course Outcomes
1.</td></tr>
<tr><td colspan="7">Detailed Contents
UNIT II:
Bitcoin – Creation of bitcoins, Transactions, Address generation, Use of public and private keys in bitcoin. Introduction to FORTH language, Bitcoin Script- Understanding of operators and execution of script using stack, Transaction validation using bitcoin script.Bitcoin peer-to-peer network- Joining procedure, Relaying transactions, Relaying blocks.UNIT III: Consensus in Bitcoin- Introduction, Proof of work, Proof of stake, Proof of elapsedtime, Proof of burn, Monopoly in bitcoin, Attacks- Double spending attack, Sybil attack,Denial of service attack, Bitcoin mining, Difficulty of mining, Permissioned blockchain –Definition, smart contracts- Distributed state machine replication (crowd funding example) Consensus algorithms : RAFT consensus, Network faults, Byzantine general problem, Practical byzantine fault tolerance systems.Unit IV: Blockchains for enterprises (Hyperledger fabric)– Introduction, Actors and components in blockchain, System architecture, Transaction flow, ordering services, Channels, Single channel and multi channel networks, Hyperledger fabric network setup, Usecases- Blockchain in financial services, Identity management and other sectors. Unit V: Introduction to Docker, Docker compose, Node.js, Git client, Creating a network using Hyperledger fabric- Executing first network(github), Ethereum-Introduction, Network types, gas, Tools for ethereum application development, Introduction to solidity programming, challenges of blockchain technology-scalability, Interoperability, standardizations, Energy intensive, Regulations</td></tr>
<tr><td colspan="7">Text Books</td></tr>
<tr><td colspan="7">References</td></tr>
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Course Code	Course Title					Course Type
CS4152	Robotics Process Automation					PEC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	0	0	40	60	3

Course Objectives

- Students will be able to Classify by coordinate system and control system.
- Acquire Knowledge on Different types of Power Sources and Sensors.
- Classification of Manipulators, Actuators and Grippers.
- Acquire Knowledge on kinematics and Applications of different Robots.

Course Outcomes

1. Acquire knowledge on different types of Power Sources (actuators) and Sensors, Classification Of Manipulators, Actuators and Grippers.
2. Acquire knowledge on different applications of various types of robots.
3. Analyze the direct and the inverse kinematic problems and calculate the manipulator dynamics.
4. Able to identify the applications of robots in different process operations.

Detailed Contents

UNIT-I: Basic Concepts & Power Sources Fundamentals:
An overview of Robotics, classification of Robots, Robot Components, Robot degrees of freedom, Robot Joints, Robot Coordinates, Robot reference frames, Programming modes, Robot Characteristics.
Actuators: Characteristics of activating system, comparison of activating system Hydraulic devices, Pneumatic devices, electric motors, magnetostrictive actuators.

UNIT-II: Sensors, Manipulators and Grippers
Sensors: Sensors characteristics, Position sensors, velocity sensors, acceleration sensors, torque sensors, micro switches, lighten infrared sensors, touch and tactile sensors, proximity sensors, range finders.
Grippers: Robot end effectors, Classification, drive system for Gripper, Mechanical Grippers, Magnetic Grippers, Vacuum Grippers, Adhesive Grippers, Hooks, Scoops and other Miscellaneous Devices, Gripper force Analysis and Gripper Design, Active and passive Grippers.

UNIT-III: Kinematics
Matrix representation of translational and Rotational motion – Homogeneous Transformation- DH representation of standard configuration Robots- Inverse Kinematics. Joint space vs. Cartesian space-Basics of Trajectory planning in joint and Cartesian space.

UNIT-IV: Low level and high-level vision
Image acquisition, Illumination Techniques, Imaging Geometry, Some Basic Relationships between

Pixels, Segmentation, Description, Segmentation and Description of 3-D Structures, Recognition, Interpretation.

UNIT-V: Robot Applications

Material Transfer and Machine loading/unloading: General Considerations in Robot Material Handling, Material Transfer application, Machine loading and unloading. Liquid handling and pumping.

Processing operations: Spot welding, Continuous Arc Welding, Spray Coating, other processing operations using Robots.

Assembly and Inspection: Assembly and Robot Assembly automation, Parts Presentation methods,Assembly operations, compliance and the Remote Center Compliance (RCC) Device, Assembly system configuration, Adaptable-Programmable assembly system, Designing for Robotic Assembly, Inspection Automation.

Text Books

- Mikell. P, Weiss.G. M, Nage. l R. N and Odraj .N.G, ‖Industrial Robotics", McGraw Hill Singapore, 1996.
- Ghosh, ‖Control in Robotics and Automation: Sensor Based Integration", Allied Publishers, Chennai, 1998.
- R18 B.Tech. EIE Syllabus JNTU HYDERABAD 65.

References

1. Deb. S.R, ‖Robotics technology and flexible Automation", John Wiley, USA 1992.
2. Asfahl. C.R, ―Robots and manufacturing Automation", John Wiley, USA 1992.
3. Klafter. R. D, Chimielewski. T. A, Negin. M, ―Robotic Engineering – An integrated approach",
4. Prentice Hall of India, New Delhi, 1994.

Course Code	Course Title					Course Type
CS4153	Mobile Application Development					PEC
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	0	0	40	60	3

Course Objectives

- To demonstrate their understanding of the fundamentals of Android operating systems
- To improves their skills of using Android software development tools
- To demonstrate their ability to develop software with reasonable complexity on mobile platform
- To demonstrate their ability to deploy software to mobile devices
- To demonstrate their ability to debug programs running on mobile devices

Course Outcomes

1. Students understand the working of Android OS Practically.
2. Student will be able to develop Android user interfaces
3. Students will be able to develop, deploy and maintain the Android Applications.

Detailed Contents

UNIT-I

Introduction to Android The Android 4.1 Jelly Bean SDK, Understanding the Android Software Stack, Installing the Android SDK, Creating Android Virtual Devices, Creating the First Android Project. Using the Text View Control, Using the Android Emulator, The Android Debug Bridge (ADB), Launching Android Applications on a Handset

.

UNIT-II

Basic Widgets Understanding the Role of Android Application Components, Understanding the Utility of Android API, Overview of the Android Project Files, Understanding Activities, Role of the Android Manifest File, Creating the User Interface, Commonly Used Layouts and Controls, Event Handling, Displaying Messages Through Toast, Creating and Starting an Activity Using the Edit Text Control, Choosing Options with Checkbox, Choosing Mutually Exclusive Items Using Radio Buttons.

UNIT-II

Building Blocks for Android Application Design Introduction to Layouts, Linear Layout, Relative Layout, Absolute Layout, Using Image View, Frame Layout, Table Layout, Grid Layout, Adapting to Screen Orientation. Utilizing Resources and Media Resources, Creating Values Resources, Using Drawable Resources, Switching States with Toggle Buttons, Creating an Images Switcher Application, Scrolling Through Scroll View, Playing Audio, Playing Video, Displaying Progress with Progress Bar, Using Assets.

UNIT-IV

Using Selection Widgets and Debugging Using List View, Using the Spinner Control, Using the GridView Control, Creating an Image Gallery Using the ViewPager Control, Using the Debugging Tool: Dalvik Debug Monitor Service (DDMS), Debugging Application, Using the Debug Perspective. Displaying and Fetching Information Using Dialogs and Fragments What Are Dialogs?, Selecting the Date and Time in One Application, Fragments, Creating Fragments with java Code, Creating Special Fragments.

UNIT-V

Building Menus and Storing Data Creating Interactive Menus and Action Bars, Menus and their Types, Creating Menus Through XML, Creating Menus Through Coding, Applying a Context Menu to a List View, Using the ActionBar, Replacing a Menu with the ActionBar, Creating a Tabbed ActionBar, Creating a Drop-Down List ActionBar. Using Databases Using the SQLiteOpenHelperclass, Accessing Databases with the ADB, Creating a Data Entry Form. Communicating with SMS and Emails Understanding Broadcast Receivers, Using the Notification System, Sending SMS Messages with Java Code, Receiving SMS Messages, Sending Email, Working with Telephony Manager.

Text Books

- O'Reilly Media, "Mobile App Development with React Native," Sebastopol, CA, USA: O'Reilly Media, Inc., 2019.

References

1. "Android Programming: The Big Nerd Ranch Guide" by Bill Phillips and Brian Hardy
2. "Learning Mobile App Development: A Hands-on Guide to Building Apps with iOS and Android" by Jakob Iversen and Michael Eierman
3. "Swift Programming: The Big Nerd Ranch Guide" by Matthew Mathias and John Gallagher

CS4155	Cyber Forensics					
Prerequisite	Contact Hours per Week			Internal	External	Credits
	L	T	P			
	3	0	0	40	60	3

Course Objectives

- To learn computer forensics
- To become familiar with forensics tools
- To learn to analyze and validate forensics data

Course Outcomes

1. Understand the basics of computer forensics
2. Apply a number of different computer forensic tools to a given scenario
3. Analyze and validate forensics data
4. Identify the vulnerabilities in a given network infrastructure
5. Implement real-world hacking techniques to test system security

Detailed Contents

UNIT I

INTRODUCTION TO COMPUTER FORENSICS

Introduction to Traditional Computer Crime, Traditional problems associated with Computer Crime. Introduction to Identity Theft & Identity Fraud. Types of CF techniques - Incident and incident response methodology - Forensic duplication and investigation. Preparation for IR: Creating response tool kit and IR team. - Forensics Technology and Systems - Understanding Computer Investigation – Data Acquisition.

UNIT II

EVIDENCE COLLECTION AND FORENSICS TOOLS

Processing Crime and Incident Scenes – Working with Windows and DOS Systems. Current Computer Forensics Tools: Software/ Hardware Tools.

UNIT III

ANALYSIS AND VALIDATION

Validating Forensics Data – Data Hiding Techniques – Performing Remote Acquisition – Network Forensics – Email Investigations – Cell Phone and Mobile Devices Forensics

UNIT IV

ETHICAL HACKING

Introduction to Ethical Hacking - Footprinting and Reconnaissance - Scanning Networks - Enumeration - System Hacking - Malware Threats - Sniffing

UNIT V

ETHICAL HACKING IN WEB

Social Engineering - Denial of Service - Session Hijacking - Hacking Web servers - Hacking Web

Applications – SQL Injection - Hacking Wireless Networks - Hacking Mobile Platforms.
Text Books ● Bill Nelson, Amelia Phillips, Frank Enfinger, Christopher Steuart, ―Computer Forensics and Investigations‖, Cengage Learning, India Edition, 2016. ● CEH official Certfied Ethical Hacking Review Guide, Wiley India Edition, 2015.
References 1. John R.Vacca, ―Computer Forensics‖, Cengage Learning, 2005 2. MarjieT.Britz, ―Computer Forensics and Cyber Crime‖: An Introduction‖, 3rd Edition, Prentice Hall, 2013. 3. AnkitFadia ― Ethical Hacking‖ Second Edition, Macmillan India Ltd, 2006 4. Kenneth C.Brancik ―Insider Computer Fraud‖ Auerbach Publications Taylor & Francis Group– 2008.

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