

B.Tech. – R21 COURSE STRUCTURE
(Applicable from the batch admitted during 2021-22 and onwards)

Department of Computer Science & Engineering

I-Year I-Semester						
S. No.	Subject Code	Subject	Hours Per Week			Credits
			L	T	P	
1	21MA101BS	Linear Algebra and Calculus	3	1	0	4
2	21CH101BS	Chemistry	3	1	0	4
3	21EE101ES	Basic Electrical Engineering	3	0	0	3
4	21ME102ES	Engineering Workshop	1	0	3	2.5
5	21EN101HS	English	2	0	0	2
6	21CH102BS	Engineering Chemistry Lab	0	0	3	1.5
7	21EN102HS	English Language and Communication Skills Lab	0	0	2	1
8	21EE102ES	Basic Electrical Engineering Lab	0	0	2	1
TOTAL			12	2	10	19

I-Year II-Semester						
S. No.	Subject Code	Subject	Hours Per Week			Credits
			L	T	P	
1	21MA202BS	Advanced Calculus	3	1	0	4
2	21PH201BS	Applied Physics	3	1	0	4
3	21CS201ES	Programming for Problem Solving	3	1	0	4
4	21ME203ES	Engineering Graphics	1	0	4	4
5	21PH202BS	Applied Physics Lab	0	0	3	1.5
6	21CS202ES	Programming for Problem Solving Lab	0	0	3	1.5
TOTAL			10	3	10	19
Mandatory Course (Non-Credit)						
7	21MC201ES	Environmental Science	2	0	0	0

II-Year I-Semester						
S. No.	Subject Code	Subject	Hours Per Week			Credits
			L	T	P	
1	21CS340PC	Discrete Mathematics	3	0	0	3
2	21CS320PC	Python Programming	3	0	0	3
3	21EC310ES	Analog and Digital Electronics	3	0	0	3
4	21CS305PC	Database Management Systems	3	0	0	3
5	21CS303PC	Data structures	3	0	0	3
6	21EC311ES	Analog and Digital Electronics Lab	0	0	2	1
7	21CS306PC	Database Management Systems Lab	0	0	3	1.5
8	21CS304PC	Data structures Lab	0	0	2	1
9	21CS321PC	Python Programming Lab	0	0	2	1
10	21MA308BS	Aptitude and Critical Thinking Skills Practice	0	0	3	1.5
TOTAL			15	00	12	21
Mandatory Course (Non-Credit)						
11	21MC303	Constitution of India	0	0	2	0

II-Year II-Semester						
S. No.	Subject Code	Subject	Hours Per			Credits
			L	T	P	
1	21CS437PC	Data Warehouse & Data Mining	3	0	0	3
2	21CS411PC	Computer Organization and Architecture	3	0	0	3
3	21CS413PC	Object Oriented Programming Through Java	3	0	0	3
4	21CS431PC	Design and Analysis of Algorithm	3	0	0	3
5	21CS417PC	Operating Systems	3	0	0	3
6	21CS414PC	Object Oriented Programming Through Java Lab	0	0	3	1.5
7	21CS412PC	IT Workshop Lab	0	0	3	1.5
8	21CS418PC	Operating Systems Lab	0	0	3	1.5
9	21HS401	Social Innovation in Practice	0	0	3	1.5
TOTAL			15	0	12	21
Mandatory Course (Non-Credit)						
10	21MC402	Gender Sensitization Lab	0	0	2	0

III-Year I-Semester

S. No.	Subject Code	Subject	Hours Per Week			Credits
			L	T	P	
1	21CS507PC	Software Engineering & Object Oriented Analysis and Design	3	0	0	3
2	21CS524PC	Formal Languages and Automata Theory	3	0	0	3
3	21CS515PC	Computer Networks	3	0	0	3
4	21CS529PC	Web Technologies	3	0	0	3
5		Professional Elective – I	3	0	0	3
6	21CS527PC	Linux Programming Lab	0	0	2	1
7	21CS516PC	Computer Networks Lab	0	0	2	1
8	21CS530PC	Web Technologies Lab	0	0	3	1.5
9	21CS508PC	Software Engineering & Object Oriented Analysis and Design Lab	0	0	3	1.5
10	21CS5174PR	Summer Internship - I	0	0	0	1
TOTAL			15	0	10	21
Mandatory Course (Non-Credit)						
11	*21MC505	Environmental Science	3	0	0	0
12	21MC507	Artificial Intelligence	3	0	0	0

III-Year II-Semester

S. No.	Subject Code	Subject	Hours Per Week			Credits
			L	T	P	
1	21CS625PC	Information Security	3	0	0	3
2	21CS633PC	Machine Learning	3	0	0	3
3	21CS635PC	Compiler Design	3	0	0	3
4		Professional Elective – II	3	0	0	3
5		Open Elective – I	3	0	0	3
6	21CS626PC	Information Security Lab	0	0	3	1.5
7	21CS634PC	Machine Learning Lab	0	0	3	1.5
8	21CS636PC	Compiler Design Lab	0	0	3	1.5
9	21EN603HS	Advanced English Communication Skills Lab	0	0	3	1.5
TOTAL			15	0	12	21
Mandatory Course (Non-Credit)						
10	21MC604	Intellectual Property Rights	3	0	0	0
11	21MC606	Cyber Security	3	0	0	0

IV-Year I-Semester

S. No.	Subject Code	Subject	Hours Per Week			Credits
			L	T	P	
1	21SM701MS	Business Economics And Financial Analysis	3	0	0	3
2	21CS738PC	Data analytics using R	3	0	0	3
3		Professional Elective-III	3	0	0	3
4		Professional Elective-IV	3	0	0	3
5		Open Elective-II	3	0	0	3
6	21CS739PC	Data Analytics using R Lab	0	0	2	1
7	21CS7175PR	Summer Internship – II	0	0	0	1
8	21CS7176PR	Project Stage– I	0	0	8	4
TOTAL			15	0	10	21

IV-Year II-Semester

S. No.	Subject Code	Subject	Hours Per Week			Credits
			L	T	P	
1		Professional Elective-V	3	0	0	3
2		Professional Elective-VI	3	0	0	3
3		Open Elective-III	3	0	0	3
4	21CS8177PR	Project Stage-II	0	0	16	8
TOTAL			9	0	16	17

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List of Subjects

Sl.No	Name of The Subject
1	Programming for Problem Solving
2	Programming for Problem Solving Lab
3	Data Structure
4	Data Structure Lab
5	Database Management Systems
6	Database Management Systems Lab
7	Software Engineering & Object Oriented Analysis and Design
8	Software Engineering & Object Oriented Analysis and Design Lab
9	Software Engineering
10	Software Engineering Lab
11	Computer Organization and Architecture
12	IT Workshop Lab
13	Object Oriented Programming Through Java
14	Object Oriented Programming Through Java Lab
15	Computer Networks
16	Computer Networks Lab
17	Operating Systems
18	Operating Systems Lab
19	Natural Language Processing
20	Python Programming
21	Python Programming Lab
22	Software Testing Methodologies
23	Software Testing Methodologies Lab
24	Formal Languages and Automata Theory
25	Information Security
26	Information Security Lab
27	Linux Programming Lab
28	Fundamentals Of IoT
29	Web Technologies
30	Web Technologies Lab
31	Design and Analysis of Algorithm
32	Design and Analysis of Algorithm Lab
33	Machine Learning
34	Machine Learning Lab
35	Compiler Design
36	Compiler Design Lab
37	Data Warehouse & Data Mining
38	Data Analytics using R
39	Data Analytics using R Lab
40	Discrete Mathematics
41	Scripting Languages Lab
42	Software Requirements & Estimation
43	Agile Software Development
44	Automata Theory and Compiler Design
45	Software Architecture and Design Patterns
46	Computer Vision and Robotics
47	Programming Languages for IoT
48	IoT lab

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49	Computer Vision Lab
50	IoT Security & Cloud Computing
51	IoT Security & Cloud Computing Lab
52	Object Oriented Analysis and Design Lab
53	DevOps
54	DevOps Lab
55	Artificial Intelligence and Natural Language Processing Lab
56	Neural Networks & Deep Learning
57	Reinforcement Learning
58	Deep Learning Lab
59	Introduction to Data Science
60	Big Data Analytics
61	Big Data Analytics Lab
62	Predictive Analytics
63	Web and Social Media Analytics
174	Summer Internship – I
175	Summer Internship – II
176	Project Stage– I
177	Project Stage– II

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List of Professional Electives for CSE

Subject code	Professional Elective	Subject name
21CS564PE	Professional Elective – I	Advanced Algorithms
21CS565PE		Multimedia and Interaction Design
21CS566PE		Computer Forensics
21CS567PE		Digital marketing
21CS668PE	Professional Elective – II	Information Retrieval Systems
21CS669PE		Block chain Technology
21CS670PE		Scripting Languages
21CS671PE		Software Process & Project Management
21CS772PE	Professional Elective – III	Natural Language Processing
21CS773PE		Business Intelligence
21CS774PE		Mobile and Wireless Security
21CS775PE		Cloud Computing
21CS776PE	Cyber Forensics	
21CS777PE	Professional Elective – IV	Principles of Programming Languages
21CS778PE		Data Visualization Techniques
21CS779PE		Cloud Security
21CS780PE		Smart Sensors and Networking
21CS781PE		Social Networks
21CS882PE	Professional Elective –V	Artificial Neural Systems
21CS883PE		Social Media Analytics
21CS884PE		IT Audit Control and Security
21CS885PE		Design Patterns
21CS886PE	Cyber Laws	
21CS887PE	Professional Elective –VI	Real Time Systems
21CS888PE		Data Science
21CS889PE		Distributed System
21CS890PE		Human Computer Interface
21CS891PE		Computer Ethics

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21MA101BS: LINEAR ALGEBRA AND CALCULUS

B.Tech. I Year I Sem.

L	T	P	C
3	1	0	4

Course Objectives: To learn

- Types of matrices and their properties.
- Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
- Concept of Eigen values and eigenvectors and to reduce the quadratic form to canonical form
- Concept of Sequence.
- Concept of nature of the series.
- Geometrical approach to the mean value theorems and their application to the mathematical problems
- Evaluation of surface areas and volumes of revolutions of curves.
- Evaluation of improper integrals using Beta and Gamma functions.
- Partial differentiation, concept of total derivative
- Finding maxima and minima of function of two and three variables.

Course Outcomes: After learning the contents of this paper the student must be able to

- Write the matrix representation of a set of linear equations and to analyse the solution of the system of equations
- Find the Eigen values and Eigen vectors
- Reduce the quadratic form to canonical form using orthogonal transformations.
- Analyse the nature of sequence and series.
- Solve the applications on the mean value theorems.
- Evaluate the improper integrals using Beta and Gamma functions
- Find the extreme values of functions of two variables with/ without constraints.

UNIT-I: Matrices

Matrices: Types of Matrices, Symmetric; Hermitian; Skew-symmetric; Skew-Hermitian; orthogonal matrices; Unitary Matrices; rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method; System of linear equations; solving system of Homogeneous and Non-Homogeneous equations. Gauss elimination method; Gauss Seidel Iteration Method.

UNIT-II: Eigen values and Eigen vectors

Linear Transformation and Orthogonal Transformation: Eigen values and Eigenvectors and their properties: Diagonalization 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; Reduction of Quadratic form to canonical forms by Orthogonal Transformation

UNIT-III: Sequences & Series

Sequence: Definition of a Sequence, limit; Convergent, Divergent and Oscillatory sequences.

Series: 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 Conditionally Convergence.

UNIT-IV: Calculus

Mean value theorems: Rolle's theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem. Taylor's Series.

Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (Only in Cartesian coordinates), Definition of Improper Integral: Beta and Gamma functions and their applications.

UNIT-V: Multivariable calculus (Partial Differentiation and applications)

Definitions of Limit and continuity.

Partial Differentiation; Euler's Theorem; Total derivative; Jacobian; Functional dependence & independence, Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.

TEXTBOOKS:

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1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.

REFERENCES:

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.

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21CH101BS: CHEMISTRY

B.Tech. I Year I Sem.

**L T P C
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Course Objectives:

- To bring adaptability to the concepts of chemistry and to acquire the required skills to become a perfect engineer.
- To impart the basic knowledge of atomic, molecular and electronic modifications which make the student to understand the technology based on them.
- To acquire the knowledge of electrochemistry, corrosion and water treatment which are essential for the Engineers and in industry.
- To acquire the skills pertaining to spectroscopy and to apply them for medical and other fields.
- To impart the knowledge of stereochemistry and synthetic aspects useful for understanding reaction pathways

Course Outcomes: The basic concepts included in this course will help the student to gain:

- The knowledge of atomic, molecular and electronic changes, band theory related to conductivity.
- The required principles and concepts of electrochemistry, corrosion and in understanding the problem of water and its treatments.
- The required skills to get clear concepts on basic spectroscopy and application to medical and other fields.
- The knowledge of configurational and conformational analysis of molecules and reaction mechanisms.

UNIT - I:

Molecular structure and Theories of Bonding: Atomic and Molecular orbitals. Linear Combination of Atomic Orbitals (LCAO), molecular orbitals of diatomic molecules, molecular orbital energy level diagrams of N₂, O₂ and F₂ molecules. π molecular orbitals of butadiene and benzene.

Crystal Field Theory (CFT): Salient Features of CFT – Crystal Field Splitting of transition metal ion d- orbitals in Tetrahedral, Octahedral and square planar geometries. Band structure of solids and effect of doping on conductance.

UNIT - II:

Water and its treatment: Introduction – hardness of water – Causes of hardness - Types of hardness: temporary and permanent – expression and units of hardness – Estimation of hardness of water by complexometric method. Potable water and its specifications. Steps involved in treatment of water – Disinfection of water by chlorination and ozonation. Boiler feed water and its treatment – Calgon conditioning, Phosphate conditioning and Colloidal conditioning. External treatment of water – Ion exchange process. Desalination of water – Reverse osmosis. Numerical problems.

UNIT - III:

Electrochemistry and corrosion: Electro chemical cells – electrode potential, standard electrode potential, types of electrodes – calomel, Quinhydrone and glass electrode. Nernst equation Determination of pH of a solution by using quinhydrone and glass electrode. Electrochemical series and its applications. Numerical problems. Potentiometric titrations. Batteries – Primary (Lithium cell) and secondary batteries (Lead – acid storage battery and Lithium ion battery).

Causes and effects of corrosion – theories of chemical and electrochemical corrosion – mechanism of electrochemical corrosion, Types of corrosion: Galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection – Sacrificial anode and impressed current cathodic methods. Surface coatings – metallic coatings – methods of application. Electroless plating of Nickel.

UNIT - IV:

Stereochemistry, Reaction Mechanism and synthesis of drug molecules: Introduction to representation of 3-dimensional structures, Structural and stereoisomers, configurations, symmetry and chirality. Enantiomers, diastereomers, optical activity and Absolute configuration. Conformation analysis of n-butane.

Substitution reactions: Nucleophilic substitution reactions: Mechanism of S_N1, S_N2 reactions. Electrophilic and nucleophilic addition reactions: Addition of HBr to propene. Markownikoff and anti Markownikoff's additions. Grignard additions on carbonyl compounds. Elimination reactions: Dehydro halogenation of alkylhalides. Saytzeff rule. Oxidation reactions: Oxidation of alcohols using KMnO₄ and chromic acid.

Reduction reactions: reduction of carbonyl compounds using LiAlH₄ & NaBH₄. Hydroboration of olefins. Structure, synthesis and pharmaceutical applications of Paracetamol and Aspirin.

UNIT - V:

Spectroscopic techniques and applications: Principles of spectroscopy, selection rules and applications of electronic spectroscopy. vibrational and rotational spectroscopy. Basic concepts of Nuclear magnetic resonance Spectroscopy, chemical shift. Introduction to Magnetic resonance imaging.

TEXT BOOKS:

1. Physical Chemistry, by P.W. Atkins
2. Engineering Chemistry by P.C.Jain & M.Jain; Dhanpat Rai Publishing Company (P) Ltd., NewDelhi.
3. Fundamentals of Molecular Spectroscopy, by C.N. Banwell
4. Organic Chemistry: Structure and Function by K.P.C. Volhardt and N.E.Schore, 5th Edition.
5. University Chemistry, by B.M. Mahan, Pearson IV Edition.
6. Engineering Chemistry (NPTEL Web-book), by B.L. Tembe, Kamaluddin and M.S. Krishnan

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21EE101ES: BASIC ELECTRICAL ENGINEERING

B.Tech. I Year I Sem.

L	T	P	C
3	0	0	3

Course Objectives:

- To introduce the concepts of electrical circuits and its components
- To understand magnetic circuits, DC circuits and AC single phase & three phase circuits
- To study and understand the different types of DC/AC machines and Transformers.
- To impart the knowledge of various electrical installations.
- To introduce the concept of power, power factor and its improvement.

Course Outcomes:

- To analyze and solve electrical circuits using network laws and theorems.
- To understand and analyze basic Electric and Magnetic circuits
- To study the working principles of Electrical Machines
- To introduce components of Low Voltage Electrical Installations

UNIT-I: D.C. Circuits

Electrical circuit elements (R, L and C), voltage and current sources, KVL&KCL, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems.

Time-domain analysis of first-order RL and RC circuits.

UNIT-II: A.C. Circuits

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance in series R-L-C circuit.

Three-phase balanced circuits, voltage and current relations in star and delta connections.

UNIT-III: Transformers

Ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

UNIT-IV: Electrical Machines

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor.

Construction and working of synchronous generators.

UNIT-V: Electrical Installations

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

TEXT BOOKS/ REFERENCE BOOKS:

1. Basic Electrical Engineering - D.P. Kothari and I.J. Nagrath, 3rd edition 2010, Tata McGrawHill.
2. D.C. Kulshreshtha, -Basic Electrical Engineering, McGraw Hill, 2009.
3. L.S. Bobrow, Fundamentals of Electrical Engineering, Oxford University Press, 2011
4. Electrical and Electronics Technology, E. Hughes, 10th Edition, Pearson, 2010
5. Electrical Engineering Fundamentals, Vincent Deltoro, Second Edition, Prentice Hall India,1989.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21ME102ES: ENGINEERING WORKSHOP

B.Tech. I Year I Sem.

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Pre-requisites: Practical skill

Course Objectives:

- To Study of different hand operated power tools, uses and their demonstration.
- To gain a good basic working knowledge required for the production of various engineering products.
- To provide hands on experience about use of different engineering materials, tools, equipments and processes those are common in the engineering field.
- To develop a right attitude, team working, precision and safety at work place.
- It explains the construction, function, use and application of different working tools, equipment and machines.
- To study commonly used carpentry joints.
- To have practical exposure to various welding and joining processes.
- Identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances.

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

- Study and practice on machine tools and their operations
- Practice on manufacturing of components using workshop trades including plumbing, fitting, carpentry, foundry, house wiring and welding.
- Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiseling.
- Apply basic electrical engineering knowledge for house wiring practice.

1. TRADES FOR EXERCISES:

At least two exercises from each trade:

- I. Carpentry – (T-Lap Joint, Dovetail Joint, Mortise & Tenon Joint)
- II. Fitting – (V-Fit, Dovetail Fit & Semi-circular fit)
- III. Tin-Smithy – (Square Tin, Rectangular Tray & Conical Funnel)
- IV. Foundry – (Preparation of Green Sand Mould using Single Piece and Split Pattern)
- V. Welding Practice – (Arc Welding & Gas Welding)
- VI. House-wiring – (Parallel & Series, Two-way Switch and Tube Light)
- VII. Black Smithy – (Round to Square, Fan Hook and S-Hook)

2. TRADES FOR DEMONSTRATION & EXPOSURE:

Plumbing, Machine Shop, Metal Cutting (Water Plasma), Power tools in construction and Wood Working

TEXT BOOKS:

1. Workshop Practice /B. L. Juneja / Cengage
2. Workshop Manual / K. Venugopal / Anuradha.

REFERENCE BOOKS:

1. Work shop Manual - P. Kannaiah/ K. L. Narayana/ SciTech
2. Workshop Manual / Venkat Reddy/ BSP

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21EN101HS: ENGLISH

B.Tech. I Year I Sem.

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INTRODUCTION

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire language skills, the syllabus of English has been designed to develop linguistic, communicative and critical thinking competencies of Engineering students.

In English classes, the focus should be on the skills development in the areas of vocabulary, grammar, reading and writing. For this, the teachers should use the prescribed text for detailed study. The students should be encouraged to read the texts leading to reading comprehension and different passages may be given for practice in the class. The time should be utilized for working out the exercises given after each excerpt, and also for supplementing the exercises with authentic materials of a similar kind, for example, newspaper articles, advertisements, promotional material etc. *The focus in this syllabus is on skill development, fostering ideas and practice of language skills in various contexts and cultures.*

Learning Objectives: The course will help to

- 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: Students should be able to

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

SYLLABUS

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 and Prepositions. **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.

TEXTBOOK:

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

REFERENCE BOOKS:

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.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)****21CH102BS: ENGINEERING CHEMISTRY LAB****B.Tech. I Year I Sem.****L T P C
0 0 3 1.5**

Course Objectives: The course consists of experiments related to the principles of chemistry required for engineering student. The student will learn:

- Estimation of hardness and chloride content in water to check its suitability for drinking purpose.
- To determine the rate constant of reactions from concentrations as a function of time.
- The measurement of physical properties like adsorption and viscosity.
- To synthesize the drug molecules and check the purity of organic molecules by thin layer chromatographic (TLC) technique.

Course Outcomes: The experiments will make the student gain skills on:

- Determination of parameters like hardness and chloride content in water.
- Estimation of rate constant of a reaction from concentration – time relationships.
- Determination of physical properties like adsorption and viscosity.
- Calculation of R_f values of some organic molecules by TLC technique.

List of Experiments:

1. Determination of total hardness of water by complexometric method using EDTA
2. Determination of chloride content of water by Argentometry
3. Estimation of an HCl by Conductometric titrations
4. Estimation of Acetic acid by Conductometric titrations
5. Estimation of HCl by Potentiometric titrations
6. Estimation of Fe²⁺ by Potentiometry using KMnO₄
7. Determination of rate constant of acid catalysed hydrolysis of methyl acetate
8. Synthesis of Aspirin and Paracetamol
9. Thin layer chromatography calculation of R_f values. eg ortho and para nitro phenols
10. Determination of acid value of coconut oil
11. Verification of Freundlich adsorption isotherm-adsorption of acetic acid on charcoal
12. Determination of viscosity of castor oil and ground nut oil by using Ostwald's viscometer.
13. Determination of partition coefficient of acetic acid between n-butanol and water.
14. Determination of surface tension of a given liquid using stalagmometer.

REFERENCE BOOKS:

1. Senior practical physical chemistry, B.D. Khosla, A. Gulati and V. Garg (R. Chand & Co., Delhi)
2. An introduction to practical chemistry, K.K. Sharma and D. S. Sharma (Vikas publishing, N. Delhi)
3. Vogel's text book of practical organic chemistry 5th edition
4. Text book on Experiments and calculations in Engineering chemistry – S.S. Dara

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)**

21EN102HS: ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB

B.Tech. I Year I Sem.

L T P C

0 0 2 1

The **Language Lab** focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations both in formal and informal contexts.

Course Objectives:

- To facilitate computer-assisted multi-media 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 interviews

Learning Outcomes: Students will be able to attain

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

Syllabus

English Language and Communication Skills Lab (ELCS) shall have two parts:

- a. Computer Assisted Language Learning (CALL) Lab**
- b. Interactive Communication Skills (ICS) Lab**

Listening Skills

Objectives

1. To enable students develop their listening skills so that they may appreciate its role in the LSRW skills approach to language and improve their pronunciation
2. 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

Objectives

1. To involve students in speaking activities in various contexts
2. To enable students 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

- **The following course content is prescribed for the English Language and Communication Skills Lab based on Unit-6 of AICTE Model Curriculum 2018 for B.Tech First English. As the syllabus is very limited, it is required to prepare teaching/learning materials by the teachers collectively in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning and time saving in the Lab)**

Exercise – I

CALL Lab:

Understand: Listening Skill- Its importance – Purpose- Process- Types- Barriers of Listening.

Practice: Introduction to Phonetics – Speech Sounds – Vowels and Consonants.

ICS Lab:

Understand: Communication at Work Place- Spoken vs. Written language.

Practice: Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.

Exercise – IICALL

18

Lab:

Understand: Structure of Syllables – Word Stress and Rhythm– Weak Forms and Strong Forms in Context.

Practice: Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms in Context.

ICS Lab:

Understand: Features of Good Conversation – Non-verbal Communication.

Practice: Situational Dialogues – Role-Play- Expressions in Various Situations –Making Requests and Seeking Permissions - Telephone Etiquette.

Exercise - IIICALL

Lab:

Understand: Intonation-Errors in Pronunciation-the Influence of Mother Tongue (MTI).

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

ICS Lab:

Understand: How to make Formal Presentations.

Practice: Formal Presentations.

Exercise – IVCALL

Lab:

Understand: Listening for General Details.

Practice: Listening Comprehension Tests.

Lab:

Understand: Public Speaking – Exposure to Structured Talks.

Practice: Making a Short Speech – Extempore.

Exercise – VCALL

Lab:

Understand: Listening for Specific Details.

Practice: Listening Comprehension Tests.

ICS Lab:

Understand: Interview Skills.*Practice:*

Mock Interviews.

Minimum Requirement of infrastructural facilities for ELCS Lab:

1. Computer Assisted Language Learning (CALL) Lab:

The Computer Assisted Language Learning Lab has to accommodate 40 students with 40 systems, with one Master Console, LAN facility and English language learning software for self- study by students.

System Requirement (Hardware component):

Computer network with LAN facility (minimum 40 systems with multimedia) with the following specifications:

- i) Computers with Suitable Configuration
- ii) High Fidelity Headphones

2. Interactive Communication Skills (ICS) Lab:

The Interactive Communication Skills Lab: A Spacious room with movable chairs and audio-visual aids with a Public-Address System, a LCD and a projector etc.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21EE102ES: BASIC ELECTRICAL ENGINEERING LAB

B.Tech. I Year I Sem.

L	T	P	C
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Course Objectives:

- To analyze a given network by applying various electrical laws and network theorems
- To know the response of electrical circuits for different excitations
- To calculate, measure and know the relation between basic electrical parameters.
- To analyze the performance characteristics of DC and AC electrical machines

Course Outcomes:

- Get an exposure to basic electrical laws.
- Understand the response of different types of electrical circuits to different excitations.
- Understand the measurement, calculation and relation between the basic electrical parameters
- Understand the basic characteristics of transformers and electrical machines.

List of experiments/demonstrations:

1. Verification of Ohms Law
2. Verification of KVL and KCL
3. Transient Response of Series RL and RC circuits using DC excitation
4. Transient Response of RLC Series circuit using DC excitation
5. Resonance in series RLC circuit
6. Calculations and Verification of Impedance and Current of RL, RC and RLC series circuits
7. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single-Phase Transformer
8. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)
9. Three Phase Transformer: Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta-star, Star-Star)
10. Measurement of Active and Reactive Power in a balanced Three-phase circuit
11. Performance Characteristics of a Separately/Self Excited DC Shunt/Compound Motor
12. Torque-Speed Characteristics of a Separately/Self Excited DC Shunt/Compound Motor
13. Performance Characteristics of a Three-phase Induction Motor
14. Torque-Speed Characteristics of a Three-phase Induction Motor

No-Load Characteristics of a Three-phase Alternator

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21MA202BS: ADVANCED CALCULUS

Common for All Branches

B.Tech. I Year II Sem.

L	T	P	C
3	1	0	4

Course Objectives: To learn

- Methods of solving the differential equations of first and higher order.
- Evaluation of multiple integrals and their applications
- The physical quantities involved in engineering field related to vector valued functions
- The basic properties of vector valued functions and their applications to line, surface and volume integrals

Course Outcomes: After learning the contents of this paper the student must be able to

- Identify whether the given differential equation of first order is exact or not
- Solve higher differential equation and apply the concept of differential equation to real world problems
- Evaluate the multiple integrals and apply the concept to find areas, volumes, centre of mass and Gravity for cubes, sphere and rectangular parallelepiped
- Evaluate the line, surface and volume integrals and converting them from one to another

UNIT-I: First Order ODE

Exact, linear and Bernoulli's equations; Applications : Newton's law of cooling, Law of natural growth and decay; Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

UNIT-II: Ordinary Differential Equations of Higher Order

Second order linear differential equations with constant coefficients: Non-Homogeneous terms of the type e^{ax} , $\sin ax$, $\cos ax$, polynomials in x, $e^{ax}V(x)$ and $x V(x)$; method of variation of parameters; Equations reducible to linear ODE with constant coefficients: Legendre's equation, Cauchy-Euler equation.

UNIT-III: Multivariable Calculus (Integration)

Evaluation of Double Integrals (Cartesian and polar coordinates); change of order of integration (only Cartesian form); Evaluation of Triple Integrals: Change of variables (Cartesian to polar) for double and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals.

Applications: Areas (by double integrals) and volumes (by double integrals and triple integrals), Centre of mass and Gravity (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.

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006
3. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.

REFERENCES:

1. Paras Ram, Engineering Mathematics, 2nd Edition, CBS Publishes
2. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)**

21PH201BS: APPLIED PHYSICS

B.Tech. I Year II Sem.

L T P C

3 1 0 4

Course Objectives:

- Students will demonstrate skills in scientific inquiry, problem solving and laboratory techniques.
- Students will be able to demonstrate competency and understanding of the concepts found in Quantum Mechanics, Fiber optics and lasers, Semiconductor physics and Electromagnetic theory and a broad base of knowledge in physics.
- The graduates will be able to solve non-traditional problems that potentially draw on knowledge in multiple areas of physics.
- To study applications in engineering like memory devices, transformer core and electromagnetic machinery.

Course Outcomes: Upon graduation:

- The student would be able to learn the fundamental concepts on Quantum behaviour of matter in its micro state.
- The knowledge of fundamentals of Semiconductor physics, Optoelectronics, Lasers and fibre optics enable the students to apply to various systems like communications, solar cell, photo cells and so on.
- Design, characterization and study of properties of material help the students to prepare new materials for various engineering applications.
- The course also helps the students to be exposed to the phenomena of electromagnetism and also to have exposure on magnetic materials and dielectric materials.

UNIT-I: Quantum Mechanics

Introduction to quantum physics, Black body radiation, Planck's law, Photoelectric effect, Compton effect, de-Broglie's hypothesis, Wave-particle duality, Davisson and Germer experiment, Heisenberg's Uncertainty principle, Born's interpretation of the wave function, Schrodinger's time independent wave equation, Particle in one dimensional box.

UNIT-II: Semiconductor Physics

Intrinsic and Extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature, Carrier generation and recombination, Carrier transport: diffusion and drift, Hall effect, p- n junction diode, Zener diode and their V-I Characteristics, Bipolar Junction Transistor (BJT): Construction, Principle of operation.

UNIT-III: Optoelectronics

Radiative and non-radiative recombination mechanisms in semiconductors, LED and semiconductor lasers: Device structure, Materials, Characteristics and figures of merit, Semiconductor photodetectors: Solar cell, PIN and Avalanche and their structure, Materials, working principle and Characteristics.

UNIT-IV: Lasers and Fibre Optics

Lasers: Introduction to interaction of radiation with matter, Coherence, Principle and working of Laser, Population inversion, Pumping, Types of Lasers: Ruby laser, Carbon dioxide (CO₂) laser, He-Ne laser, Applications of laser. Fibre Optics: Introduction, Optical fibre as a dielectric wave guide, Total internal reflection, Acceptance angle, Acceptance cone and Numerical aperture, Step and Graded index fibres, Losses associated with optical fibres, Applications of optical fibres.

UNIT-V: Electromagnetism and Magnetic Properties of Materials

Laws of electrostatics, Electric current and the continuity equation, Ampere's and Faraday's laws, Maxwell's equations, Polarisation, Permittivity and Dielectric constant, Internal fields in a solid, Clausius-Mossotti equation, Ferroelectrics and Piezoelectrics. Magnetisation, permeability and susceptibility, Classification of magnetic materials, Ferromagnetism and ferromagnetic domains, Hysteresis, Applications of magnetic materials.

TEXT BOOKS:

22

1. Engineering Physics, B.K. Pandey, S. Chaturvedi - Cengage Learning.
2. Halliday and Resnick, Physics - Wiley.
3. A textbook of Engineering Physics, Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar - S. Chand

REFERENCE BOOKS:

1. Richard Robinett, Quantum Mechanics
2. J. Singh, Semiconductor Optoelectronics: Physics and Technology, Mc Graw-Hill inc. (1995).
3. Online Course: -Optoelectronic Materials and Devices by Monica Katiyar and Deepak Gupta on NPTEL

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21CS201ES: PROGRAMMING FOR PROBLEM SOLVING

B.Tech. I Year II Sem.

**L T P C
3 1 0 4**

Course Objectives:

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

Course Outcomes: The student will learn

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

UNIT - 1: Introduction to Programming

Introduction to components of a computer system: disks, primary and secondary memory, processor, operating system, compilers, creating, compiling and executing a program etc., Number systems Introduction to Algorithms: steps to solve logical and numerical problems. Representation of Algorithm, Flowchart/Pseudo code 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, Storage classes (auto, extern, static and register), type conversion, The main method and command line arguments
Bitwise operations: Bitwise AND, OR, XOR and NOT operators
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

UNIT - II: Arrays, Strings, Structures and Pointers:

Arrays: one and two dimensional arrays, creating, accessing and manipulating elements of arrays
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, Use of Pointers in self-referential structures, usage of self referential structures in linked list (no implementation) Enumeration data type

UNIT - III: Pre-processor and File handling in C:

Preprocessor: Commonly used Preprocessor commands like include, define, undef, if, ifdef, ifndef
Files: Text and Binary files, Creating and Reading and writing text and binary files, Appending data to existing files, Writing and reading structures using binary files, Random access using fseek, ftell and rewind functions.

UNIT - IV: Function 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, Some C standard functions and libraries
Recursion: Simple programs, such as Finding Factorial, Fibonacci series etc., Limitations of Recursive functions
Dynamic memory allocation: Allocating and freeing memory, Allocating memory for arrays of different data types

UNIT - V: Introduction to Algorithms:

Algorithms for finding roots of a quadratic equations, finding minimum and maximum numbers of a givenset, finding if a number is prime number, etc.

Basic searching in an array of elements (linear and binary search techniques),

Basic algorithms to sort array of elements (Bubble, Insertion and Selection sort algorithms), Basic concept of order of complexity through the example programs

TEXT BOOKS:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition)

REFERENCE BOOKS:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice
2. Hall of India
3. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
4. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
5. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)**

21ME203ES: ENGINEERING GRAPHICS

B.Tech. I Year II Sem.

**L T P C
1 0 4 4**

Pre-requisites: Nil

Course objectives:

- To provide basic concepts in engineering drawing.
- To impart knowledge about standard principles of orthographic projection of objects.
- To draw sectional views and pictorial views of solids.

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

- Preparing working drawings to communicate the ideas and information.
- Read, understand and interpret engineering drawings.

UNIT – I

Introduction to Engineering Drawing: Principles of Engineering Graphics and their Significance, Conic Sections including the Rectangular Hyperbola – General method only. Cycloid, Epicycloid and Hypocycloid, Scales – Plain & Diagonal.

UNIT- II

Orthographic Projections: Principles of Orthographic Projections – Conventions – Projections of Points and Lines, Projections of Plane regular geometric figures.—Auxiliary Planes.

UNIT – III

Projections of Regular Solids – Auxiliary Views - Sections or Sectional views of Right Regular Solids –Prism, Cylinder, Pyramid, Cone – Auxiliary views – Sections of Sphere

UNIT – IV

Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid and Cone, Intersection of Solids: Intersection of – Prism vs Prism- Cylinder Vs Cylinder

UNIT – V

Isometric Projections: Principles of Isometric Projection – Isometric Scale – Isometric Views – Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts. Conversion of Isometric Views to Orthographic Views and Vice-versa –Conventions

Introduction to CAD: (For Internal Evaluation Weightage only):

Introduction to CAD Software Package Commands - Free Hand Sketches of 2D - Creation of 2DSketches by CAD Package

TEXT BOOKS:

1. Engineering Drawing N.D. Bhatt / Charotar
2. Engineering Drawing / N. S. Parthasarathy and Vela Murali/ Oxford

REFERENCE BOOKS:

1. Engineering Drawing / Basant Agrawal and McAgrawal/ McGraw Hill
 2. Engineering Drawing/ M. B. Shah, B.C. Rane / Pearson.
- Computer Aided Engineering Drawing – K Balaveera Reddy et al – CBS Publishers

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)****21PH202BS: APPLIED PHYSICS LAB****B.Tech. I Year II Sem.****L T P C
0 0 3 1.5****List of Experiments:**

1. Energy gap of P-N junction diode:
To determine the energy gap of a semiconductor diode.
2. Solar Cell:
To study the V-I Characteristics of solar cell.
3. Light emitting diode:
Plot V-I and P-I characteristics of light emitting diode.
4. Stewart – Gee's experiment:
Determination of magnetic field along the axis of a current carrying coil.
5. Hall effect:
To determine Hall co-efficient of a given semiconductor.
6. Photoelectric effect:
To determine work function of a given material.
7. LASER:
To study the characteristics of LASER sources.
8. Optical fibre:
To determine the bending losses of Optical fibres.
9. LCR Circuit:
To determine the Quality factor of LCR Circuit.
10. R-C Circuit:
To determine the time constant of R-C circuit.

Note: Any 8 experiments are to be performed

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21CS202ES: PROGRAMMING FOR PROBLEM SOLVING LAB

B.Tech. I Year II Sem.

L T P C
0 0 3 1.5

Course Objectives: The students will learn the following:

- 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:

- formulate the algorithms for simple problems
- translate given algorithms to a working and correct program
- correct syntax errors as reported by the compilers
- identify and correct logical errors encountered during execution
- represent and manipulate data with arrays, strings and structures
- use pointers of different types
- create, read and write to and from simple text and binary files
- modularize the code with functions so that they can be reused

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 to find the max and min from the three numbers.
- b. Write the program for the simple, compound interest.
- c. Write 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:
 - e. $5 \times 1 = 5$
 - f. $5 \times 2 = 10$
 - g. $5 \times 3 = 15$
- h. 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: ²⁸the 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. $1 - \frac{x}{2} + \frac{x^2}{4} - \frac{x^3}{6}$
- j. Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression: $1+x+x^2+x^3+\dots+x^n$. For example: if n is 3 and x is 5, then the program computes $1+5+25+125$.

Arrays and Pointers and Functions:

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

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)

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)

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:
- d. To insert a sub-string in to a given main string from a given position.
- e. ii. To delete n Characters from a given position in a given string.
- f. 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.)
- g. Write a C program that displays the position of a character ch in the string S or - 1 if S doesn't contain ch.
- h. Write a C program to count the lines, words and characters in a given text.

Miscellaneous:

- 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. 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       ***
                                           *
                                           **
                                           **
                                           *

```

Sorting and Searching:

- a. Write a C program that uses non recursive function to search for a Key value in a given
- b. list of integers using linear search method.
- c. Write a C program that uses non recursive function to search for a Key value in a given
- d. sorted list of integers using binary search method.
- e. Write a C program that implements the Bubble sort method to sort a given list of
- f. integers in ascending order.
- g. Write a C program that sorts the given array of integers using selection sort in descending order
- h. Write a C program that sorts the given array of integers using insertion sort in ascending order
- i. Write a C program that sorts a given array of names

Suggested Reference Books for solving the problems:

- i. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
- ii. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition)
- iii. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
- iv. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
- v. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
- vi. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)**

21MC201ES: ENVIRONMENTAL SCIENCE

B.Tech. I Year II Sem.

L	T	P	C
3	0	0	0

Course Objectives:

- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures.
- Understanding the environmental policies and regulations

Course Outcomes:

- Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development

UNIT-I

Ecosystems: Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

UNIT-II

Natural Resources: Classification of Resources: Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. **Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non-renewable energy sources, use of alternate energy source, case studies.

UNIT-III

Biodiversity And Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

UNIT-IV

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and characteristics of e-Waste and its management. **Pollution control technologies:** Wastewater Treatment methods: Primary, secondary and Tertiary.

Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental Issues and Global Efforts:** Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. NAPCC-GoI Initiatives.

UNIT-V

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan

(EMP). **Towards Sustainable Future:** Concept of Sustainable Development Goals, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

TEXT BOOKS:

- 1 Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
- 2 Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHIL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHILearning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.
6. Introduction to Environmental Science by Y. Anjaneyulu, BS. Publications.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)**

21CS340PC-DISCRETE MATHEMATICS

B.Tech. II Year I- Semester

L T P C
3 0 0 3

Course Objectives:

- Introduces the elementary discrete mathematics for computer science and engineering.
- Topics include formal logic notation, methods of proof, induction, sets, relations, graph theory, permutations and combinations, counting principles; recurrence relations and generating functions.

Course Outcomes:

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

UNIT - I

The Foundations: Logic and Proofs: Propositional Logic, Normal Forms, Propositional Equivalence, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs, Proof Methods and Strategy.

UNIT - II

Basic Structures, Sets, Binary Relations, Functions, Sequences, Sums, Sequences & Summations, Relations and Their Properties, n-array Relations and Their Applications, Representing Relations, Closures of Relations, Equivalence Relations.

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.

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, Connectivity, 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 BOOK:

1. Discrete Mathematics and its Applications with Combinatorics and Graph Theory- Kenneth H Rosen, 7th Edition, TMH.

REFERENCES BOOKS:

1. Discrete Mathematical Structures with Applications to Computer Science-J.P. Tremblay and R. Manohar, TMH,
2. Discrete Mathematics for Computer Scientists & Mathematicians: Joe L. Mott, Abraham Kandel, Theodore P. Baker, 2nd ed, Pearson Education.
3. Discrete Mathematics- Richard Johnsonbaugh, 7Th Edn., Pearson Education.
4. Discrete Mathematics with Graph Theory- Edgar G. Goodaire, Michael M. Parmenter.
5. Discrete and Combinatorial Mathematics - an applied introduction: Ralph.P. Grimald, 5th edition, Pearson Education.

B.TECH. CSE

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)****21CS320PC-PYTHON PROGRAMMING**

B.Tech. II Year I- Semester

L T P C
3 0 0 3**Course Objectives:**

- Learn Syntax and Semantics and Create Functions in Python.
- Handle Strings and Files in Python.
- Understand Lists, Dictionaries and Regular Expressions in Python.
- Implement Object Oriented Programming Concepts in Python.
- Build Web Services and Introduction to Network and Database Programming in Python.

Course Outcomes:

- Examine Python Syntax and Semantics and be Fluent in the Use of Python Flow Control and Functions.
- Demonstrate Proficiency in Handling Strings and File Systems.
- Create, Run and Manipulate Python Programs Using Core Data Structures like Lists, Dictionaries and Use Regular Expressions.
- Interpret the Concepts of Object-Oriented Programming as Used in Python.
- Implement Exemplary Applications Related to Network Programming, Web Services and Databases in Python.

UNIT - I

Python Basics, Objects- Python Objects, Standard Types, Other Built-in Types, Internal Types, Standard Type Operators, Standard Type Built-in Functions, Categorizing the Standard Types, Unsupported Types Numbers - Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators, Built-in Functions, Related Modules Sequences - Strings, Lists, and Tuples, Mapping and Set Types

UNIT - II

FILES: File Objects, File Built-in Function [open()], File Built-in Methods, File Built-in Attributes, Standard Files, File System, File Execution.

Exceptions: Exceptions in Python, Detecting and Handling Exceptions, Exceptions as Strings, Raising Exceptions, Assertions, Standard Exceptions, *Creating Exceptions, Functions.

Types of Arguments. Why Exceptions (Now)? Why Exceptions at All? Exceptions and the sys Module, Related Modules.

Modules: Built-in Functions, User Defined Functions, Packages, Other Features of Modules

UNIT - III

Regular Expressions: Introduction, Special Symbols and Characters, Res and Python

Multithreaded Programming: Introduction, Threads and Processes, Python, Threads, and the Global Interpreter Lock, Thread Module, Threading Module, Related Modules

UNIT - IV

GUI Programming: Introduction, Tkinter and Python Programming, Brief Tour of Other GUIs, Related Modules and Other GUIs

WEB Programming: Introduction, Web Surfing with Python, Creating Simple Web Clients, Advanced Web Clients, CGI-Helping Servers Process Client Data, Building CGI Application, Web (HTTP) Servers.

UNIT - V

Database Programming: Introduction, Advantages of DBMS, Types of Databases: MySQL Database, Working with MySQL Database, Python Database Application Programmer's Interface (DB-API), Using MySQL from Python.

TEXT BOOK:

1. Core Python Programming, Wesley J. Chun, Second Edition, Pearson.

REFERENCE BOOKS:

1. Think Python, Allen Downey, Green Tea Press
2. Introduction to Python, Kenneth A. Lambert, Cengage
3. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
4. Learning Python, Mark Lutz, O'Really
5. Core Python Programming, R. Nageshwar Rao, Dreamtech Press, Third Edition

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)**

21EC310ES: ANALOG AND DIGITAL ELECTRONICS

	L	T	P	C
B.Tech. II Year I Sem.	3	0	0	3

Prerequisite: Analog Electronics

Course Objectives:

- To introduce components such as diodes, BJTs and FETs.
- To know the applications of components.
- To give understanding of various types of amplifier circuits
- To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems.
- To understand the concepts of combinational logic circuits and sequential circuits.

Course Outcomes: Upon completion of the Course, the students will be able to:

- Know the characteristics of various components.
- Understand the utilization of components.
- Design and analyze small signal amplifier circuits.
- Learn Postulates of Boolean algebra and to minimize combinational functions
- Design and analyze combinational and sequential circuits
- Know about the logic families and realization of logic gates.

UNIT - I

Diodes and Applications: p-n junction diode, V-I characteristics, diode resistance, diode capacitance, Zener diode, Tunnel diodes, photo diode.

Diode Applications - clipping circuits, Half wave rectifier, Full wave rectifier, rectifier with capacitor filter.

UNIT - II

BJT: Principle of Operation, Common Emitter, Common Base and Common Collector Configurations, Transistor Hybrid model, Determination of h-parameters from transistor characteristics, Analysis of CE, CC, CB Amplifiers.

UNIT - III

FETs and Digital Circuits: Construction and Operation of JFET, Volt- Ampere Characteristics, Comparison of BJT and FET, Small Signal Model, MOSFET Characteristics in Enhancement and Depletion mode, analysis of CS and CD amplifiers

Digital Circuits: Number systems and Conversions, Complements of Numbers, basic theorems and properties, Digital Logic Gates, EX-OR gates, Universal Gates, Multilevel NAND/NOR realizations, RTL, DTL, DCTL, TTL gates.

UNIT – IV:

Minimization of Boolean functions: Karnaugh Map Method - Up to five Variables, Don't Care Map Entries, Tabular Method,

Combinational Logic Circuits: Adders, Subtractors, comparators, Multiplexers, Demultiplexers, Encoders, Decoders.

UNIT - V

Sequential Circuits: Latches, Flip Flops, Excitation Table of all Flip Flops, Conversion from one type of Flip-Flop to another.

Registers and Counters: Shift Registers, Design and operation of Asynchronous and Synchronous Counters, Modulo N – Counters, Random-Access Memory, Read-Only Memory.

TEXTBOOKS:

35

1. Integrated Electronics: Analog and Digital Circuits and Systems, 2/e, Jaccob Millman, Christos Halkias and Chethan D. Parikh, Tata McGraw-Hill Education, India, 2010.
2. Digital Design, 5/e, Morris Mano and Michael D. Cilette, Pearson, 2011.

REFERENCE BOOKS:

1. Electronic Devices and Circuits, Jimmy J Cathey, Schaum's outline series, 1988.
2. Digital Principles, 3/e, Roger L. Tokheim, Schaum's outline series, 1994.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)****21CS305PC-DATABASE MANAGEMENT SYSTEMS**

B.Tech. II Year I- Semester

L T P C
3 0 0 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.

Course Outcomes:

- 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

UNIT - I

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

Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes, Weak Entity sets 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 data base 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, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active data bases.

Schema Refinement: Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, FIRST, SECOND, THIRD normal forms, BCNF, lossless join decomposition, multi-valued dependencies, FOURTH normal form, FIFTH normal Form, E.F.Codd rules.

UNIT - IV

Transaction Processing Concept: Transaction Concept, Transaction State, Implementation of Atomicity and Durability.

Concurrency Control Techniques: 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

Indexing: Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree base Indexing, Indexed Sequential Access Methods (ISAM), B+ Trees: A Dynamic Index Structure.

Database Security & Authorization: Introduction to DB Security issues, Discretionary access control based on granting /recovery of privileges.

TEXT BOOKS:

1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill 3rd Edition
2. Database System Concepts, Silberschatz, Korth, Mc Graw hill, V edition.

REFERENCE BOOKS:

1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems, Elmasri Navrate, Pearson Education
3. Introduction to Database Systems, C. J. Date, Pearson Education
4. Oracle for Professionals, The X Team, S.Shah and V. Shah, SPD.
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, Shah, PHI.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)**

21CS303PC-DATA STRUCTURES

B.Tech. II Year I- Semester

L T P C
3 0 0 3

Course Objectives:

- Exploring Basic Data Structures Such as Stacks and Queues.
- Introduces a Variety of Data Structures Such as Hash Tables, Search Trees, Tries, Heaps, Graphs.
- Introduces Sorting And Pattern Matching Algorithms

Course Outcomes:

- Ability to Select the Data Structures that Efficiently Model the Information in a Problem.
- Ability to Assess Efficiency Trade-Offs among Different Data Structure Implementations or Combinations.
- Implement and Know the Application of Algorithms for Sorting and Pattern Matching.
- Design Programs Using a Variety of Data Structures, Including Hash Tables, Binary and General Tree Structures, Search Trees, Tries, Heaps, Graphs, and AVL-Trees.

UNIT - I

Introduction to Data Structures, Abstract Data Types, Types of Data Structures, Linked List, Types of Linked List, Linked List Operations and Implementation.

UNIT - II

Stacks: Operations, Array and Linked Representations of Stacks, Stack Applications- Expression Evaluation, Recursion, Keeping Track of Function Calls.

Queues: Operations, Array and Linked Representation of Queues, Queue Applications.

UNIT – III

Dictionaries: Linear List Representation, Skip List Representation, Operations - Insertion, Deletion and Searching.

Hash Table Representation: Hash Functions, Collision Resolution Techniques-Separate Chaining, Open Addressing Linear Probing, Quadratic Probing, Double Hashing, Re-hashing, Extendible Hashing.

UNIT - IV

Search Trees: Binary Search Trees, Definition, Implementation, Operations- Searching, Insertion and Deletion, AVL Trees, Definition, Height of an AVL Tree, Operations – Insertion, Deletion and Searching, Red –Black Trees, Splay Trees.

UNIT - V

Graphs: Graph Implementation Methods. Graph Traversal Methods.

Sorting: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort and Heap Sort.

Pattern Matching and Tries: Pattern Matching Algorithms- Brute Force, The Boyer – Moore Algorithm and The Knuth-Morris-Pratt Algorithm.

TEXT BOOKS:

1. Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press.
2. Data Structures using C – A. S. Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education.

REFERENCE BOOK:

1. Data Structures: A Pseudocode Approach with C, 2nd Edition, R. F. Gilberg and B.A. Forouzan, Cengage Learning.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21EC311ES: ANALOG AND DIGITAL ELECTRONICS LAB

B.Tech. II Year I Sem.	L	T	P	C
Course Objectives	0	0	3	1

- To introduce components such as diodes, BJTs and FETs.
- To know the applications of components.
- To give understanding of various types of amplifier circuits
- To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems.
- To understand the concepts of combinational logic circuits and sequential circuits.

Course Outcomes: Upon completion of the Course, the students will be able to:

- Know the characteristics of various components.
- Understand the utilization of components.
- Design and analyze small signal amplifier circuits.
- Postulates of Boolean algebra and to minimize combinational functions
- Design and analyze combinational and sequential circuits
- Known about the logic families and realization of logic gates.

LIST OF EXPERIMENTS

1. Full Wave Rectifier with & without filters
2. Common Emitter Amplifier Characteristics
3. Common Base Amplifier Characteristics
4. Common Source amplifier Characteristics
5. Measurement of h-parameters of transistor in CB, CE, CC configurations
6. Input and Output characteristics of FET in CS configuration
7. Realization of Boolean Expressions using Gates
8. Design and realization logic gates using universal gates
9. generation of clock using NAND / NOR gates
10. Design a 4 – bit Adder / Subtractor
11. Design and realization a Synchronous and Asynchronous counter using flip-flops
12. Realization of logic gates using DTL, TTL, ECL, etc.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)****21CS306PC-DATABASE MANAGEMENT SYSTEMS LAB**

B.Tech. II Year I Semester

L T P C
0 0 3 1.5**Course Objectives:**

- Introduce ER data model, database design and normalization
- Learn SQL basics for data definition and data manipulation

Course Outcomes:

- Design database schema for a given application and apply normalization
- Acquire skills in using SQL commands for data definition and data manipulation.
- Develop solutions for database applications using procedures, cursors and triggers

List of Experiments:

1. Concept design with E-R Model
2. Relational Model
3. Normalization
4. Practicing DDL commands
5. Practicing DML commands
6. Querying (using ANY, ALL, IN, Exists, NOT EXISTS, UNION, INTERSECT, Constraints etc.)
7. Queries using Aggregate functions, GROUP BY, HAVING and Creation and dropping of Views.
8. Triggers (Creation of insert trigger, delete trigger, update trigger)
9. Procedures
10. Usage of Cursors

TEXT BOOKS:

1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill, 3rd Edition
2. Database System Concepts, Silberschatz, Korth, McGraw Hill, V edition.

REFERENCES BOOKS:

1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems, Elmasri Navrate, Pearson Education
3. Introduction to Database Systems, C.J. Date, Pearson Education
4. Oracle for Professionals, The X Team, S. Shah and V. Shah, SPD.
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, Shah, PHI.
6. Fundamentals of Database Management Systems, M. L. Gillenson, Wiley Student Edition

21CS304PC-DATA STRUCTURES LAB

B.Tech. II Year I- Semester

L T P C
0 0 2 1**Course Objectives:**

- It covers various concepts of C programming language
- It introduces searching and sorting algorithms
- It provides an understanding of data structures such as stacks and queues.

Course Outcomes:

- Ability to develop C programs for computing and real-life applications using basic elements like control statements, arrays, functions, pointers and strings, and data structures like stacks, queues and linked lists.
- Ability to Implement searching and sorting algorithms

List of Experiments

1. Write a program that uses functions to perform the following operations on Single Linked List.:
i) Creation ii) Insertion iii) Deletion iv) Traversal
2. Write a program that uses functions to perform the following operations on Double Linked List.:
i) Creation ii) Insertion iii) Deletion iv) Traversal
3. Write a program that uses functions to perform the following operations on Circular Linked List.:
i) Creation ii) Insertion iii) Deletion iv) Traversal
4. Write a program that implement Stack (its operations) using
i) Arrays ii) Pointers
5. Write a program that implement Queue (its operations) using
i) Arrays ii) Pointers
6. Write a program that implements the following sorting methods to sort a given list of integers in ascending order
i) Bubble sort ii) Selection sort iii) Insertion sort
7. Write programs to perform the following searching operations for a Key value in a given list of integers:
i) Linear search ii) Binary search
8. Write a program to implement the Tree Traversal Methods.
9. Write a program to implement the Graph Traversal Methods.

TEXT BOOKS:

1. Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press.
2. Data Structures using C – A. S. Tanenbaum, Y. Langsam, and M. J. Augenstein, PHI/Pearson Education.

REFERENCE BOOK:

1. Data Structures: A Pseudocode Approach with C, 2nd Edition, R. F. Gilberg and B. A. Forouzan, Cengage Learning

21CS321PC-PYTHON PROGRAMMING LAB

B.Tech. II Year I- Semester

L T P C
0 0 2 1**Course Objectives**

- To be able to introduce core programming basics and program design with functions using Python programming language.
- To understand a range of Object-Oriented Programming, as well as in-depth data and information processing techniques.
- To understand the high-performance programs designed to strengthen the practical expertise.

Course Outcome

- Student should be able to understand the basic concepts scripting and the contributions of scripting language
- Ability to explore python especially the object-oriented concepts, and the built in objects of Python.
- Ability to create practical and contemporary applications such as TCP/IP network programming, Web applications, discrete event simulations

List of Experiments:

1. Write a Program to Demonstrate Different Number Data Types In Python.
2. Write a Program to Perform Different Arithmetic Operations On Numbers In Python.
3. Write a Program to Create, Concatenate and Print a String and Accessing Sub-String from a Given String.
4. Write a Python Script to Print the Current Date in the Following Format —Sun May 29 02:26:23IST 2017|
5. Write a Program to Create, Append, And Remove Lists in Python.
6. Write a Program to Demonstrate Working With Tuples in Python.
7. Write a Program to Demonstrate Working With Dictionaries in Python.
8. Write a Python Program to Find Largest of Three Numbers.
9. Write a Python Program to Convert Temperatures to and From Celsius, Fahrenheit.[Formula : $C/5 = F-32/9$].
10. Write a Python Program to Construct the Following Pattern, Using a Nested For Loop.


```

*
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* * * *
* * *
* *
*

```
11. Write a Python Script that Prints Prime Numbers Less Than 20.
12. Write a Python Program to Find Factorial of a Number Using Recursion.
13. Write a Program that Accepts the Lengths of Three Sides of a Triangle as Inputs. The Program Output Should Indicate Whether or Not the Triangle Is a Right Triangle (Recall from the Pythagorean Theorem that in a Right Triangle, the Square of One Side Equals the Sum of the Squares of the Other Two Sides).
14. Write a Python Program to Define a Module to Find Fibonacci Numbers and Import the Module to another Program.
15. Write a Python Program to Define a Module and Import a Specific Function in that Module to another Program.
16. Write a Script Named Copyfile.Py. This Script Should Prompt the User for the Names of Two Text Files. The Contents of The First File Should be Input and Written to the Second File.
17. Write a Program that Inputs a Text File. The Program Should Print all of the Unique Words in the File in Alphabetical Order.
18. Write a Python Class to Convert an Integer to a Roman Numeral.
19. Write a Python Class to Implement Pow(x, n).
20. Write a Python Class to Reverse a String Word by Word.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)**

21MA308BS-APTITUDE AND CRITICAL THINKING SKILLS PRACTICE

B.Tech. II Year I Semester

L T P C
0 0 3 1.5

Course Objectives:

- To categorize, apply and use thought process to distinguish between concepts of Quantitative methods.
- To prepare and explain the fundamentals related to various possibilities and probabilities related to quantitative aptitude.
- To critically evaluate numerous possibilities related to puzzles.

Course Outcomes:

The student will be able to

- Use their logical thinking and analytical abilities to solve Quantitative aptitude questions from company specific and other competitive tests.
- Solve questions related to Time and distance and time and work etc. from company specific and other competitive tests.
- Understand and solve puzzle related questions from specific and other competitive tests

UNIT I**NUMERICAL ABILITY:**

Simplification, BODMAS, Fractions, Decimals, Squares, Square Roots, Cubes, Cube Roots, Speed Maths, LCM & HCF

UNIT II

Numerical computation: Applications based on Numbers, Chain Rule, Ratio Proportion

Numerical Reasoning: Problems related to Number series, Analogy of numbers, Classification of numbers, Letter series, Seating arrangements, Directions, blood relations and puzzle test.

UNIT III

Numerical estimation – I, Applications Based on Time and work, Time and Distance

Combinatory: Counting techniques, Permutations, Combinations and Probability

Numerical estimation – II, Applications based on Percentages, Profit Loss and Discount, Simple interest and Compound Interest Partnerships.

UNIT IV

Data interpretation: Data interpretation related to Averages, Mixtures and allegations, Bar charts, Pie charts, Venn diagrams, Application to industry in Geometry and Menstruation

UNIT V

Critical Thinking: Alphabet Test, Coding-Decoding, Statement and Conclusion, Statement and Arguments, Statement and Assumption, Calendars, Clocks, Cubes and dice, Counting of figures.

Books for practice

1. Quantitative aptitude by R S Agarwal, S Chand Publications
2. Verbal and non verbal Reasoning by RS Agarwal from S Chand publications

References

1. Barron's by Sharon Welner Green and IraK Wolf (Galgotia Publications pvt. Ltd.)
2. Quantitative Aptitude by U Mohan Rao Scitech publications
3. Quantitative Aptitude by Arun Sharma McGrawhill publications
4. Quantitative Aptitude by Ananta Asisha Arihant publications
5. Quantitative Aptitude by Abhijit Guha
6. Quantitative Aptitude by Pearson publications
7. Material from „IMS, Career Launcher and Time Institutes for Competitive exams.

Elementary and Higher Algebra by H. S. Hall an S. R. Knight

21MC303-CONSTITUTION OF INDIA

B.Tech. II Year I Sem.

L T/P/D C
3 0/0/0 0

The Constitution of India is the supreme law of India. Parliament of India cannot make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the —basic structure of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of —Constitutionalism— a modern and progressive concept historically developed by the thinkers of —liberalism— an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of —constitutionalism— in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America.

The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India's legacy of —diversity—. It has been said that Indian constitution reflects ideals of its freedom movement; however, few critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be —static— and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950. The Indian judiciary and particularly the Supreme Court of India has played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution but also strengthened the same through progressive interpretations of the text of the Constitution. The judicial activism of the Supreme Court of India and its historic contributions has been recognized throughout the world and it gradually made it—as one of the strongest court in the world—.

Course content

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India
3. Salient features and characteristics of the Constitution of India
4. Scheme of the fundamental rights
5. The scheme of the Fundamental Duties and its legal status
6. The Directive Principles of State Policy – Its importance and implementation
7. Federal structure and distribution of legislative and financial powers between the Union and the States
8. Parliamentary Form of Government in India – The constitution powers and status of the President of India
9. Amendment of the Constitutional Powers and Procedure
10. The historical perspectives of the constitutional amendments in India
11. Emergency Provisions: National Emergency, President Rule, Financial Emergency
12. Local Self Government – Constitutional Scheme in India
13. Scheme of the Fundamental Right to Equality
14. Scheme of the Fundamental Right to certain Freedom under Article 19
15. Scope of the Right to Life and Personal Liberty under Article 21

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)**

21CS437PC-DATA WAREHOUSE & DATA MINING

II Year B.Tech II Semester

**L T P C
3 0 0 3**

Pre-Requisites:

- A course on –Database Management Systems
- Knowledge of probability and statistics

Course Objectives:

- It presents the methods for treatment of Outliers in Preprocessing,
- It presents concepts of OLAP, OLTP, Data warehouse
- It presents methods for mining Frequent Patterns, Associations, and Correlations.
- It then describes methods for Data Classification and Prediction
- It describes about Data Clustering approaches.

Course Outcomes:

- Apply preprocessing methods for any given raw data.
- Analyze the mechanisms of OLTP and OLAP, Data warehouse.
- Apply Association Rule mining to extract interesting patterns from large amounts of data
- Choose and employ suitable data mining algorithms to build analytical applications on Classification and Prediction.
- Build the clusters to find the hidden patterns of Large amount of data.

UNIT - I

Data Mining: Data – Types of Data, Data Mining Functionalities, Interestingness Patterns, Classification of Data Mining systems, Data mining Task primitives, Integration of Data mining system with a Data warehouse, Major issues in Data Mining–Data Preprocessing: Missing Values, Null Values, Errors; Inter Quartile Range (IQR) technique for Outlier Treatment.

UNIT – II

Data warehouse & OLAP technology for Data Mining: Data Warehouse and OLAP Technology for Data Mining: Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Data Cube Computation and Data Generalization: Efficient & scalable frequent Itemset mining Methods, OLAP Technology, Attribute-Oriented Induction.

UNIT - III

Association Rule Mining: Mining Frequent Patterns, Associations and correlations, Mining Methods, Mining Various kinds of Association Rules, Correlation Analysis, Principal Component Analysis (PCA) for dimensionality reduction, Constraint based Association mining. Graph Pattern Mining, SPM.

UNIT - IV

Classification: Classification and Prediction, Basic concepts, Decision tree induction, Bayesian classification, Rule–based classification, Lazy learner, Linear Regression, Logistic Regression.

UNIT - V

Clustering and Applications: Cluster analysis, Types of Data in Cluster Analysis, Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density–based Methods, Grid–based Methods, Outlier Analysis.

TEXT BOOKS:

1. Data Mining – Concepts and Techniques – Jiawei Han & Micheline Kamber, 3rd Edition Elsevier.
2. Data Mining Introductory and Advanced topics – Margaret H Dunham, PEA.

REFERENCE BOOK:

1. Ian H. Witten and Eibe Frank, Data Mining: Practical Machine Learning Tools and Techniques (Second Edition), Morgan Kaufmann, 2005.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)**

21CS411PC-COMPUTER ORGANIZATION AND ARCHITECTURE

B.Tech. II Year II Semester

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Course Objectives:

- The purpose of the course is to introduce principles of computer organization and the basic architectural concepts.
- It begins with basic organization, design, and programming of a simple digital computer and introduces simple register transfer language to specify various computer operations.
- Topics include computer arithmetic, instruction set design, micro programmed control unit, pipelining and vector processing, memory organization and I/O systems, and multiprocessors

Course Outcomes:

- Understand the basics of instructions sets and their impact on processor design.
- Demonstrate an understanding of the design of the functional units of a digital computer system.
- Evaluate cost performance and design trade-offs in designing and constructing a computer processor including memory.
- Design a pipeline for consistent execution of instructions with minimum hazards.
- Recognize and manipulate representations of numbers stored in digital computers

UNIT - I

Digital Computers: Introduction, Block diagram of Digital Computer, Definition of Computer Organization, Computer Design and Computer Architecture.

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

Basic Computer Organization and Design: Instruction Codes, Computer Registers Computer.

UNIT - II

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

Central Processing Unit: General Register Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control.

UNIT - III

Data Representation: Data types, Complements, Fixed Point Representation, Floating Point Representation.

Computer Arithmetic: Addition and Subtraction, Multiplication Algorithms, Division Algorithms, Floating – point Arithmetic operations. Decimal Arithmetic Unit, Decimal Arithmetic Operations.

UNIT - IV

Input-Output Organization: Input-Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt Direct memory Access.

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associate Memory, Cache Memory.

UNIT - V

Reduced Instruction Set Computer: CISC Characteristics, RISC Characteristics.

Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processor.

TEXT BOOK:

1. Computer System Architecture – M. Moris Mano, Third Edition, Pearson/PHI.

REFERENCE BOOKS:

1. Computer Organization – Car Hamacher, Zvonks Vranesic, Safea Zaky, Vth Edition, McGraw Hill.
2. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI.
3. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition, PHI/Pearson.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)**

21CS413PC-OBJECT ORIENTED PROGRAMMING THROUGH JAVA

B.Tech. II Year II Semester

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Course Objectives:

- To introduce the object-oriented programming concepts.
- To understand object-oriented programming concepts, and apply them in solving problems.
- To introduce the principles of inheritance and polymorphism; and demonstrate how they relate to the design of abstract classes
- 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 applets and swing controls.

Course Outcomes:

- Able to solve real world problems using OOP techniques.
- Able to understand the use of abstract classes.
- Able to solve problems using java collection framework and I/o classes.
- Able to develop multithreaded applications with synchronization.
- Able to develop applets for web applications.
- Able to design GUI based applications

Unit - I

Object-Oriented Thinking- Why Java? History Features Of Java, JVM and Its Architecture, Object-Oriented Concepts. Java Buzzwords, Data Types, Variables and Arrays, Operators, Expressions, Control Statements, Introducing Classes And Objects, String Handling Methods.

Inheritance– Inheritance Concept, Inheritance Basics, Types of Inheritance, Pros and Cons of Inheritance. Member Access, Constructors, Creating Multilevel Hierarchy, Super Keyword Uses, Using Final Keyword With Inheritance, Polymorphism, Method Overloading, Method Overriding, Abstract Classes, java.lang.Object Class.

Unit - II

Packages- Defining a Package, Classpath, Access Protection, Importing Packages.

Interfaces- Defining an Interface, Implementing Interfaces, Nested Interfaces, Applying Interfaces, Variables in Interfaces and Extending Interfaces.

Stream Based I/O (java.io) – The Stream Classes-Byte Streams and Character Streams, Reading Console Input and Writing Console Output, File Class, Reading and Writing Files, Random Access File Operations, The Console Class, Serialization, Enumerations, Boxing, Auto Boxing.

Unit - III

Exception Handling - Fundamentals of Exception Handling, Exception Types, Using Try And Catch, Multiple Catch Clauses, Nested Try Statements, throw, throws and finally, Built- In Exceptions, Creating Own Exceptions.

Multithreading- Thread, Differences Between Thread-Based Multitasking and Process-Based Multitasking, Thread Life Cycle, Creating Threads, Thread Priorities, Synchronizing Threads, Inter Thread Communication.

Unit - IV

The Collections Framework (java.util)- Collections Overview, Collection Interfaces, The Collection Classes- Array List, Linked List, Hash Set, Tree Set. Accessing A Collection Via An Iterator, Using An Iterator, The For-Each Alternative, Comparators, Arrays, Dictionary, Hash Table, Map Properties, Stack, Vector. More Utility Classes, String Tokenizer, Bit Set, Date, Calendar, Random, Formatter, Scanner

Unit - V

GUI Programming with Swing – Introduction, Limitations of AWT, MVC Architecture, Components, Containers. Exploring AWT Controls, Understanding Layout Managers, Flow Layout, Border Layout, Grid Layout, Card Layout, Grid Bag Layout.

Event Handling- The Delegation Event Model- Events, Event Sources, Event Listeners, Event Classes, Handling Mouse And Keyboard Events, Adapter Classes, Inner Classes, Anonymous Inner Classes.

A Simple Swing Application, Applets – Applets and HTML, Security Issues, Applets and Applications, Passing Parameters to Applets. Exploring Swing Controls- JLabel and Image Icon, JText Field, The Swing Buttons- JButton, JToggleButton, JCheckBox, JRadioButton, JTabbedPane, JScrollPane, JList, JComboBox, Swing Menus, Dialogs.

TEXT BOOKS:

1. Java The complete reference, 9th edition, Herbert Schildt, McGraw Hill Education (India) Pvt. Ltd.
2. Understanding Object-Oriented Programming with Java, updated edition, T. Budd, Pearson Education.

REFERENCE BOOKS:

1. An Introduction to programming and OO design using Java, J. Nino and F.A. Hosch, John Wiley & sons
2. Introduction to Java programming, Y. Daniel Liang, Pearson Education.
3. Object Oriented Programming through Java, P. Radha Krishna, University Press.
4. Programming in Java, S. Malhotra, S. Chudhary, 2nd edition, Oxford Univ. Press.
5. Java Programming and Object-oriented Application Development, R. A. Johnson, Cengage Learning.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)**

21CS431PC-DESIGN AND ANALYSIS OF ALGORITHMS

B.Tech. II Year II Semester

L T P C

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Course Objectives:

- Introduces the notations for analysis of the performance of algorithms.
- Introduces the data structure disjoint sets.
- 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 NP complete.

Course Outcomes:

- Ability to analyze the performance of algorithms
- Ability to choose appropriate data structures and algorithm design methods for a specified application
- Ability to understand how the choice of data structures and the algorithm design methods impact the performance of programs

UNIT I:

Introduction: Algorithm, Pseudo code for expressing algorithms, Performance Analysis- Space complexity, Time complexity, Asymptotic Notation- Big oh notation, Omega notation, Theta notation and Little oh notation, Probabilistic analysis, Amortized analysis.

Divide and conquer: General method, applications-Binary search, Quick sort, Merge sort, Strassen's matrix multiplication.

UNIT II:

Disjoint Sets: Disjoint set operations, union and find algorithms.

Backtracking: General method, applications, n-queen's problem, sum of subsets problem, graph coloring.

UNIT - III

Dynamic Programming: General method, applications- Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Traveling sales person problem, Reliability design.

UNIT - IV

Greedy method: General method, applications-Job sequencing with deadlines, knapsack problem, Minimum cost spanning trees, Single source shortest path problem.

UNIT V:

Branch and Bound: General method, applications - Travelling sales person problem, 0/1 knapsack problem- LC Branch and Bound solution, FIFO Branch and Bound solution.

NP-Hard and NP-Complete problems: Basic concepts, non deterministic algorithms, NP -Hard and NP-Complete classes, Cook's theorem.

TEXT BOOKS:

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharam, Galgotia publications pvt. Ltd.
2. Foundations of Algorithm, 4th edition, R. Neapolitan and K. Naimipour, Jones and Bartlett Learning.
3. Design and Analysis of Algorithms, P. H. Dave, H. B. Dave, Pearson Education, 2008.

REFERENCES:

1. Computer Algorithms, Introduction to Design and Analysis, 3rd Edition, Sara Baase, Allen, Van, Gelder, Pearson Education.
2. Algorithm Design: Foundations, Analysis and Internet examples, M. T. Goodrich and R. Tomassia, John Wiley and sons.
3. Fundamentals of Sequential and Parallel Algorithm, K. A. Berman and J. L. Paul, Cengage Learning.
4. Introduction to the Design and Analysis of Algorithms, A. Levitin, Pearson Education.
5. Introduction to Algorithms, 3rd Edition, T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein, PHI Pvt. Ltd.
6. Design and Analysis of algorithm, Aho, Ullman and Hopcroft, Pearson Education, 2004.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)**

21CS417PC-OPERATING SYSTEMS

B.Tech. II Year II Semester

L T P C
3 0 0 3

Course Objectives:

- Introduce operating system concepts (i.e., processes, threads, scheduling, synchronization, deadlocks, memory management, file and I/O subsystems and protection)
- Introduce the issues to be considered in the design and development of operating system
- Introduce basic Unix commands, system call interface for process management, interprocess communication and I/O in Unix

Course Outcomes:

- Will be able to control access to a computer and the files that may be shared
- Demonstrate the knowledge of the components of computer and their respective roles in computing.
- Ability to recognize and resolve user problems with standard operating environments.
- Gain practical knowledge of how programming languages, operating systems, and architectures interact and how to use each effectively.

UNIT - I

Operating System - Introduction, Structures – OS **operations**, Simple Batch, Multiprogrammed, Time-shared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, System components, Operating System services, System Calls, OS design implementations.

UNIT - II

Process and CPU Scheduling - Process concepts, **Process, Process control blocks** , Operations on processes, Cooperating Processes, Threads, and Interposes Communication, Scheduling Criteria, Scheduling Algorithms, Multiple -Processor Scheduling. System call interface for process management-fork, exit, wait, waitpid, exec.

UNIT - III

Deadlocks - System Model, Deadlocks Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock Process Management and Synchronization - The Critical Section Problem, Synchronization Hardware, Semaphores, and Classical Problems of Synchronization, Critical Regions, Monitors Interprocess Communication Mechanisms: IPC between processes on a single computer system, IPC between processes on different systems, using pipes, FIFOs, message queues, shared memory.

UNIT - IV

Memory Management and Virtual Memory - Logical versus Physical Address Space, Cache Memory, Swapping, Contiguous Allocation, Paging, Segmentation, Segmentation with Paging, Demand Paging, Page Replacement, Page Replacement Algorithms. Thrashing, dynamic memory allocation.

UNIT - V

File System Interface and Operations -Access methods, Directory Structure, Protection, File System Structure, Allocation methods, Free-space Management. Usage of open creates, read, write, close, lseek, stat, ioctl system calls.

TEXT BOOKS:

1. *Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley*
2. *Advanced programming in the UNIX environment, W.R. Stevens, Pearson education.*

REFERENCE BOOKS:

1. *Operating Systems – Internals and Design Principles Stallings, Fifth Edition–2005, Pearson Education/PHI*
2. *Operating System A Design Approach- Crowley, TMH.*
3. *Modern Operating Systems, Andrew S. Tanenbaum 2nd edition, Pearson/PHI*
4. *UNIX programming environment, Kernighan and Pike, PHI/ Pearson Education*
5. *UNIX Internals -The New Frontiers, U. Vahalia, Pearson Education.*

21CS414PC-OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB

B.Tech. II Year II Semester

L T P C
0 0 2 1**Course Objectives:**

- To write programs using abstract classes.
- To write programs for solving real world problems using java collection frame work.
- To write multithreaded programs.
- To write GUI programs using swing controls in Java.
- To introduce java compiler and eclipse platform.
- To impart hands on experience with java programming.

Course Outcomes:

- Able to write programs for solving real world problems using java collection frame work.
- Able to write programs using abstract classes.
- Able to write multithreaded programs.
- Able to write GUI programs using swing controls in Java.

1. Use LINUX and My SQL for the Lab Experiments. Though not mandatory, encourage the use of Eclipse platform.
2. The list suggests the minimum program set. Hence, the concerned staff is requested to add more problems to the list as needed.

List of Experiments:

1. Write Java Programs on Method Overloading and Method Overriding .
2. Write Java Programs on the Following
 - a. Single Level Inheritance
 - b. Multi-Level Inheritance
 - c. Hierarchical Inheritance
3. Write a Java Program on String Handling Functions.
4. Write a Java program to create an abstract class named Shape that contains two integers and an empty method named print Area (). Provide three classes named Rectangle, Triangle, and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.
5. Write a Java Program to Achieve Multiple Inheritance using Interface.
6. Write a Java Program to Create User-Defined Package and Importing the Package.
7. Write a Java program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num 2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a Number Format Exception. If Num2 were Zero, the program would throw an Arithmetic Exception. Display the exception in a message dialog box.
8. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -, *, % operations. Add a text field to display the result. Handle any possible exceptions like divided by zero.
9. Write the Applet Programs on the following.
 - a) Develop an applet in Java that displays a simple message.
 - b) Develop an applet in Java that receives an integer in one text field, and computes its factorial Value and returns it in another text field, when the button named —Computel is clicked.

10. Write a Java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.
11. Write a Java program for the following: Create a doubly linked list of elements. Delete a given element from the above list. Display the contents of the list after deletion.
12. Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with —Stop| or —Ready| or —Go| should appear above the buttons in selected color. Initially, there is no message shown.
13. Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired (Use Adapter classes).
14. Write a Java program that correctly implements the producer – consumer problem using the concept of inter thread communication.
15. Write a Java program to list all the files in a directory including the files present in all its subdirectories.
16. Write a Java program that implements Quick sort algorithm for sorting a list of names in ascending order
17. Write a Java program that implements Bubble sort algorithm for sorting in descending order and also shows the number of interchanges occurred for the given set of integers.

REFERENCE BOOKS

1. Java for Programmers, P. J. Deitel and H. M. Deitel, 10th Edition Pearson education.
2. Thinking in Java, Bruce Eckel, Pearson Education.
3. Java Programming, D. S. Malik and P. S. Nair, Cengage Learning.
4. Core Java, Volume 1, 9th edition, Cay S. Horstmann and G Cornell, Pearson

21CS412PC: IT WORKSHOP LAB

B.Tech. II Year II Semester

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Task 1: Different generations of computers, computing environments, Identify the peripherals of a computer, components in CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral.

Task 2: Identification of the peripherals of a computer. To prepare a report containing the block diagram of the CPU along with the configuration of each peripheral and its functions. Description of various I/O Devices.

Task 3: A practice on disassembling the components of a PC and assembling them to back to working condition

Task 4: Identification of the various similarities and dissimilarities in the features of Windows and Linux Operating Systems.

Task 5: Introduction to Memory and Storage Devices , I/O Port, Device Drivers, Assemblers, Compilers, Interpreters , Linkers, Loaders.

Task 6: Hardware Troubleshooting (Demonstration): Identification of a problem and fixing a defective PC(improper assembly or defective peripherals).

Task 7: Software Troubleshooting (Demonstration):. Identification of a problem and fixing the PC for any software issues Internet & Networking Infrastructure

Task 8: Identification of various Networking Devices and Transmission Media highlighting their importance.

Task 9: Configuring the network settings to connect to the Internet. Use various web browser settings. Creating Basic, Static Web Pages using HTML.

Task 10: Use Word Processor Software Tool, Spread Sheet Software Tool, Presentation Tool, Data Storage Tool (All are from Libra Office suite)

Task11: Use LaTeX and Word to create Project Certificates

Reference Books:

1. Introduction to Information Technology, IITL Education solution limited by David Anfinen.
2. IT Essentials PC Hardware and Software Companion Guide, Third Edition by David Anfinen.
3. LaTeX Companion-Leslie Lamport, PHI/Pearson.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)**

21CS418PC: OPERATING SYSTEMS LAB

B.Tech. II Year II Semester

L T P C
0 0 3 1.5

Course Objectives:

- To provide an understanding of the design aspects of operating system concepts through simulation
- Introduce basic Unix commands, system call interface for process management, interprocess communication and I/O in Unix

Course Outcomes:

- Simulate and implement operating system concepts such as scheduling, deadlock management, file management and memory management.
- Able to implement C programs using Unix system calls

List of Experiments:

1. Write C programs to simulate the following CPU Scheduling algorithms
 - a) FCFS b) SJF c) Round Robin d) priority
2. Write programs using the I/O system calls of UNIX/LINUX operating system (open, read, write, close, fcntl, seek, stat, opendir, readdir)
3. Write a C program to simulate Bankers Algorithm for Deadlock Avoidance and Prevention.
4. Write a C program to implement the Producer – Consumer problem using semaphores using UNIX/LINUX system calls.
5. Write C programs to illustrate the following IPC mechanisms
 - a) Pipes b) FIFOs c) Message Queues d) Shared Memory
6. Write C programs to simulate the following memory management techniques
 - a) Paging b) Segmentation

TEXT BOOKS:

1. *Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley*
2. *Advanced programming in the Unix environment, W.R.Stevens, Pearson education.*

REFERENCE BOOKS:

1. *Operating Systems – Internals and Design Principles, William Stallings, Fifth Edition–2005, Pearson Education/PHI*
2. *Operating System - A Design Approach-Crowley, TMH.*
3. *Modern Operating Systems, Andrew S Tanenbaum, 2nd edition, Pearson/PHI*
4. *UNIX Programming Environment, Kernighan and Pike, PHI/Pearson Education*
5. *UNIX Internals: The New Frontiers, U. Vahalia, Pearson Education*

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)**

21HS401: SOCIAL INNOVATION IN PRACTICE

B.Tech. II Year II Semester

L T P C
0 0 3 1.5

COURSE OBJECTIVES:

The course should enable the students to:

- Understand social innovation concepts and approaches.
- Understand the community problems, social and economical change.
- Identify new and unaddressed social needs.
- Analysis of social innovation disclosures in different sectors.

Design innovative solutions with Social impact through application of new models of leadership, collective intelligence and creativity techniques.

UNIT-I

INTRODUCTION TO SOCIAL INNOVATION

Core definitions, core elements and common features of social innovation, a topology of social innovations, history of social innovation, social and economic change, Swachh Bharat, Unnat Bharat Abhiyan, National Service Scheme (NSS).

UNIT-II

INTERACTION AND ENGAGEMENT WITH SOCIETY

Engage with community, interact with them to understand the community problems, Understanding social and economical change individuals, organizations and movements.

UNIT-III

PROCESS OF SOCIAL INNOVATION

Understanding the pain/need, description and problem definition, social and economic constraints for affordable and appropriate technology.

UNIT-IV

SOCIAL INNOVATION ACROSS FOUR SECTORS IN INDIA AND GLOBAL SCENARIO

The four sectors the non-profit sector, public sector, the private sector, the informal sector, links between and cross sectors

UNIT-V

SOCIAL INNOVATION CASE STUDIES

Designing and implementing social innovations, report writing and documentation, presentation of the case studies with a focus on impact and vision on society.

TEXT BOOKS:

1. The Power of Social Innovation: How Civic Entrepreneurs Ignite Community Networks for Good 1st Edition by Stephen Goldsmith, Michael R. Bloomberg, Gigi Georges, Tim Glynn Burke.
2. The Open Book of Social Innovation: Ways to Design, Develop and Grow Social Innovation Paperback March, 2010 by Robin Murray, Julia Caulier-Grice, Geoff Mulgan.

REFERENCE BOOKS:

1. Social innovator series: ways to design, develop and grow social innovation, the open book of social innovation by robin murray julie caulier-grice geoff mulgan.
2. The International Handbook on Social Innovation: Collective Action, Social Learning and Transdisciplinary Research Paperback by Frank Moulaert , Diana MacCallum. Guide to Social Innovation by Johannes HAHN and Laszlo ANDOR.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)**

21MC402-GENDER SENSITIZATION LAB

B.Tech. II Year II Sem.

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COURSE DESCRIPTION

This course offers an introduction to Gender Studies, an interdisciplinary field that asks critical questions about the meanings of sex and gender in society. The primary goal of this course is to familiarize students with key issues, questions and debates in Gender Studies, both historical and contemporary. It draws on multiple disciplines – such as literature, history, economics, psychology, sociology, philosophy, political science, anthropology and media studies – to examine cultural assumptions about sex, gender, and sexuality. This course integrates analysis of current events through student presentations, aiming to increase awareness of contemporary and historical experiences of women, and of the multiple ways that sex and gender interact with race, class, caste, nationality and other social identities. This course also seeks to build an understanding and initiate and strengthen programmes combating gender-based violence and discrimination. The course also features several exercises and reflective activities designed to examine the concepts of gender, gender-based violence, sexuality, and rights. It will further explore the impact of gender-based violence on education, health and development.

Objectives of the Course:

- To develop students' sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.
- To expose the students to debates on the politics and economics of work.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.

Learning Outcomes:

- Students will have developed a better understanding of important issues related to gender in contemporary India.
- Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
- Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
- Students will acquire insight into the gendered division of labour and its relation to politics and economics.
- Men and women students and professionals will be better equipped to work and live together as equals.
- Students will develop a sense of appreciation of women in all walks of life.
- Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

UNIT - I: UNDERSTANDING GENDER

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men - Preparing for Womanhood. GrowingupMale.Firstlessonsincaste.

UNIT – II: GENDER ROLES AND RELATIONS

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Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles- Gender Roles and Relationships Matrix-Missing Women-Sex Selection and Its Consequences-Declining Sex Ratio. Demographic Consequences-Gender Spectrum: Beyond the Binary

UNIT – III: GENDER AND LABOUR

Division and Valuation of Labour-Housework: The Invisible Labor- —My Mother doesn't Work. || -Share the Load.||-Work: Its Politics and Economics -Fact and Fiction. Unrecognized and Unaccounted work. -

Gender Development Issues-Gender, Governance and Sustainable Development-Gender and HumanRights-Gender and Mainstreaming

UNIT – IV: GENDER - BASED VIOLENCE

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a HumanRights Perspective-Sexual Harassment: Say No! -Sexual Harassment, not Eve-teasing-Coping with Everyday Harassment- Further Reading: -*Chupulu*".

Domestic Violence: Speaking OutIs Home a Safe Place? -When Women Unite [Film].

Rebuilding Lives.Thinking about Sexual Violence Blaming the Victim—I Fought for my Life||

UNIT – V: GENDER AND CULTURE

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues-Gender Sensitive Language-Gender and Popular Literature - Just Relationships: Being Together as Equals Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Rosa Parks-The Brave Heart.

Note: Since it is Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field from engineering departments.

- *Classes will consist of a combination of activities: dialogue-based lectures, discussions, collaborative learning activities, group work and in-class assignments. Apart from the above prescribed book, Teachers can make use of any authentic materials related to the topics given in the syllabus on "Gender".*
- **ESSENTIAL READING:** The Textbook, -*Towards a World of Equals: A Bilingual Textbook on Gender*" written by A.Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu published by Telugu Akademi, Telangana Government in 2015.

ASSESSMENT AND GRADING:

- ✓ Discussion & Classroom Participation: 20%
- ✓ Project/Assignment: 30%
- End Term Exam: 50%

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)**

21CS507PC: SOFTWARE ENGINEERING & OBJECT ORIENTED ANALYSIS AND DESIGN

B.Tech. III Year I Sem.

L T P C
3 0 0 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
- The main objective is to become familiar with all phases of OOAD and master the main features of the UML.
- Ability to analyze and solve challenging problems in various domains.

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.
- Select the basic elements of modeling such as Things, Relationships and Diagrams depending on the views of UML Architecture and SDLC.
- Design Class and Object Diagrams that represent Static Aspects of a Software System.

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 patterns, process assessment, personal and team process models.

UNIT-II

Process Models : The waterfall model, Incremental process models, Evolutionary process models, The Unified process.
Software Requirements : Functional and non-functional requirements, User requirements, System requirements, Interface specification, the software requirements document.

UNIT-III

System models : Context Models, Behavioral models, Data models, Object models, structured methods
Object-Oriented Design : Objects and object classes, An Object-Oriented design process, Design evolution.
Performing User interface Design : Golden rules, User interface analysis and design, interface analysis, interface design steps, Design evaluation.

UNIT- IV

Introduction to UML : Importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, Architecture, Software Development Life Cycle
Basic Structural Modeling : Classes, Relationships, common Mechanisms, and diagrams

UNIT - V

Class & Object Diagrams : Terms, concepts, modeling techniques for Class & Object Diagrams
Basic Behavioural Modeling-I : Use cases, Use case Diagrams, Activity Diagrams.
Architectural Modeling : Component, Deployment, Component diagrams and Deployment diagrams.

TEXT BOOKS

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition. McGrawHill International Edition.
2. Software Engineering- Sommerville, 7th edition, Pearson education.
3. Grady Booch, James Rumbaugh, Ivar Jacobson : The Unified Modeling Language User Guide, Pearson Education.
4. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado: UML 2 Toolkit, WILEY-Dreamtech India Pvt. Ltd.
5. Grady Booch, James Rumbaugh, Ivar Jacobson: The Unified Modeling Language User Guide, Pearson Education.

REFERENCES

1. Software Engineering- K.K. Agarwal & Yogesh Singh, New Age International Publishers
2. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiely.
3. Pascal Roques: Modeling Software Systems Using UML2, WILEY-Dreamtech India Pvt. Ltd.
4. Meilir Page-Jones: Fundamentals of Object-Oriented Design in UML, Pearson Education.

21CS524PC: FORMAL LANGUAGE AND AUTOMATA THEORY

B.Tech. III Year I Sem.

L T P C
3 0 0 3**Course Objectives:**

- To provide introduction to some of the central ideas of theoretical computer science from the perspective of formal languages.
- To introduce the fundamental concepts of formal languages, grammars and automata theory.
- Classify machines by their power to recognize languages.
- Employ finite state machines to solve problems in computing.
- To understand deterministic and non-deterministic machines.
- To understand the differences between decidability and undesirability.

Course Outcomes:

- Able to understand the concept of abstract machines and their power to recognize the languages.
- Able to employ finite state machines for modeling and solving computing problems.
- Able to design context free grammars for formal languages.
- Able to distinguish between decidability and undesirability.
- Able to gain proficiency with mathematical tools and formal methods.

UNIT - I

Introduction to Finite Automata: Structural Representations, Automata and Complexity, the Central Concepts of Automata Theory – Alphabets, Strings, Languages, Problems.

Nondeterministic Finite Automata: Formal Definition, an application, Text Search, Finite Automata with Epsilon-Transitions.

Deterministic Finite Automata: Definition of DFA, How A DFA Process Strings, The language of DFA, Conversion of NFA with ϵ -transitions to NFA without ϵ -transitions. Conversion of NFA to DFA, Moore and Melay machines

UNIT - II

Regular Expressions: Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Conversion of Finite Automata to Regular Expressions.

Pumping Lemma for Regular Languages, Statement of the pumping lemma, Applications of the Pumping Lemma.

Closure Properties of Regular Languages: Closure properties of Regular languages, Decision Properties of Regular Languages, Equivalence and Minimization of Automata.

UNIT - III

Context-Free Grammars: Definition of Context-Free Grammars, Derivations Using a Grammar, Leftmost and Rightmost Derivations, the Language of a Grammar, Sentential Forms, Parse Trees, Applications of Context-Free Grammars, Ambiguity in Grammars and Languages.

Pumping Lemma for Context-Free Languages: Statement of pumping lemma, Applications Closure

Properties of Context-Free Languages: Closure properties of CFL's, Decision Properties of CFL's

UNIT - IV

Push Down Automata: Definition of the Pushdown Automaton, the Languages of a PDA, Equivalence of PDA's and CFG's, Acceptance by final state, Acceptance by empty stack, Deterministic Pushdown Automata. From CFG to PDA & PDA to CFG.

Turing Machines: Introduction to Turing Machine, Formal Description, Instantaneous description, the language of a Turing machine

Types of Turing machine: Turing machines and halting.

Undesirability: Undesirability, A Language that is Not Recursively Enumerable, An Undecidable Problem That is RE, Undecidable Problems about Turing Machines, Recursive languages, Properties of recursive languages, Post's Correspondence Problem, Modified Post Correspondence problem, Other Undecidable Problems, Counter machines.

TEXT BOOKS:

1. Introduction to Automata Theory, Languages, and Computation, 3rd Edition, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson Education.
2. Theory of Computer Science – Automata languages and computation, Mishra and Chandrashekar, 2nd edition, PHI.

REFERENCE BOOKS:

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 the Theory of Computation, Michael Sipser, 3rd edition, Cengage Learning.
5. Introduction to Formal languages Automata Theory and Computation Kamala Krithivasan, Rama R, Pearson.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)****21CS515PC: COMPUTER NETWORKS**

B.Tech. III Year I Sem.

L T P C
3 0 0 3**Course Objectives**

- The objective of the course is to equip the students with a general overview of the concepts and fundamentals of computer networks.
- Familiarize the students with the standard models for the layered approach to communication between machines in a network and the protocols of the various layers.

Course Outcomes

- Gain the knowledge of the basic computer network technology.
- Gain the knowledge of the functions of each layer in the OSI and TCP/IP reference model.
- Obtain the skills of subletting and routing mechanisms.
- Familiarity with the essential protocols of computer networks, and how they can be applied in network design and implementation.

UNIT – I

Network hardware, Network software, OSI, TCP/IP Reference models, Example Networks: ARPANET, Internet.
Physical Layer: Guided Transmission media: Twisted Pairs, Coaxial Cable, Fiber Optics, Wireless Transmission, the Public Switched Telephone Networks, Mobile Telephone Systems.

UNIT - II

Data link layer: Design issues, Framing, Error Detection and Correction.

Elementary data link protocols: Simplex Protocol, A Simplex Stop and Wait Protocol for an Error-Free Channel, A Simplex Stop and Wait Protocol for Noisy Channel.

Sliding Window Protocols: A One-Bit Sliding Window Protocol, A Protocol Using Go-Back-N, A Protocol Using Selective Repeat, Example Data Link Protocols.

Medium Access sub layer: The Channel Allocation Problem, Multiple Access Protocols: ALOHA, Carrier Sense Multiple Access Protocols, Ethernet, Collision Free Protocols. Wireless LANs, Data Link Layer Switching, Broad Band Wireless, Bluetooth.

UNIT - III

Network Layer: Design Issues, Routing Algorithms: Shortest Path Routing, Flooding, Hierarchical Routing, Broadcast, Multicast, Distance Vector Routing, Congestion Control Algorithms, Internetworking, The Network Layer In The Internet, Quality Of Service.

UNIT - IV

Transport Layer: Transport Services, Elements of Transport Protocols, Connection Management, TCP and UDP Protocols.

UNIT - V

Application Layer –Domain Name System, SNMP, Electronic Mail; The World WEB, HTTP, SMTP, FTP.

TEXT BOOK:

1. Computer Networks -- Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. Pearson Education/PHI

REFERENCE BOOKS:

1. An Engineering Approach to Computer Networks-S. Keshav, 2nd Edition, Pearson Education
2. Data Communications and Networking – Behrouz A. Forouzan. Third Edition TM

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)****21CS529PC: WEB TECHNOLOGIES**

B.Tech. III Year I Sem.

L T P C
3 0 0 3**Course Objectives:**

1. To introduce PHP language for server-side scripting
2. To introduce XML and processing of XML Data with Java
3. To introduce Server-side programming with Java Servlets and JSP
4. To introduce Client-side scripting with Javascript and AJAX.

Course Outcomes

1. gain knowledge of client-side scripting, validation of forms and AJAX programming
2. understand server-side scripting with PHP language
3. understand what is XML and how to parse and use XML Data with Java
4. To introduce Server-side programming with Java Servlets and JSP

UNIT- I Introduction to PHP: Declaring variables, data types, arrays, strings, operators, expressions, control structures, functions, Reading data from web form controls like text boxes, radio buttons, lists etc., Handling File Uploads. Connecting to database (MySQL as reference), executing simple queries, handling results, Handling sessions and cookies

File Handling in PHP: File operations like opening, closing, reading, writing, appending, deleting etc. on text and binary files, listing directories.

UNIT- II HTML Common tags- List, Tables, images, forms, Frames; Cascading Style sheets;

XML: Introduction to XML, Defining XML tags, their attributes and values, Document Type Definition, XML Schemes, Document Object Model, XHTML Parsing XML Data – DOM and SAX Parsers in java.

UNIT – III Introduction to Servlets: Common Gateway Interface (CGI), Life cycle of a Servlet, deploying a servlet, The Servlet API, Reading Servlet parameters, Reading Initialization parameters, Handling Http Request & Responses, Using Cookies and Sessions, connecting to a database using JDBC.

UNIT – IV Introduction to JSP: The Anatomy of a JSP Page, JSP Processing, Declarations, Directives, Expressions, Code Snippets, implicit objects, Using Beans in JSP Pages, Using Cookies and session for session tracking, connecting to database in JSP.

UNIT – V Client-side Scripting: Introduction to Javascript, Javascript language – declaring variables, scope of variables, functions. Event handlers (onclick, onsubmit etc.), Document Object Model, Form validation.

TEXT BOOKS

1. Web Technologies, Uttam K Roy, Oxford University Press
2. The Complete Reference PHP — Steven Holzner, Tata McGraw-Hill

REFERENCE BOOKS

1. Web Programming, building internet applications, Chris Bates 2' edition, Wiley Dreamtech
2. Java Server Pages —Hans Bergsten, SPD O'Reilly,
3. Java Script, D.Flanagan
4. Beginning Web Programming-Jon Duckett WROX.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)**

21CS564PE: ADVANCED ALGORITHMS (PE-I)

B.Tech. III Year I Sem.

L T P C
3 0 0 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:

- Ability to analyze the performance of algorithms
- Ability to choose appropriate data structures and algorithm design methods for a specified application
- Ability to understand how the choice of data structures and the algorithm design methods impact the performance of programs

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 Sales person problem

TEXT BOOK:

1. Introduction to Algorithms," T.H. Cormen, C.E. Leiserson, R.L. Rivest, and C. Stein, Third Edition, PHI.

REFERENCE BOOKS:

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharam, Galgotia publications pvt. Ltd.
2. Design and Analysis Algorithms - Parag Himanshu Dave, Himanshu Bhalchandra Dave Publisher: Pearson
3. Algorithm Design: Foundations, Analysis and Internet examples, M.T. Goodrich and R. Tomassia, John Wiley and sons.
4. Data structures and Algorithm Analysis in C++, Allen Weiss, Second edition, Pearson education.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)****21CS565PE: MULTIMEDIA & INTERACTION DESIGN (PE-I)**

B.Tech. III Year I Sem.

L T P C
3 0 0 3**Course Objectives:**

- Publishing and electronic/multimedia production
- Audiovisual and multimedia archives
- Digital communication and new web and multimedia technologies
- The world of radio, television and cinema

Course Outcomes:

- Create an object such as chair, table etc.
- 3D Modeling. Explain NURBS modeling, Polygon Modeling and Subdivision modeling
- Shortcut keys of : Duplicate Special, Group, Parent and Unparent, Set
- What is Mesh, Channel box, Layer editor Hotbox and Autosave

UNIT – I

Fundamentals of Design: Introduction to elements and principles of design. Learning basics of design – dot, line, shape, form as fundamental design components. Principles of design – simplicity, unity, proportion, emphasis, rhythm and balance. Learning design laws such as Gestalt's law.

UNIT – II

Introduction to UX Design: Understand the evolution of UX design as an industry practice and learning about UX industry experts. Understanding UX design processes and methodologies – user centred design, 5S model. Job roles and responsibilities in the UX industry. UX industry trends.

UNIT – III

History of Art & Evolution of Design: Understanding history of different art forms – modern art, contemporary art, classical art, renaissance art, art appreciation and historical interpretation of art in its cultural contexts. Understanding the evolution in design through forms and everyday things. Journey of design across in the 19th century to modern times. Project submission on Art & design history

UNIT – IV

Introduction to Visual Design: Learning visualization techniques through - visual identity design, metamorphism visualization techniques, brainstorming and mind mapping. Information visualization through infographics and designing brand communication. Documenting and communicating design ideas through presentations, role play and group activities.

UNIT – V

Empathy & understanding problems: Learn how to understand users, techniques to empathize with users and identify key user problems. Learn how to gain insights from empathy and define problems statements. Empathy tools – techniques for getting empathy insights through interviews empathy maps, emotional mapping, observation, project submissions empathy mapping

Text Book:

1. **Introductory Chapter: Multimedia and Interaction**

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)****21CS566PE: COMPUTER FORENSICS (PE-I)**

B.Tech. III Year I Sem.

L T P C
3 0 0 3**UNIT-I**

Computer Forensics Fundamentals: what is computer forensics, use of computer Forensics in Law Enforcement, Computer Forensics Assistance to Human Resources/Employment Proceedings, Computer Forensics Services, Benefits of Professional Forensics Methodology, Steps taken by Computer Forensics Specialists Types of Computer Forensics Technology: Types of Military Computer Forensic Technology, Types of Law Enforcement — Computer Forensic Technology — Types of Business Computer Forensic Technology Computer Forensics Evidence and Capture: Data Recovery Defined — Data Back-up and Recovery — The Role of Back-up in Data Recovery — The Data-Recovery Solution.

UNIT-II

Evidence Collection and Data Seizure: Why Collect Evidence? Collection Options — Obstacles — Types of Evidence — The Rules of Evidence — Volatile Evidence — General Procedure — Collection and Archiving — Methods of Collection — Artifacts — Collection Steps — Controlling Contamination: The Chain of Custody Duplication and Preservation of Digital Evidence: Preserving the Digital Crime Scene — Computer Evidence Processing Steps — Legal Aspects of Collecting and Preserving Computer Forensic Evidence Computer Image Verification and Authentication: Special Needs of Evidential Authentication — Practical Consideration — Practical Implementation.

UNIT - III

Computer Forensics analysis and validation: Determining what data to collect and analyze, validating forensic data, addressing data-hiding techniques, performing remote acquisitions **Network Forensics:** Network forensics overview, performing live acquisitions, developing standard procedures for network forensics, using network tools, examining the honeynet project.

Processing Crime and Incident Scenes: Identifying digital evidence, collecting evidence in private-sector incident scenes, processing law enforcement crime scenes, preparing for a search, securing a computer incident or crime scene, seizing digital evidence at the scene, storing digital evidence, obtaining a digital hash, reviewing a case

UNIT - IV

Current Computer Forensic tools: evaluating computer forensic tool needs, computer forensics software tools, computer forensics hardware tools, validating and testing forensics software E-Mail Investigations: Exploring the role of e-mail in investigation, exploring the roles of the client and server in e-mail, investigating e-mail crimes and violations, understanding e-mail servers, using specialized e-mail forensic tools.

Cell phone and mobile device forensics: Understanding mobile device forensics, understanding acquisition procedures for cell phones and mobile devices.

UNIT - V

Working with Windows and DOS Systems: understanding file systems, exploring Microsoft File Structures, Examining NTFS disks, Understanding whole disk encryption, windows registry, Microsoft startup tasks, MS-DOS startup tasks, virtual machines.

TEXT BOOKS

1. Computer Forensics, Computer Crime Investigation by John R. Vacca, FirewallMedia, New Delhi.
2. Computer Forensics and Investigations by Nelson, Phillips Enfinger, Steuart, CENGAGE Learning

REFERENCE BOOKS

1. Real Digital Forensics by Keith J. Jones, Richard Bejtlich, Curtis W. Rose, Addison-Wesley Pearson Education
2. Forensic Compiling, A Tractitioneris Guide by Tony Sammes and Brian Jenkinson, Springer International edition.
3. Computer Evidence Collection & Presentation by Christopher L.T. Brown, FirewallMedia.
4. Homeland Security, Techniques & Technologies by Jesus Mena, Firewall Media.

21CS567PE: DIGITAL MARKETING (PE-I)

B.Tech. III Year I Sem.

L T P C
3 0 0 3**Course Objectives:**

- Provide students with the essential philosophies and practices of marketing and digital marketing technologies.
- equip students with specific knowledge in the areas of digital marketing communications
- Familiarize students to methodologies, tools and technologies involved in digital marketing.
- Provide students with sufficient background that will allow them to pursue their careers in the Digital Marketing area.

Course Outcomes:

- Translate some of the key marketing and business models that will help to shape your digital marketing strategy
- Review the history of digital marketing to give some perspective to your digital strategic plan
- Describe online market presence, segmentation and the 4 Ps of marketing and their implications for digital marketing
- Discuss the opportunities and risks of integrated digital marketing
- Outline an approach to developing a digital marketing plan
- Explain the key digital marketing activities needed for competitive success

UNIT – I : Introduction to Digital Marketing: Defining digital marketing how is it different from traditional marketing and why is it relevant now? Search Engine Optimization (SEO): Techniques used to optimize any article, website, or blog for traffic & revenue generation.

UNIT – II : Social Media Marketing: Using different social media platforms (Facebook/Instagram/Twitter) to connect with the audience & convert them to a call of action (purchase or form filling).

Search Engine Marketing: Techniques used to increase the visibility of your webpage on Google search results (SERP); Search engine marketing mostly revolves around paid search advertising (text-based ads that are visible on top of every search result).

UNIT – III : Web Analytics: Analyzing the behavior of visitors to a website through reports based on traffic sources, referring sites, page views, and conversion rates of that website.

E-Commerce Management: Maintenance of an online product-listing website through product keyword research, product pricing, positive reviews, and customer retention.

UNIT – IV : Planning and Creating a Website: How to create a website on WordPress and later use website analytics to track the behavior of visitors to a website.

Email Marketing: How to create and send product-based emails in bulk, and ensure that all of the emails have a good open rate and conversion rate.

UNIT – V: Content Strategy: How to create content that matches the user intent and also your business goals.

Affiliate Marketing: Generation of traffic via a third party (company/website). The third party is paid a commission fee to drive traffic to your website.

TEXT BOOK:

1. Marketing 5.0: Technology for Humanity by Philip Kotler, Iwan Setiawan & Hermawan Kartajaya
2. Digital Marketing For Dummies by Russ Henneberry and Ryan Deiss.

REFERENCE BOOKS:

1. Jab, Jab, Jab, Right Hook: How to Tell Your Story in A Noisy Social World by Gary Vaynerchuck

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)****21CS527PC: LINUX PROGRAMING LAB**

B.Tech. III Year I Sem.

L T P C
0 0 2 1**Course Objectives**

- To write shell scripts to solve problems.
- To implement some standard Linux utilities such as ls,cp etc using system calls.
- To develop network-based applications using C.

Course Outcomes

- Ability to understand the Linux environment
- Ability to perform the file management and multiple tasks using shell scripts in Linux environment

List of Experiments**Note: Use Bash for Shell scripts.**

1. Write a shell script that accepts a file name, starting and ending line numbers as arguments and displays all the lines between the given line numbers.
2. Write a shell script that deletes all lines containing a specified word in one or more files supplied as arguments to it.
3. Write a shell script that displays a list of all the files in the current directory to which the user has read, write and execute permissions.
4. Write a shell script that receives any number of file names as arguments checks if every argument supplied is a file or a directory and reports accordingly. Whenever the argument is a file, the number of lines on it is also reported.
5. Write a shell script that accepts a list of file names as its arguments, counts and reports the occurrence of each word that is present in the first argument file on other argument files.
6. Write a shell script to list all of the directory files in a directory.
7. Write a shell script to find factorial of a given integer.
8. Write an awk script to count the number of lines in a file that do not contain vowels.
9. Write an awk script to find the number of characters, words and lines in a file.
10. Write a C program that makes a copy of a file using standard I/O and system calls.
11. Implement in C the following Linux commands using System calls
 - a) cat
 - b) mv
12. Write a C program to list files in a directory.
13. Write a C program to emulate the Unix ls -l command.
14. Write a C program to list for every file in a directory, its inode number and file name.
15. Write a C program that redirects standard output to a file.Ex: ls > f1.
16. Write a C program to create a child process and allow the parent to display "parent"and the child to display "child" on the screen.
17. Write a C program to create a Zombie process.
18. Write a C program that illustrates how an orphan is created.
19. Write a C program that illustrates how to execute two commands concurrently with a command pipe. Ex :- ls -l | sort
20. Write C programs that illustrate communication between two unrelated processes using named pipe (FIFO File).
21. Write a C program in which a parent writes a message to a pipe and the child readsthe message.
22. Write a C program (sender.c) to create a message queue with read and writepermissions to write 3 messages to it with different priority numbers.
23. Write a C program (receiver.c) that receives the messages (from the above message queue as specified in (22)) and displays them.
24. Write a C program that illustrates suspending and resuming processes using signals.

25. Write Client and Server programs in C for connection oriented communication between Server and Client processes using Unix Domain sockets to perform the following:
Client process sends a message to the Server Process. The Server receives the message, reverses it and sends it back to the Client. The Client will then display the message to the standard output device.
26. Write Client and Server programs in C for connection oriented communication between Server and Client processes using Internet Domain sockets to perform the following:
Client process sends a message to the Server Process. The Server receives the message, reverses it and sends it back to the Client. The Client will then display the message to the standard output device.
27. Write C programs to perform the following:
One process creates a shared memory segment and writes a message (“Hello”) into it. Another process opens the shared memory segment and reads the message (i.e. “Hello”). It will then display the message (“Hello”) to standard output device.

TEXT BOOKS:

1. Beginning Linux Programming, 4th Edition, N. Matthew, R. Stones, Wrox, WileyIndia Edition.
2. Advanced Unix Programming, N. B. Venkateswarulu, BS Publications.
3. Unix and Shell Programming, M.G. Venkatesh Murthy, Pearson Education.
4. Unix Shells by Example, 4th Edition, Ellie Quigley, Pearson Education.
5. Sed and Awk, O. Dougherty & A. Robbins, 2nd edition, SPD.

B.Tech. III Year I Sem.

L T P C
0 0 2 1**Course Objectives**

- To understand the working principle of various communication protocols.
- To understand the network simulator environment and visualize a network topology and observe its performance
- To analyze the traffic flow and the contents of protocol frames

Course Outcomes

- Implement data link layer framing methods
- Analyze error detection and error correction codes.
- Implement and analyze routing and congestion issues in network design.
- Implement Encoding and Decoding techniques used in presentation layer
- To be able to work with different network tools

List of Experiments

1. Implement the data link layer framing methods such as character, character-stuffing and bit stuffing.
2. Write a program to compute CRC code for the polynomials CRC-12, CRC-16 and CRC CCIP
3. Develop a simple data link layer that performs the flow control using the sliding window protocol and loss recovery using the Go-Back-N mechanism.
4. Implement Dijkstra's algorithm to compute the shortest path through a network
5. Take an example subnet of hosts and obtain a broadcast tree for the subnet.
6. Implement distance vector routing algorithm for obtaining routing tables at each node.
7. Implement data encryption and data decryption
8. Write a program for congestion control using Leaky bucket algorithm.
9. Write a program for frame sorting technique used in buffers.
10. Wireshark
 - i. Packet Capture Using Wire shark
 - ii. Starting Wire shark
 - iii. Viewing Captured Traffic
 - iv. Analysis and Statistics & Filters.
11. How to run Nmap scan
12. Operating System Detection using Nmap
13. Do the following using NS2 Simulator
 - i. NS2 Simulator-Introduction
 - ii. Simulate to Find the Number of Packets Dropped
 - iii. Simulate to Find the Number of Packets Dropped by TCP/UDP
 - iv. Simulate to Find the Number of Packets Dropped due to Congestion
 - v. Simulate to Compare Data Rate & Throughput.
 - vi. Simulate to Plot Congestion for Different Source/Destination
 - vii. Simulate to Determine the Performance with respect to Transmission of Packets

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)****21CS530PC: WEB TECHNOLOGIES LAB**

B.Tech. III Year I Sem.

L T P C
0 0 3 1.5**Course Objectives**

- To understand client server architecture
- To understand web application using java technologies.

Course Outcomes

- Implement a server side java application
- Implement project-based experience needed for entry into web application and development careers.

Web Technologies Experiments

1. Write a PHP script to print prime numbers between 1-50.
2. PHP script to
 - a. Find the length of a string.
 - b. Count no of words in a string.
 - c. Reverse a string.
 - d. Search for a specific string.
3. Write a PHP script to merge two arrays and sort them as numbers, in descending order.
4. Write a PHP script that reads data from one file and write into another file.
5. Develop static pages (using Only HTML) of an online book store. The pages should resemble: www.amazon.com. The website should contain the following pages.
 - a) Home page
 - b) Registration and user Login
 - c) User Profile Page
 - d) Books catalog
 - e) Shopping Cart
 - f) Payment By credit card
 - g) Order Conformation
6. Validate the Registration, user login, user profile and payment by credit card pages using JavaScript.
7. Create and save an XML document on the server, which contains 10 users information. Write a program, which takes User Id as an input and returns the user details by taking the user information from the XML document.
8. Install TOMCAT web server. Convert the static web pages of assignments 2 into dynamic webpages using servlets and cookies. Hint: Users information (user id, password, credit card number) would be stored in web.xml. Each user should have a separate Shopping Cart.
9. Redo the previous task using JSP by converting the static web pages of assignments 2 into dynamic web pages. Create a database with user information and books information. The books catalogue should be dynamically loaded from the database. Follow the MVC architecture while doing the website.

TEXT BOOK:

1. WEB TECHNOLOGIES: A Computer Science Perspective, Jeffrey C. Jackson, Pearson Education

REFERENCE BOOKS:

1. Deitel H.M. and Deitel P.J., "Internet and World Wide Web How to program", Pearson International, 2012, 4th Edition.
2. J2EE: The complete Reference By James Keogh, McGraw-Hill
3. Bai and Ekedhi, The Web Warrior Guide to Web Programming, Thomson
4. Paul Dietel and Harvey Deitel, "Java How to Program", Prentice Hall of India, 8th Edition
5. Web technologies, Black Book, Dreamtech press.
6. Gopalan N.P. and Akilandeswari J., "Web Technology", Prentice Hall of India

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)****21CS508PC: SOFTWARE ENGINEERING & OBJECT ORIENTED ANALYSIS AND DESIGN LAB**

B.Tech. III Year I Sem.

L T P C
0 0 3 1.5**Course Objectives**

1. To have hands on experience in developing a software project by using various software 2.Engineering principles and methods in each of the phases of software development.
3. The main objective is to become familiar with all phases of OOAD and master the main features of the UML.
4. Ability to analyze and solve challenging problems in various domains.
5. Learn the Object design Principles and understand how to apply them towards implementation.

Course Outcomes

1. Ability to translate end-user requirements into system and software requirements
2. Ability to generate a high-level design of the system from the software requirements
3. Select the basic elements of modeling such as Things, Relationships and Diagrams depending on the views of UML Architecture and SDLC.
4. Design Class and Object Diagrams that represent Static Aspects of a Software System.
5. Design and analyze component and deployment diagrams of software systems.
6. Understand various stages and phases of software project.

List of Experiments

1. Development of problem statement.
2. Preparation of Software Requirement Specification Document, Design Documents and TestingPhase 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

OOAD List of Experiments

1. The student should take up the case study of Unified Library Application which is mentioned in the theory, and Model it in different views i.e Use case view, logical view, component view, Deployment view, Database design, forward and Reverse Engineering, and Generation of documentation of the project.
2. Draw the following diagrams using UML for an ATM system whose description is given below. UML diagrams to be developed are:
 1. Use Case Diagram.
 2. Class Diagram.
 3. Sequence Diagram.
 4. Collaboration Diagram.
 5. State Diagram
 6. Activity Diagram.
 7. Component Diagram
 8. Deployment Diagram.
 9. Test Design.

TEXT BOOKS:

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition.McGrawHill International Edition.
2. Software Engineering- Sommerville, 7th edition, Pearson education.
3. Grady Booch, James Rumbaugh, Ivar Jacobson : The Unified Modeling Language User Guide,Pearson Education.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)**

***21MC505: ENVIRONMENTAL SCIENCE**

B.Tech. III Year I Sem.

L T P C
3 0 0 0

Course Objectives:

- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures.
- Understanding the environmental policies and regulations

Course Outcomes:

- Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development

UNIT - I

Ecosystems: Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

UNIT - II

Natural Resources: Classification of Resources: Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. **Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non-renewable energy sources, use of alternate energy source, case studies.

UNIT - III

Biodiversity And Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

UNIT - IV

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and characteristics of e-Waste and its management. **Pollution control technologies:** Wastewater Treatment methods: Primary, secondary and Tertiary. Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental Issues and Global Efforts:** Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. NAPCC-GoI Initiatives.

UNIT - V

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act-1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio- economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan

(EMP). **Towards Sustainable Future:** Concept of Sustainable Development Goals, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

TEXT BOOKS:

- 1 Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
- 2 Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.
6. Introduction to Environmental Science by Y. Anjaneyulu, BS. Publications.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)****21MC507: ARTIFICIAL INTELLIGENCE**

B.Tech. III Year I Sem.

L T P C
3 0 0 0

Course Objectives: To train the students to understand different types of AI agents, various AI search algorithms, fundamentals of knowledge representation, building of simple knowledge-based systems and to apply knowledge representation, reasoning. Study of Markov Models enable the student ready to step into applied AI.

UNIT - I

Introduction: AI problems, Agents and Environments, Structure of Agents, Problem Solving Agents

Basic Search Strategies: Problem Spaces, Uninformed Search (Breadth-First, Depth-First Search, Depth-first with Iterative Deepening), Heuristic Search (Hill Climbing, Generic Best-First, A*), Constraint Satisfaction (Backtracking, Local Search)

UNIT - II

Advanced Search: Constructing Search Trees, Stochastic Search, A* Search Implementation, Minimax Search, Alpha-Beta Pruning

Basic Knowledge Representation and Reasoning: Propositional Logic, First-Order Logic, Forward Chaining and Backward Chaining, Introduction to Probabilistic Reasoning, Bayes Theorem

UNIT - III

Advanced Knowledge Representation and Reasoning: Knowledge Representation Issues, Nonmonotonic Reasoning, Other Knowledge Representation Schemes

Reasoning Under Uncertainty: Basic probability, Acting Under Uncertainty, Bayes' Rule, Representing Knowledge in an Uncertain Domain, Bayesian Networks

UNIT - IV

Learning: What Is Learning? Rote Learning, Learning by Taking Advice, Learning in Problem Solving, Learning from Examples, Winston's Learning Program, Decision Trees.

UNIT - V

Expert Systems: Representing and Using Domain Knowledge, Shell, Explanation, Knowledge Acquisition.

TEXT BOOK:

1. Russell, S. and Norvig, P, Artificial Intelligence: A Modern Approach, Third Edition, Prentice-Hall, 2010.

REFERENCE BOOKS:

1. Artificial Intelligence, Elaine Rich, Kevin Knight, Shivasankar B. Nair, The McGraw Hill publications, Third Edition, 2009.
2. George F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education, 6th ed., 2009.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)****21CS625PC: INFORMATON SECURITY**

B.Tech. III Year II Sem.

L T P C
3 0 0 3**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,IDEA, Block cipher operation, Stream ciphers,
Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, 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, 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
Web Security Requirements:, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET). Firewall: Design principles, Trusted Systems. Intrusion Detection Systems.

TEXT BOOKS

- 1.Network Security Essentials (Applications and Standards) by William Stallings Pearson Education.
- 2Hack Proofing your network by Ryan Russell, Dan Kaminsky, Rain Forest Puppy, Joe Grand, David Ahmad, Hal Flynn Ido Dubrawsky, Steve W.Manzuik and Ryan Permech, wiley Dreamtech,

REFERENCES

1. Fundamentals of Network Security by Eric Maiwald (Dreamtech press)
2. Network Security - Private Communication in a Public World by Charlie Kaufman, Radia Perlman and Mike Speciner, Pearson/PHI.
- 3.Cryptography and network Security, Third edition, Stallings, PHI/Pearson
- 4.Principles of Information Security, Whitman, Thomson.
- 5.Network Security: The complete reference, Robert Bragg, Mark Rhodes, TMH
6. Introduction to Cryptography, Buchmann, Springer.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)****21CS633PC: MACHINE LEARNING**

B.Tech. III Year II Sem.

L T P C
3 0 0 3**Course Objectives**

- This course explains machine learning techniques such as decision tree learning, Bayesian learning etc.
- To understand computational learning theory.
- To study the pattern comparison techniques.

Course Outcomes

- Understand the concepts of computational intelligence like machine learning
- Ability to get the skill to apply machine learning techniques to address the real time problems in different areas
- Understand the Neural Networks and its usage in machine learning application.

UNIT - I

Introduction - Well-posed learning problems, designing a learning system, Perspectives and issues in machine learning
Concept learning and the general to specific ordering – introduction, a concept learning task, concept learning as search, find-S: finding a maximally specific hypothesis, version spaces and the candidate elimination algorithm, remarks on version spaces and candidate elimination, inductive bias.

Decision Tree Learning – Introduction, decision tree representation, appropriate problems for decision tree learning, the basic decision tree learning algorithm, hypothesis space search in decision tree learning, inductive bias in decision tree learning, issues in decision tree learning.

UNIT - II

Artificial Neural Networks-1– Introduction, neural network representation, appropriate problems for neural network learning, perceptions, multilayer networks and the back-propagation algorithm.

Artificial Neural Networks-2- Remarks on the Back-Propagation algorithm, An illustrative example: face recognition, advanced topics in artificial neural networks.

Evaluation Hypotheses – Motivation, estimation hypothesis accuracy, basics of sampling theory, a general approach for deriving confidence intervals, difference in error of two hypotheses, comparing learning algorithms.

UNIT - III

Bayesian learning – Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum Likelihood and least squared error hypotheses, maximum likelihood hypotheses for predicting probabilities, minimum description length principle, Bayes optimal classifier, Gibbs algorithm, Naïve Bayes classifier, an example: learning to classify text, Bayesian belief networks, the EM algorithm.

Computational learning theory – Introduction, probably learning an approximately correct hypothesis, sample complexity for finite hypothesis space, sample complexity for infinite hypothesis spaces, the mistake bound model of learning.

Instance-Based Learning- Introduction, k -nearest neighbour algorithm, locally weighted regression, radial basis functions, case-based reasoning, remarks on lazy and eager learning.

UNIT- IV

Genetic Algorithms – Motivation, Genetic algorithms, an illustrative example, hypothesis space search, genetic programming, models of evolution and learning, parallelizing genetic algorithms.

Learning Sets of Rules – Introduction, sequential covering algorithms, learning rule sets: summary, learning First-Order rules, learning sets of First-Order rules: FOIL, Induction as inverted deduction, inverting resolution.

Reinforcement Learning – Introduction, the learning task, Q -learning, non-deterministic, rewards and actions, temporal difference learning, generalizing from examples, relationship to dynamic programming.

UNIT - V

Analytical Learning-1- Introduction, learning with perfect domain theories: PROLOG-EBG, remarks on explanation-based learning, explanation-based learning of search control knowledge.

Analytical Learning-2-Using prior knowledge to alter the search objective, using prior knowledge to augment search operators.

Combining Inductive and Analytical Learning – Motivation, inductive-analytical approaches to learning, using prior knowledge to initialize the hypothesis.

TEXT BOOK

1. Machine Learning – Tom M. Mitchell, - MGH

REFERENCE BOOK

2. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)****21CS635PC: COMPILER DESIGN**

B.Tech. III Year II Sem.

L T P C
3 0 0 3**Course Objectives**

- 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, code optimization techniques, intermediate code generation, code generation and data flow analysis.

Course Outcomes

- Demonstrate the ability to design a compiler given a set of language features.
- Demonstrate the the knowledge of patterns, tokens & regular expressions for lexical analysis.
- Acquire skills in using lex tool & yacc tool for develeoping a scanner and parser.
- Design and implement LL and LR parsers
- Design algorithms to do code optimization in order to improve the performance of a program interms of space and time complexity.
- Design algorithms to generate machine code.

UNIT - I**Introduction:** The structure of a compiler, the science of building a compiler, programming language basics**Lexical Analysis:** The Role of the Lexical Analyzer, Input Buffering, Recognition of Tokens, The Lexical-Analyzer Generator Lex, Finite Automata, From Regular Expressions to Automata, Design of a Lexical-Analyzer Generator, Optimization of DFA-Based Pattern Matchers.**UNIT - II****Syntax Analysis:** Introduction, Context-Free Grammars, Writing a Grammar, Top-Down Parsing, Bottom-Up Parsing, Introduction to LR Parsing: Simple LR, More Powerful LR Parsers, Using Ambiguous Grammars and Parser Generators.**UNIT - III****Syntax-Directed Translation:** Syntax-Directed Definitions, Evaluation Orders for SDD's, Applications of Syntax-Directed Translation, Syntax-Directed Translation Schemes, Implementing L-Attributed SDD's.**Intermediate-Code Generation:** Variants of Syntax Trees, Three-Address Code, Types and Declarations, Type Checking, Control Flow, Switch-Statements, Intermediate Code for Procedures.**UNIT - IV****Run-Time Environments:** Stack Allocation of Space, Access to Nonlocal Data on the Stack, Heap Management, Introduction to Garbage Collection, Introduction to Trace-Based Collection.**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, A Simple Code Generator, Peephole Optimization, Register Allocation and Assignment, Dynamic Programming Code-Generation.**UNIT - V****Machine-Independent Optimization:** The Principal Sources of Optimization, Introduction to Data-Flow Analysis, Foundations of Data-Flow Analysis, Constant Propagation, Partial-Redundancy Elimination, Loops in Flow Graphs.**TEXT BOOK:**

1. Compilers: Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman.

REFERENCE BOOKS:

1. Lex & Yacc – John R. Levine, Tony Mason, Doug Brown, O'reilly
2. Compiler Construction, Loudon, Thomson.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)****21CS668PE: INFORMATION RETRIEVAL SYSTEMS (PE-II)**

B.Tech. III Year II Sem.

L T P C
3 0 0 3**Course Objectives:**

- To learn the important concepts and algorithms in IRS
- To understand the data/file structures that are necessary to design, and implement information retrieval (IR) systems.

Course Outcomes:

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

UNIT - I

Introduction to Information Retrieval Systems: 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 - III

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 BOOK:

1. Information Storage and Retrieval Systems – Theory and Implementation, Second Edition, Gerald J. Kowalski, Mark T. Maybury, Springer

REFERENCE BOOKS:

1. Frakes, W.B., Ricardo Baeza-Yates: Information Retrieval Data Structures and Algorithms, Prentice Hall, 1992.
2. Information Storage & Retrieval By Robert Korfhage – John Wiley & Sons.
3. Modern Information Retrieval By Yates and Neto Pearson Education.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)****21CS669PE: BLOCK CHAIN TECHNOLOGY (PE-II)**

B.Tech. III Year II Sem.

L T P C
3 0 0 3**Course Objectives:** To Introduce block chain technology and Cryptocurrency.**Course Outcomes:**

1. Learn about research advances related to one of the most popular technological areas today.
2. Understand Extensibility of Blockchain concepts.
3. Understand and Analyze Blockchain Science.
4. Understand Technical challenges, Business model challenges.

UNIT - I

Introduction: Block chain or distributed trust, Protocol, Currency, Cryptocurrency, How a Cryptocurrency works, Crowdfunding.

UNIT - II

Extensibility of Blockchain concepts, Digital Identity verification, Block chain Neutrality, Digital art, Blockchain Environment.

UNIT - III

Blockchain Science: Gridcoin, Folding coin, Blockchain Genomics, Bitcoin MOOCs.

UNIT - IV

Currency, Token, Tokenizing, Campuscoin, Coindrop as a strategy for Public adoption, Currency Multiplicity, Demurrage currency.

UNIT - V

Technical challenges, Business model challenges, Scandals and Public perception, Government Regulations.

TEXT BOOK:

1. Melanie Swan, Blockchain Blueprint for Economy, O'reilly.

REFERENCE BOOKS:

1. Building Blockchain Apps, Michael Juntao Yuan, Pearson Education
2. Daniel Drescher, Blockchain Basics: A Non-Technical Introduction in 25 Steps 1st Edition
3. Bradley Lakeman, Blockchain Revolution: Understanding the Crypto Economy of the Future. A Non-Technical Guide to the Basics of Cryptocurrency Trading and Investing, ISBN: 1393889158.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)**

21CS670PE: SCRIPTING LANGUAGES (PE-II)

B.Tech. III Year II Sem.

L T P C
3 0 0 3

Course Objectives:

1. This course introduces the script programming paradigm
2. Introduces scripting languages such as Perl, Ruby and TCL.
3. Learning TCL

Course Outcomes:

1. Comprehend the differences between typical scripting languages and typical system and application programming languages.
2. Gain knowledge of the strengths and weakness of Perl, TCL and Ruby; and select an appropriate language for solving a given problem.
3. Acquire programming skills in scripting language

UNIT – I :Introduction: Ruby, Rails, The structure and Execution of Ruby Programs, Package Management with RUBYGEMS, Ruby and web: Writing CGI scripts, cookies, Choice of Webservers, SOAP and WebservicesRubyTk – Simple Tk Application, widgets, Binding events, Canvas, scrolling

UNIT - II :Extending Ruby: Ruby Objects in C, the Jukebox extension, Memory allocation, Ruby Type System, Embedding Ruby to Other Languages, Embedding a Ruby Interpreter

UNIT - III :Introduction to PERL and Scripting ,Scripts and Programs, Origin of Scripting, Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages. PERL- Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines.

UNIT – IV:Advanced perl,Finer points of looping, pack and unpack, filesystem, eval, ,data structures, packages, modules, objects, interfacing to the operating system, Creating Internet ware applications, Dirty Hands Internet Programming, security Issues.

UNIT – V:TCL Structure, syntax, Variables and Data in TCL, Control Flow, Data Structures, input/output, procedures, strings, patterns, files, Advance TCL- eval, source, exec and uplevel commands, Name spaces, trapping errors, event driven programs, making applications internet aware, Nuts and BoltsInternet Programming, Security Issues, C Interface. TkTk-Visual Tool Kits, Fundamental Concepts of Tk, Tk by example, Events and Binding, Perl-Tk.

TEXT BOOKS:

1. The World of Scripting Languages, David Barron,Wiley Publications.
2. Ruby Programming language by David Flanagan and Yukihiro Matsumoto O'Reilly
3. “Programming Ruby” The PragmaticProgrammers guide by Dabve Thomas Second edition

REFERENCE BOOKS:

1. Open Source Web Development with LAMP using Linux Apache, MySQL, Perl and PHP, J. Lee and B. Ware (Addison Wesley) Pearson Education.
2. Perl by Example, E. Quigley, Pearson Education.
3. Programming Perl, Larry Wall, T. Christiansen and J. Orwant, O'Reilly, SPD.
4. Tcl and the Tk Tool kit, Ousterhout, Pearson Education.
5. Perl Power, J. P. Flynt, Cengage Learning

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)**

21CS671PE: SOFTWARE PROCESS AND PROJECT MANAGEMENT (PE-II)

B.Tech. III Year II Sem.

L T P C
3 0 0 3

Course Objectives:

- To acquire knowledge on software process management
- To acquire managerial skills for software project development
- To understand software economics

Course Outcomes:

- Gain knowledge of software economics, phases in the life cycle of software development, project organization, project control and process instrumentation
- Analyze the major and minor milestones, artifacts and metrics from management and technical perspective
- Design and develop software product using conventional and modern principles of software project management

UNIT – I : Software Process Maturity: Software maturity Framework, Principles of Software Process Change, Software Process Assessment, The Initial Process, The Repeatable Process, The Defined Process, The Managed Process, The Optimizing Process.Process Reference Models,Capability Maturity Model (CMM), CMMI, PCMM, PSP, TSP).

UNIT – II : Software Project Management Renaissance,Conventional Software Management, Evolution of Software Economics, Improving Software Economics, The old way and the new way. Life-Cycle Phases and Process artifacts Engineering and Production stages, inception phase, elaboration phase, construction phase, transition phase, artifact sets, management artifacts, engineering artifacts and pragmatic artifacts, model-based software architectures.

UNIT - III

Workflows and Checkpoints of process,Software process workflows, Iteration workflows, Major milestones, minor milestones, periodic status assessments.

Process Planning:Work breakdown structures, Planning guidelines, cost and schedule estimating process, iteration planning process, Pragmatic planning.

UNIT - IV

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

UNIT - V

Peoples' Governance Forum(<http://sites.google.com/view/pgovernanceforum>) PGF Project Case Study: Cyberpolicing FGoI/FGoT for Secure Digital India, Future Software Project Management Practices, Modern Project Profiles, Next-Generation software Economics, Modern Process Transitions.

TEXT BOOKS:

1. Managing the Software Process, Watts S. Humphrey, Pearson Education
2. Software Project Management, Walker Royce, Pearson Education

REFERENCE BOOKS:

1. An Introduction to the Team Software Process, Watts S. Humphrey, Pearson Education, 2000
2. Process Improvement essentials, James R. Persse, O'Reilly, 2006
3. Software Project Management, Bob Hughes & Mike Cotterell, fourth edition, TMH, 2006
4. Applied Software Project Management, Andrew Stellman & Jennifer Greene, O'Reilly, 2006.
5. Head First PMP, Jennifer Greene & Andrew Stellman, O'Reilly, 2007
6. Software Engineering Project Management, Richard H. Thayer & Edward Yourdon, 2nd edition, Wiley India, 2004.
7. Agile Project Management, Jim Highsmith, Pearson education, 2004.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)****21CS626PC: INFORMATION SECURITY LAB**

B.Tech. III Year II Sem.

L T P C
0 0 3 1.5**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 displays the result.
2. Write a C program that contains a string (char pointer) with a value 'Hello world'. The program should AND or and XOR each character in this string with 127 and display the result.
3. Write a Java program to perform encryption and decryption using the following algorithms
 - A. Ceaser cipher
 - B. Substitution cipher
 - C. Hill Cipher
4. Write a C/JAVA program to implement the DES algorithm logic.
5. Write a Java program to implement RSA algorithm.
6. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript.
7. Calculate the message digest of a text using the SHA-1 algorithm in JAVA.
8. Calculate the message digest of a text using the MD5 algorithm in JAVA.
9. Using open SSL for web server - browser communication

TEXT BOOKS

1. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education.
2. Hack Proofing your network by Ryan Russell, Dan Kaminsky, Rain Forest Puppy, Joe Grand, David Ahmad, Hal Flynn Ido Dubrawsky, Steve W.Manzuik and Ryan Permech, wiley Dreamtech,

REFERENCES

1. Fundamentals of Network Security by Eric Maiwald (Dreamtech press)
2. Network Security - Private Communication in a Public World by Charlie Kaufman, Radia Perlman and Mike Speciner, Pearson/PHI.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)**

21CS634PC: MACHINE LEARNING LAB

B.Tech. III Year II Sem.

L T P C
0 0 3 1.5

Course Objective: The objective of this lab is to get an overview of the various machine learning techniques and can able to demonstrate those using python.

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

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

List of Experiments

1. The probability that it is Friday and that a student is absent is 3 %. Since there are 5 school days in a week, the probability that it is Friday is 20 %. What is the probability that a student is absent given that today is Friday? Apply Baye's rule in python to get the result. (Ans: 15%)
2. Extract the data from database using python
3. Implement k-nearest neighbours classification using python
4. Given the following data, which specify classifications for nine combinations of VAR1 and VAR2 predict a classification for a case where VAR1=0.906 and VAR2=0.606, using the result of k- means clustering with 3 means (i.e., 3 centroids)

VAR1	VAR2	CLASS
1.713	1.586	0
0.180	1.786	1
0.353	1.240	1
0.940	1.566	0
1.486	0.759	1
1.266	1.106	0
1.540	0.419	1
0.459	1.799	1
0.773	0.186	1

5. The following training examples map descriptions of individuals onto high, medium and low credit-worthiness.

```

medium skiing design single twenties no -> highRisk high
      golf trading married forties yes -> lowRisk
low speedway transport married thirties yes -> medRisk
medium football banking single thirties yes -> lowRisk high
      flying media married fifties yes -> highRisk
low football security single twenties no -> medRisk
medium golf media single thirties yes -> medRisk
medium golf transport married forties yes -> lowRisk high
      skiing banking single thirties yes -> highRisk low
      golf unemployed married forties yes -> highRisk

```

Input attributes are (from left to right) income, recreation, job, status, age-group, home-owner. Find the unconditional probability of 'golf' and the conditional probability of 'single' given 'medRisk' in the dataset?

6. Implement linear regression using python.
7. Implement Naïve Bayes theorem to classify the English text
8. Implement an algorithm to demonstrate the significance of genetic algorithm
9. Implement the finite words classification system using Back-propagation algorithm

TEXT BOOK

1. Machine Learning – Tom M. Mitchell, - MGH

REFERENCE BOOK

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)**

21CS636PC: COMPILER DESIGN LAB

B.Tech. III Year II Sem.

L T P C
0 0 3 1.5

Course Objectives:

- To understand the various phases in the design of a compiler.
- To understand the design of top-down and bottom-up parsers.
- To understand syntax directed translation schemes.
- To introduce lex and yacc tools.

Course Outcomes:

- Ability to design, develop, and implement a compiler for any language.
- Able to use lex and yacc tools for developing a scanner and a parser.
- Able to design and implement LL and LR parsers.

List of Experiments

1. Write a LEX Program to scan reserved word & Identifiers of C Language
2. Implement Predictive Parsing algorithm
3. Write a C program to generate three address code.
4. Implement SLR(1) Parsing algorithm
5. Design LALR bottom up parser for the given language

```

<program> ::= <block>
<block> ::= { <variabledefinition><slist> }
| { <slist> }
<variabledefinition> ::= int <vardeflist> ;
<vardeflist> ::= <vardec> | <vardec> , <vardeflist>
<vardec> ::= <identifier> | <identifier> [ <constant> ]
<slist> ::= <statement> | <statement> ; <slist>
<statement> ::= <assignment> | <ifstatement> | <whilestatement>
| <block> | <printstatement> | <empty>
<assignment> ::= <identifier> = <expression>
| <identifier> [ <expression> ] = <expression>
<ifstatement> ::= if <bexpression> then <slist> else <slist> endif
| if <bexpression> then <slist> endif
<whilestatement> ::= while <bexpression> do <slist> enddo
<printstatement> ::= print ( <expression> )
<expression> ::= <expression><addingop><term> | <term> | <addingop><term>
<bexpression> ::= <expression><relop><expression>
<relop> ::= < | <= | == | >= | > | !=
<addingop> ::= + | -
<term> ::= <term><multop><factor> | <factor>
<multop> ::= * | /
<factor> ::= <constant> | <identifier> | <identifier> [ <expression> ]
| ( <expression> )
<constant> ::= <digit> | <digit><constant>
<identifier> ::= <identifier><letterordigit> | <letter>
<letterordigit> ::= <letter> | <digit>
<letter> ::= a|b|c|d|e|f|g|h|i|j|k|l|m|n|o|p|q|r|s|t|u|v|w|x|y|z
<digit> ::= 0|1|2|3|4|5|6|7|8|9
<empty> has the obvious meaning

```

Comments (zero or more characters enclosed between the standard C/Java-style comment brackets /*...*/) can be inserted. The language has rudimentary support for 1-dimensional arrays. The declaration `int a[3]` declares an array of three elements, referenced as `a[0]`, `a[1]` and `a[2]`. Note also that you should worry about the scoping of names.

A simple program written in this language is:

```

{ int a[3],t1,t2;
  t1=2;
  a[0]=1; a[1]=2; a[t1]=3;
  t2=-(a[2]+t1*6)/(a[2]-t1);
  if t2>5 then
    print(t2);
  else {
    int t3;

```

```
t3=99;
```

88

```
t2=-25;
```

```
print(-t1+t2*t3); /* this is a comment
```

```
on 2 lines */
```

```
}
```

```
endif
```

```
}
```

TEXT BOOK

1. Compilers: Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman.

REFERENCE BOOKS

1. Lex & Yacc – John R. Levine, Tony Mason, Doug Brown, O'reilly

2. Compiler Construction, Loudon, Thomson.

21EN603HS: ADVANCED ENGLISH COMMUNICATION SKILLS LAB

B.Tech. III Year II Sem.

L T P C
0 0 3 1.5**1. INTRODUCTION:**

The introduction of the Advanced Communication Skills Lab is considered essential at 3rd year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalized context.

The proposed course should be a laboratory course to enable students to use 'good' English and perform the following:

- Gathering ideas and information to organize ideas relevantly and coherently.
- Engaging in debates.
- participating in group discussions.
- Facing interviews.
- Writing project/research reports/technical reports.
- Making oral presentations.
- Writing formal letters.
- Transferring information from non-verbal to verbal texts and vice-versa.
- Taking part in social and professional communication.

2. OBJECTIVES:

This Lab focuses on using multi-media instruction for language development to meet the following targets:

1. To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
2. Further, they would be required to communicate their ideas relevantly and coherently in writing.
3. To prepare all the students for their placements.

3. SYLLABUS:

The following course content to conduct the activities is prescribed for the Advanced English Communication Skills (AECS) Lab:

1. Activities on Fundamentals of Inter-personal Communication and Building Vocabulary - Starting a conversation – responding appropriately and relevantly – using the right body language– Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.
2. Activities on Reading Comprehension –General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading& effective googling.
3. Activities on Writing Skills – Structure and presentation of different types of writing – letter writing/Resume writing/ e-correspondence/Technical report writing/ – planning for writing –improving one's writing.
4. Activities on Presentation Skills – Oral presentations (individual and group) through JAM Sessions/seminars/PPTs and written presentations through posters/projects/reports/ emails/assignments etc.
5. Activities on Group Discussion 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-conference and Mock Interviews.

The Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructural facilities to accommodate at least 35 students in the lab:

- Spacious room with appropriate acoustics.
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system
- P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ
- T. V, a digital stereo & Camcorder
- Headphones of High quality

5. SUGGESTED SOFTWARE:

The software consisting of the prescribed topics elaborated above should be procured and used.

- Oxford Advanced Learner's Compass, 7th Edition
- DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.
- Lingua TOEFL CBT Insider, by Dream tech
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)

TEXT BOOKS:

1. Effective Technical Communication by M Asharaf Rizvi. McGraw Hill Education (India) Pvt. Ltd. 2nd Edition
2. Academic Writing: A Handbook for International Students by Stephen Bailey, Routledge, 5th Edition.

REFERENCES:

1. Learn Correct English – A Book of Grammar, Usage and Composition by Shiv K. Kumar and Hemalatha Nagarajan. Pearson 2007
2. Professional Communication by Aruna Koneru, McGraw Hill Education (India) Pvt. Ltd, 2016.
3. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
4. Technical Communication by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.
5. English Vocabulary in Use series, Cambridge University Press 2008.
6. Handbook for Technical Communication by David A. McMurrey & Joanne Buckley. 2012. Cengage Learning.
7. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
8. Job Hunting by Colm Downes, Cambridge University Press 2008.
9. English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hill 2009

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)****21MC604: INTELLECTUAL PROPERTY RIGHTS**

B.Tech. III Year II Sem.

L T P C
3 0 0 0**UNIT – I**

Introduction to Intellectual property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

UNIT – II

Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting, and evaluating trade mark, trade mark registration processes.

UNIT – III

Law of copy rights: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law. Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

UNIT – IV

Trade Secrets: Trade secrete law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade secrete litigation. Unfair competition: Misappropriation right of publicity, false advertising.

UNIT – V

New development of intellectual property: new developments in trade mark law; copy right law, patent law, intellectual property audits. International overview on intellectual property, international – trade mark law, copy right law, international patent law, and international development in trade secrets law.

TEXT & REFERENCE BOOKS:

1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning.
2. Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, Tata McGraw Hill Publishing company ltd

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)****21MC606: CYBER SECURITY**

B.Tech. III Year II Sem.

L T P C
3 0 0 0**Prerequisites: NIL****Course objectives:**

- To familiarize various types of cyber-attacks and cyber-crimes
- To give an overview of the cyber laws
- To study the defensive techniques against these attacks

Course Outcomes: The students will be able to understand cyber-attacks, types of cybercrimes, cyber laws and also how to protect them self and ultimately the entire Internet community from such attacks.

UNIT - I

Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing, Methods of defense, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.

UNIT - II

Cyberspace and the Law & Cyber Forensics: Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy. Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniques for Forensics Auditing.

UNIT - III

Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

UNIT- IV

Cyber Security: Organizational Implications: Introduction, cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations. **Cybercrime and Cyber terrorism:** Introduction, intellectual property in the cyberspace, the ethical dimension of cybercrimes the psychology, mindset and skills of hackers and other cyber criminals.

UNIT - V

Privacy Issues: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains-medical, financial, etc.

Cybercrime: Examples and Mini-Cases

Examples: Official Website of Maharashtra Government Hacked, Indian Banks Lose Millions of Rupees, Parliament Attack, Pune City Police Bust Nigerian Racket, e-mail spoofing instances.

Mini-Cases: The Indian Case of online Gambling, An Indian Case of Intellectual Property Crime, Financial Frauds in Cyber Domain.

TEXT BOOKS:

1. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley
2. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.

REFERENCES:

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin, CRC Press T&F Group.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)****21SM701MS: BUSINESS ECONOMICS AND FINANCIAL ANALYSIS**

B.Tech. IV Year I Sem.

L T P C

3 0 0 3

Course Objective:

- To learn the basic Business types, impact of the Economy on Business and Firms specifically.
- To analyze the Business from the Financial Perspective.

Course Outcome:

- The students will understand the various Forms of Business and the impact of economic variables on the Business.
- The Demand, Supply, Production, Cost, Market Structure, Pricing aspects are learnt.
- The Students can study the firm's financial position by analysing the Financial Statements of a Company

UNIT – I**Introduction to Business and Economics:**

Business: Structure of Business Firm, Theory of Firm, Types of Business Entities, Limited Liability Companies, Sources of Capital for a Company, Non-Conventional Sources of Finance.

Economics: Significance of Economics, Micro and Macro Economic Concepts, Concepts and Importance of National Income, Inflation, Money Supply in Inflation, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist, Multidisciplinary nature of Business Economics.

UNIT - II**Demand and Supply Analysis:**

Elasticity of Demand: Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting.

Supply Analysis: Determinants of Supply, Supply Function & Law of Supply.

UNIT - III**Production, Cost, Market Structures & Pricing:**

Production Analysis: Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions.

Cost analysis: Types of Costs, Short run and Long run Cost Functions.

Market Structures: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, Monopolistic Competition.

Pricing: Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, Cost Volume Profit Analysis.

UNIT - IV

Financial Accounting: Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, Preparation of Final Accounts.

UNIT - V

Financial Analysis through Ratios: Concept of Ratio Analysis, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios (simple problems). Introduction to Fund Flow and Cash Flow Analysis (simple problems).

TEXT BOOKS:

1. D.D. Chaturvedi, S.L. Gupta, Business Economics - Theory and Applications, International Book House Pvt. Ltd. 2013.
2. Dhanesh K Khatri, Financial Accounting, Tata McGraw Hill, 2011.
3. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata McGraw Hill Education Pvt. Ltd. 2012.

REFERENCES:

1. Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.
2. S.N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting, 5e, Vikas Publications, 2013.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)**

21CS738PC: DATA ANALYTICS USING R

B.Tech. IV Year I Sem.

L T P C
3 0 0 3

Course Objectives

- To explore the fundamental concepts of data analytics.
- To learn the principles and methods of statistical analysis
- Discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of the algorithms.
- To understand the various search methods and visualization techniques.

Course Outcomes

After completion of this course students will be able to

- Understand the impact of data analytics for business decisions and strategy
- Carry out data analysis/statistical analysis
- To carry out standard data visualization and formal inference procedures
- Design Data Architecture
- Understand various Data Sources

UNIT - I

Data Management: Design Data Architecture and manage the data for analysis, understand various sources of Data like Sensors/Signals/GPS etc. Data Management, Data Quality (noise, outliers, missing values, duplicate data) and Data Processing & Processing.

UNIT - II

Data Analytics: Introduction to Analytics, Introduction to Tools and Environment, Application of Modeling in Business, Databases & Types of Data and variables, Data Modeling Techniques, Missing Imputations etc. Need for Business Modeling.

UNIT - III

Regression – Concepts, Blue property assumptions, Least Square Estimation, Variable Rationalization, and Model Building etc.

Introducing to R: R Data Structures – Help functions in R – Vectors – Scalars – Declarations – recycling – Common Vector operations – Using all and any – Vector zed operations – NA and NULL values – Filtering – Victories if-then else – Vector Equality – Vector Element names

UNIT – IV

Interfacing R– Parallel R – Basic Statistics – Linear Model – Generalized linear models – Non-linear models – Time Series and Auto -correlation – Clustering ,Creating Data Frames –Matrix-like operations in frames – Merging Data Frames – Applying functions to Data frames

UNIT – V

Factors and Tables – factors and levels – Common functions used with factors – Working with tables - Other factors and table related functions

TEXT BOOKS

1. Student's Handbook for Associate Analytics – II, III.
2. Norman Mat off, "The Art of R Programming: A Tour of Statistical Software Design", No Starch Press, 2011

REFERENCES:

1. Jared P. Lander, "R for Everyone: Advanced Analytics and Graphics", Addison-Wesley Data & Analytics Series, 2013
2. Mark Gardener, "Beginning R – The Statistical Programming Language", Wiley, 2013.
3. Robert Knell, "Introductory R: A Beginner's Guide to Data Visualization, Statistical Analysis and Programming in R", Amazon Digital South Asia Services Inc, 2013.'

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)**

21CS772PE: NATURAL LANGUAGE PROCESSING (PE-III)

B.Tech. IV Year I Sem.

L T P C
3 0 0 3

Course Objectives

- Introduce to some of the problems and solutions of NLP and their relation to linguistics and statistics.

Course Outcomes

- Show sensitivity to linguistic phenomena and an ability to model them with formal grammars.
- Understand and carry out proper experimental methodology for training and evaluating empirical NLP systems
- Able to manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods.
- Able to design, implement, and analyze NLP algorithms
- Able to design different language modeling Techniques.

UNIT - I

Finding the Structure of Words: Words and Their Components, Issues and Challenges, Morphological Models

Finding the Structure of Documents: Introduction, Methods, Complexity of the Approaches, Performances of the Approaches

UNIT - II

Syntax Analysis: Parsing Natural Language, Treebanks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms, Models for Ambiguity Resolution in Parsing, Multilingual Issues

UNIT - III

Semantic Parsing: Introduction, Semantic Interpretation, System Paradigms, Word Sense Systems, Software.

UNIT - IV

Predicate-Argument Structure, Meaning Representation Systems, Software.

UNIT - V

Discourse Processing: Cohesion, Reference Resolution, Discourse Cohesion and Structure **Language Modeling:** Introduction, N-Gram Models, Language Model Evaluation, Parameter Estimation, Language Model Adaptation, Types of Language Models, Language-Specific Modeling Problems, Multilingual and Crosslingual Language Modeling

TEXT BOOKS

1. Multilingual natural Language Processing Applications: From Theory to Practice –Daniel M. Bikel and Imed Zitouni, Pearson Publication
2. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary

REFERENCE BOOK

1. Speech and Natural Language Processing - Daniel Jurafsky & James H Martin, Pearson Publications

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)**

21CS773PE: BUSINESS INTELLIGENCE (PE-III)

B.Tech. IV Year I Sem.

L T P C
3 0 0 3

Course Objectives:

1. This course is concerned with extracting data from the information systems that deal with the day-to-day operations and transforming it into data that can be used by businesses to drive high-level decision making
2. Students will learn how to design and create a data warehouse, and how to utilize the process of extracting, transforming, and loading (ETL) data into data warehouses.

Course Outcomes:

1. Understand architecture of data warehouse and OLAP operations.
2. Understand Fundamental concepts of BI and Analytics
3. Application of BI Key Performance indicators
4. Design of Dashboards, Implementation of Web Analytics
5. Understand Utilization of Advanced BI Tools and their Implementation.
6. Implementation of BI Techniques and BI Ethics.

UNIT - I

DATA WAREHOUSE: Data Warehouse-Data Warehouse Architecture- Multidimensional Data Model- Data cube and OLAP Technology-Data Warehouse Implementation -DBMS schemas for Decision support - Efficient methods for Data cube computation.

UNIT - II

Business Intelligence: Introduction – Definition, Leveraging Data and Knowledge for BI, BI Components, BI Dimensions, Information Hierarchy, Business Intelligence and Business Analytics. BI Life Cycle. Data for BI - Data Issues and Data Quality for BI.

UNIT - III

BI Implementation - Key Drivers, Key Performance Indicators and Performance Metrics, BI Architecture/Framework, Best Practices, Business Decision Making, Styles of BI-vent-Driven alerts - A cyclic process of Intelligence Creation. The value of Business Intelligence-Value driven & Information use.

UNIT - IV

Advanced BI – Big Data and BI, Social Networks, Mobile BI, emerging trends, Description of different BI-Tools (Pentaho, KNIME)

UNIT - V

Business intelligence implementation-Business Intelligence and integration implementation-connecting in BI systems-Issues of legality- Privacy and ethics- Social networking and BI.

TEXT BOOKS:

1. Data Mining – Concepts and Techniques - JIAWEI HAN & MICHELINE KAMBER, Elsevier.
2. Rajiv Sabherwal “Business Intelligence” Wiley Publications, 2012.

REFERENCE BOOKS:

1. Efraim Turban, Ramesh Sharda, Jay Aronson, David King, Decision Support and Business Intelligence Systems, 9th Edition, Pearson Education, 2009.
2. David Loshin, Business Intelligence - The Savy Manager's Guide Getting Onboard with Emerging IT, Morgan Kaufmann Publishers, 2009.
3. Philo Janus, Stacia Misner, Building Integrated Business Intelligence Solutions with SQL Server, 2008 R2 & Office 2010, TMH, 2011.
4. Business Intelligence Data Mining and Optimization for decision making [Author: Carlo-Verellis] [Publication: (Wiley)].
5. Data Warehousing, Data Mining & OLAP- Alex Berson and Stephen J. Smith- Tata McGraw- Hill Edition, Tenth reprint 2007.
6. Building the Data Warehouse- W. H. Inmon, Wiley Dreamtech India Pvt. Ltd.
7. Data Mining Introductory and Advanced topics –MARGARET H DUNHAM, PEA.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)**

21CS774PE: MOBILE AND WIRELESS SECURITY (PE-III)

B.Tech. IV Year I Sem.

L T P C
3 0 0 3

Course Educational Objectives: This skill oriented course equips the system Administrators with the skills required to protect & recover the computer systems & networks from various security threats.

Course Outcomes:

- Familiarize with the issues and technologies involved in designing a wireless and mobile system that is robust against various attacks.
- Gain knowledge and understanding of the various ways in which wireless networks can be attacked and tradeoffs in protecting networks.
- Have a broad knowledge of the state-of-the-art and open problems in wireless and mobile security, thus enhancing their potential to do research or pursue a career in this rapidly developing area.
- Learn various security issues involved in cloud computing & issues related to GPRS ,3G.

UNIT-I : Security Issues in Mobile Communication: Mobile Communication History, Security – Wired Vs Wireless, Security Issues in Wireless and Mobile Communications, Security Requirements in Wireless and Mobile Communications, Security for Mobile Applications, Advantages and Disadvantages of Application – level Security.

UNIT-II : Security of Device, Network, and Server Levels: Mobile Devices Security Requirements, Mobile Wireless network level Security, Server Level Security. Application Level Security in Wireless Networks: Application of WLANs, Wireless Threats, Some Vulnerabilities and Attach Methods over WLANs, Security for 1G Wi-Fi Applications, Security for 2G Wi-Fi Applications, Recent Security Schemes for Wi-Fi Applications

UNIT-III : Application Level Security in Cellular Networks: Generations of Cellular Networks, Security Issues and attacks in cellular networks, GSM Security for applications, GPRS Security for applications, UMTS security for applications, 3G security for applications, Some of Security and authentication Solutions.

UNIT-IV : Application Level Security in MANETs: MANETs, Some applications of MANETs, MANET Features, Security Challenges in MANETs, Security Attacks on MANETs, External Threats for MANET applications, Internal threats for MANET Applications, Some of the Security Solutions. Ubiquitous Computing, Need for Novel Security Schemes for UC, Security Challenges for UC, and Security Attacks on UC networks, Some of the security solutions for UC

UNIT V : Data Center Operations - Security challenge, implement “Five Principal Characteristics of Cloud Computing, Data center Security Recommendations Encryption for Confidentiality and Integrity, Encrypting data at rest, Key Management Lifecycle, Cloud Encryption Standards.

TEXT BOOKS:

1. Pallapa Venkataram, Satish Babu: “Wireless and Mobile Network Security”, 1st Edition, Tata McGraw Hill,2010.
2. Frank Adelstein, K.S.Gupta : “Fundamentals of Mobile and Pervasive Computing”, 1st Edition, Tata McGraw Hill 2005.

REFERENCES:

1. Randall k. Nichols, Panos C. Lekkas : “Wireless Security Models, Threats and Solutions”, 1st Edition, Tata McGraw Hill, 2006.
2. Bruce Potter and Bob Fleck : “802.11 Security” , 1st Edition, SPD O’REILLY 2005.
3. James Kempf: “Guide to Wireless Network Security, Springer. Wireless Internet Security – Architecture and Protocols”, 1st Edition, Cambridge University Press, 2008.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)****21CS775PE: CLOUD COMPUTING (PE-III)**

B.Tech. IV Year I Sem.

L T P C
3 0 0 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:

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

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, Manjrasoft, Aneka Platform

TEXT BOOK:

1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014

REFERENCE BOOKS:

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012.
3. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, O'Reilly, SPD, rp 2011.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)****21CS776PE: CYBER FORENSICS (PE-III)**

B.Tech. IV Year I Sem.

L T P C
3 0 0 3**Course Objectives:**

- To provide digital evidences which are obtained from digital media.
- In order to understand the objectives of computer forensics, first of all, people have to recognize the different roles computer plays in a certain crime.
- According to a snippet from the United States Security Service, the functions computer has in different kinds of crimes.

Course Outcomes:

- Students will understand the usage of computers in forensic, and how to use various forensic tools for a wide variety of investigations.
- It gives an opportunity to students to continue their zeal in research in computer forensics

UNIT - I

Introduction of Cybercrime: Types, The Internet spawns crime, Worms versus viruses, Computers' roles in crimes, Introduction to digital forensics, Introduction to Incident - Incident Response Methodology – Steps - Activities in Initial Response, Phase after detection of an incident

UNIT - II

Initial Response and forensic duplication, Initial Response & Volatile Data Collection from Windows system - Initial Response & Volatile Data Collection from Unix system – Forensic Duplication: Forensic duplication: Forensic Duplicates as Admissible Evidence, Forensic Duplication Tool Requirements, Creating a Forensic Duplicate/Qualified Forensic Duplicate of a Hard Drive

UNIT - III

Forensics analysis and validation: Determining what data to collect and analyze, validating forensic data, addressing data-hiding techniques, performing remote acquisitions

Network Forensics: Network forensics overview, performing live acquisitions, developing standard procedures for network forensics, using network tools, examining the honeynet project.

UNIT - IV

Current Forensic tools: evaluating computer forensic tool needs, computer forensics software tools, computer forensics hardware tools, validating and testing forensics software E-Mail Investigations: Exploring the role of e-mail in investigation, exploring the roles of the client and server in e-mail, investigating e-mail crimes and violations, understanding e-mail servers, using specialized e-mail forensic tools.

Cell phone and mobile device forensics: Understanding mobile device forensics, understanding acquisition procedures for cell phones and mobile devices.

UNIT - V

Working with Windows and DOS Systems: understanding file systems, exploring Microsoft File Structures, Examining NTFS disks, Understanding whole disk encryption, windows registry, Microsoft startup tasks, MS-DOS startup tasks, virtual machines.

TEXT BOOKS:

1. Kevin Mandia, Chris Prosise, Incident Response and computer forensics, Tata McGraw Hill, 2006.
2. Computer Forensics, Computer Crime Investigation by John R. Vacca, Firewall Media, Delhi.
3. Computer Forensics and Investigations by Nelson, Phillips Enfinger, Stuart, cengage Learning

REFERENCE BOOKS:

1. Real Digital Forensics by Keith J. Jones, Richard Bejtich, Curtis W. Rose, Addison- Wesley Pearson Education

Forensic Compiling, A Tractitioneris Guide by Tony Sammes and Brian Jenkinson, Springer

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)**

21CS777PE: PRINCIPLES OF PROGRAMMING LANGUAGES (PE-IV)

B.Tech. IV Year I Sem.

L T P C
3 0 0 3

Course Objectives

- Introduce important paradigms of programming languages
- To provide conceptual understanding of high-level language design and implementation
- Topics include programming paradigms; syntax and semantics; data types, expressions and statements; subprograms and blocks; abstract data types; concurrency; functional and logic programming languages; and scripting languages

Course Outcomes

- Acquire the skills for expressing syntax and semantics in formal notation
- Identify and apply a suitable programming paradigm for a given computing application
- Gain knowledge of and able to compare the features of various programming languages

UNIT - I

Preliminary Concepts: Reasons for Studying Concepts of Programming Languages, Programming Domains, Language Evaluation Criteria, Influences on Language Design, Language Categories, Language Design Trade-Offs, Implementation Methods, Programming Environments

Syntax and Semantics: General Problem of Describing Syntax and Semantics, Formal Methods of Describing Syntax, Attribute Grammars, Describing the Meanings of Programs

UNIT - II

Names, Bindings, and Scopes: Introduction, Names, Variables, Concept of Binding, Scope, Scope and Lifetime, Referencing Environments, Named Constants

Data Types: Introduction, Primitive Data Types, Character String Types, User Defined Ordinal Types, Array, Associative Arrays, Record, Union, Tuple Types, List Types, Pointer and Reference Types, Type Checking, Strong Typing, Type Equivalence

Expressions and Statements: Arithmetic Expressions, Overloaded Operators, Type Conversions, Relational and Boolean Expressions, Short Circuit Evaluation, Assignment Statements, Mixed-Mode Assignment

Control Structures – Introduction, Selection Statements, Iterative Statements, Unconditional Branching, Guarded Commands.

UNIT - III

Subprograms and Blocks: Fundamentals of Sub-Programs, Design Issues for Subprograms, Local Referencing Environments, Parameter Passing Methods, Parameters that Are Subprograms, Calling Subprograms Indirectly, Overloaded Subprograms, Generic Subprograms, Design Issues for Functions, User Defined Overloaded Operators, Closures, Coroutines

Implementing Subprograms: General Semantics of Calls and Returns, Implementing Simple Subprograms, Implementing Subprograms with Stack-Dynamic Local Variables, Nested Subprograms, Blocks, Implementing Dynamic Scoping

Abstract Data Types: The Concept of Abstraction, Introductions to Data Abstraction, Design Issues, Language Examples, Parameterized ADT, Encapsulation Constructs, Naming Encapsulations

UNIT - IV

Concurrency: Introduction, Introduction to Subprogram Level Concurrency, Semaphores, Monitors, Message Passing, Java Threads, Concurrency in Function Languages, Statement Level Concurrency. Exception Handling and Event Handling: Introduction, Exception Handling in Ada, C++, Java, Introduction to Event Handling, Event Handling with Java and C#.

UNIT - V

Functional Programming Languages: Introduction, Mathematical Functions, Fundamentals of Functional Programming Language, LISP, Support for Functional Programming in Primarily Imperative Languages, Comparison of Functional and Imperative Languages

Logic Programming Language: Introduction, an Overview of Logic Programming, Basic Elements of Prolog, Applications of Logic Programming.

Scripting Language: Pragmatics, Key Concepts, Case Study: Python – Values and Types, Variables, Storage and Control, Bindings and Scope, Procedural Abstraction, Data Abstraction, Separate Compilation, Module Library. (Text Book 2)

TEXT BOOKS:

1. Concepts of Programming Languages Robert. W. Sebesta 10/E, Pearson Education.
2. Programming Language Design Concepts, D. A. Watt, Wiley Dreamtech, 2007.

REFERENCE BOOKS:

1. Programming Languages, 2nd Edition, A.B. Tucker, R. E. Noonan, TMH.
2. Programming Languages, K. C. Loudon, 2nd Edition, Thomson, 2003

21CS778PE: DATA VISUALIZATION TECHNIQUES (PE-IV)

B.Tech. IV Year I Sem.

L T P C
3 0 0 3**Course Objective:**

To understand various data visualization techniques.

Course Outcomes:

1. Visualize the objects in different dimensions.
2. Design and process the data for Virtualization.
3. Apply the visualization techniques in physical sciences, computer science, applied mathematics and medical science.
4. Apply the virtualization techniques for research projects. (K1, K3).

UNIT - I

Introduction and Data Foundation: Basics - Relationship between Visualization and Other Fields -The Visualization Process - Pseudo code Conventions - The Scatter plot. Data Foundation - Types of Data - Structure within and between Records - Data Preprocessing - Data Sets

UNIT - II

Foundations for Visualization: Visualization stages - Semiology of Graphical Symbols - The Eight Visual Variables - Historical Perspective - Taxonomies - Experimental Semiotics based on Perception Gibson's Affordance theory – A Model of Perceptual Processing.

UNIT - III

Visualization Techniques: Spatial Data: One-Dimensional Data - Two-Dimensional Data – ThreeDimensional Data - Dynamic Data - Combining Techniques. Geospatial Data: Visualizing Spatial Data - Visualization of Point Data - Visualization of Line Data - Visualization of Area Data - Other Issues in Geospatial Data Visualization Multivariate Data: Point-Based Techniques - Line- Based Techniques -Region-Based Techniques - Combinations of Techniques – Trees Displaying Hierarchical Structures –Graphics and Networks- Displaying Arbitrary Graphs/Networks.

UNIT - IV

Interaction Concepts and Techniques: Text and Document Visualization: Introduction - Levels of Text Representations - The Vector Space Model - Single Document Visualizations -Document Collection Visualizations - Extended Text Visualizations Interaction Concepts: Interaction Operators -Interaction Operands and Spaces - A Unified Framework. Interaction Techniques: Screen Space -Object-Space -Data Space -Attribute Space- Data Structure Space - Visualization Structure - Animating Transformations -Interaction Control

UNIT - V

Research Directions in Virtualizations: Steps in designing Visualizations – Problems in designing effective Visualizations-Issues of Data. Issues of Cognition, Perception, and Reasoning. Issues of System Design Evaluation, Hardware and Applications.

TEXT BOOKS:

1. Matthew Ward, Georges Grinstein and Daniel Keim, "Interactive Data Visualization Foundations, Techniques, Applications", 2010.
2. Colin Ware, "Information Visualization Perception for Design", 2nd edition, Morgan Kaufmann Publishers, 2004.

REFERENCE BOOKS:

1. Robert Spence "Information visualization – Design for interaction", Pearson Education, 2ndEdition, 2007.
2. Alexandru C. Telea, "Data Visualization: Principles and Practice," A. K. Peters Ltd, 2008.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)****21CS779PE: CLOUD SECURITY (PE-IV)**

B.Tech. IV Year I Sem.

L T P C
3 0 0 3**Course Objectives:**

- Cloud Computing is the on-demand availability of computer system resources, especially data storage and computing power, without direct active management by the user.
- The objective of the course is to learn about how the data can be distributed to the different data centres available to many users over the internet.

UNIT-I

Cloud Computing Architectural Framework: Cloud Benefits, Business scenarios, Cloud Computing Evolution, cloud vocabulary, Essential Characteristics of Cloud Computing, Cloud deployment models, Cloud Service Models, Multi-Tenancy, Approaches to create a barrier between the Tenants, cloud computing vendors, Cloud Computing threats, Cloud Reference Model, The Cloud Cube Model, Security for Cloud Computing, How Security Gets Integrated.

UNIT-II

Compliance and Audit: Cloud customer responsibilities, Compliance and Audit Security Recommendations. Portability and Interoperability: Changing providers reasons, Changing providers expectations, Recommendations all cloud solutions, IaaS Cloud Solutions, PaaS Cloud Solutions, SaaS Cloud Solutions.

UNIT-III

Traditional Security, Business Continuity, Disaster Recovery, Risk of insider abuse, Security baseline, Customers actions, Contract, Documentation, Recovery Time Objectives (RTOs), Customers responsibility, Vendor Security Process (VSP).

UNIT-IV**Data Center Operations:**

Data Center Operations, Security challenge, Implement Five Principal Characteristics of Cloud Computing, Data center Security Recommendations. Encryption and Key Management: Encryption for Confidentiality and Integrity, Encrypting data at rest, Key Management Lifecycle, Cloud Encryption Standards, Recommendations.

UNIT-V**Identity and Access Management:**

Identity and Access Management in the cloud, Identity and Access Management functions, Identity and Access Management (IAM) Model, Identity Federation, Identity Provisioning Recommendations, Authentication for SaaS and Paas customers, Authentication for IaaS customers, Introducing Identity Services, Enterprise Architecture with IDaaS , IDaaS Security Recommendations. Virtualization: Hardware Virtualization, Software Virtualization, Memory Virtualization, Storage Virtualization, Data Virtualization, Network Virtualization, Virtualization Security Recommendations.

Text Books:

1. Cloud computing, by Ray Rafael's.
2. Cloud Computing Security: Foundations and Challenges, John R. Vacca.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)****21CS780PE: SMART SENSORS AND NETWORKING (PE-IV)**

B.Tech. IV Year I Sem.

L T P C
3 0 0 3**Course Objectives**

- To acquire the knowledge about various architectures and applications of Sensor Networks
- To understand issues, challenges and emerging technologies for wireless sensor networks
- To learn about various routing protocols and MAC Protocols
- To understand various data gathering and data dissemination methods
- To Study about design principals, node architectures, hardware and software required for implementation of wireless sensor networks.

Course Outcomes

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

- Analyze and compare various architectures of Wireless Sensor Networks
- Understand Design issues and challenges in wireless sensor networks
- Analyze and compare various data gathering and data dissemination methods.
- Design, Simulate and Compare the performance of various routing and MAC protocol.

UNIT – I:

Introduction to Sensor Networks, unique constraints and challenges, Advantage of Sensor Networks, Applications of Sensor Networks, Types of wireless sensor networks

UNIT – II:

Mobile Ad-hoc Networks (MANETs) and Wireless Sensor Networks, Enabling technologies for Wireless Sensor Networks. Issues and challenges in wireless sensor networks

UNIT – III:**Routing protocols, MAC protocols:** Classification of MAC Protocols, S-MAC Protocol, B-MAC protocol, IEEE 802.15.4 standard and ZigBee.**UNIT – IV:**

Dissemination protocol for large sensor network. Data dissemination, data gathering, and data fusion; Quality of a sensor network; Real-time traffic support and security protocols.

UNIT – V:

Design Principles for WSNs, Gateway Concepts Need for gateway, WSN to Internet Communication, and Internet to WSN Communication, Single-node architecture, Hardware components & design constraints, Operating systems and execution environments, introduction to TinyOS and nesC.

Text Books

- 1 Ad-Hoc Wireless Sensor Networks- C. Siva Ram Murthy, B. S. Manoj, Pearson
- 2 Principles of Wireless Networks – Kaveh Pah Laven and P. Krishna Murthy, 2002, PE

Reference Books

- 1 Wireless Digital Communications – Kamilo Feher, 1999, PHI.
- 2 Wireless Communications-Andrea Goldsmith, 2005 Cambridge University Press.
- 3 Mobile Cellular Communication – Gottapu Sasibhushana Rao, Pearson Education, 2012.
- 4 Wireless Communication and Networking – William Stallings, 2003, PHI.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)****21CS781PE: SOCIAL NETWORKS (PE-IV)**

B.Tech. IV Year I Sem.

L T P C
3 0 0 3**Course Objectives:**

This course provides training on the concepts and techniques in social networking. Areas emphasized include social networking for business and professional use; introduction to social network analysis and social network developer tools; understanding public sector media and privacy issues; and using social network concepts for solving real-world issues.

Course Learning Outcomes:

Upon completing this course, students will be able to:

- Demonstrate proficiency and understanding of social networks for business and professional use
- Demonstrate proficiency the use of social network analysis and social network developer tools
- Demonstrate proficiency and understanding of public sector media and privacy
- Demonstrate proficiency in understanding concepts in social networking and utilizing these concepts for solving real-world social network issues.

UNIT I: Understanding Various Social Networking Sites, Social Networks for Business and Professional Use .

UNIT II: Types of Social Networking Content , Introduction to Social Network Analysis

UNIT III: Using Social Network Analysis Development Tools,

UNIT IV: Public Sector Media/machine learning

UNIT V: Big data analysis

Textbook:

- Perspectives on Social Media: A Yearbook.
- Piet A.M. Kommers, Pedro Isaias, and Tomayess Issa

21CS739PC: DATA ANALYTICS USING R LAB

B.Tech. IV Year I Sem.

L T P C
0 0 2 1**Course Objectives**

- To explore the fundamental concepts of data analytics.
- To learn the principles and methods of statistical analysis

Course Outcomes

- Understand the impact of data analytics for business decisions and strategy
- Carry out data analysis/statistical analysis
- To carry out standard data visualization and formal inference procedures
- Design Data Architecture
- Understand various Data Sources

LIST OF EXPERIMENTS

- Introduction to R – Environment
- Data Input & Output (Importing & Exporting)
- Data Manipulation
- Data Visualization
- Basic Statistics (Exploratory Analysis)
- Advanced Analytics (Advanced Statistics)
- Machine Learning using R
- Data Visualization using Tableau – Complementary
- R- Hadoop Integration for Analytics – Complementary

TEXT BOOKS

1. Student's Handbook for Associate Analytics – II, III.
2. Norman Mat off, "The Art of R Programming: A Tour of Statistical Software Design", No Starch Press, 2011

REFERENCES:

1. Jared P. Lander, "R for Everyone: Advanced Analytics and Graphics", Addison-Wesley Data & Analytics Series, 2013
2. Mark Gardener, "Beginning R – The Statistical Programming Language", Wiley, 2013.
3. Robert Knell, "Introductory R: A Beginner's Guide to Data Visualization, Statistical Analysis and Programming in R", Amazon Digital South Asia Services Inc, 2013.'

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)**

21CS882PE: ARTIFICIAL NEURAL SYSTEMS (Professional Elective-V)

B.Tech. IV Year II Sem.

L T P C
3 0 0 3

Course Objectives:

- To understand the biological neural network and to model equivalent neuron models.
- To understand the architecture, learning algorithms
- To know the issues of various feed forward and feedback neural networks.
- To explore the Neuro dynamic models for various problems.

Course Outcomes:

- Upon completing this course, the student will be able to
- Understand the similarity of Biological networks and Neural networks
- Perform the training of neural networks using various learning rules.
- Understanding the concepts of forward and backward propagations.
- Understand and Construct the Hopfield models.

UNIT-I:

Introduction: A Neural Network, Human Brain, Models of a Neuron, Neural Networks viewed as Directed Graphs, Network Architectures, Knowledge Representation, Artificial Intelligence and Neural Networks

Learning Process: Error Correction Learning, Memory Based Learning, Hebbian Learning, Competitive, Boltzmann Learning, Credit Assignment Problem, Memory, Adaption, Statistical Nature of the Learning Process

UNIT-II:

Single Layer Perceptrons: Adaptive Filtering Problem, Unconstrained Organization Techniques, Linear Least Square Filters, Least Mean Square Algorithm, Learning Curves, Learning Rate Annealing Techniques, Perceptron – Convergence Theorem, Relation Between Perceptron and Bayes Classifier for a Gaussian Environment

Multilayer Perceptron: Back Propagation Algorithm XOR Problem, Heuristics, Output Representation and Decision Rule, Computer Experiment, Feature Detection

UNIT-III:

Back Propagation: Back Propagation and Differentiation, Hessian Matrix, Generalization, Cross Validation, Network Pruning Techniques, Virtues and Limitations of Back Propagation Learning, Accelerated Convergence, Supervised Learning

UNIT – IV:

Self-Organization Maps (SOM): Two Basic Feature Mapping Models, Self-Organization Map, SOM Algorithm, Properties of Feature Map, Computer Simulations, Learning Vector Quantization, Adaptive Patter Classification.

UNIT-V:

Neuro Dynamics: Dynamical Systems, Stability of Equilibrium States, Attractors, Neuro Dynamical Models, Manipulation of Attractors as a Recurrent Network Paradigm

Hopfield Models – Hopfield Models, restricted boltzmen machine.

Text Books:

- 1 Neural Networks a Comprehensive Foundations, Simon S Haykin, PHI Ed.,.
- 2 Introduction to Artificial Neural Systems Jacek M. Zurada, JAICO Publishing House Ed. 2006.

Reference Books

- 1 Neural Networks in Computer Inteligance, Li Min Fu TMH 2003.
- 2 Neural Networks -James A Freeman David M S Kapura Pearson Ed., 2004.
- 3 Artificial Neural Networks – B. Vegnanarayana Prentice Hall of India P Ltd 2005

21CS883PE: SOCIAL MEDIA ANALYTICS (Professional Elective-V)

B.Tech. IV Year II Sem.

L T P C
3 0 0 3**Course Outcome:**

- Business Environment and Domain Knowledge (BEDK)
- Critical thinking, Business Analysis, Problem Solving and Innovative Solutions (CBPI)
- Global Exposure and Cross-Cultural Understanding (GECCU)
- Social Responsiveness and Ethics (SRE)
- Effective Communication (EC)
- Leadership and Teamwork (LT)

UNIT-I

Introduction to Social Media Analytics (SMA): Social media landscape, Need for SMA; SMA in Small organizations; SMA in large organizations; Application of SMA in different areas

Network fundamentals and models: The social networks perspective - nodes, ties and influencers, Social network and web data and methods. Graphs and Matrices- Basic measures for individuals and networks. Information visualization

UNIT-II

Making connections: Link analysis. Random graphs and network evolution. Social contexts: Affiliation and identity.

Web analytics tools and techniques: Click stream analysis, A/B testing, online surveys, Use of Google Analytics; Web crawling and Indexing; Natural Language Processing Techniques for Micro-text Analysis

UNIT-III

Facebook Analytics: Introduction, parameters, demographics. Analyzing page audience. Reach and Engagement analysis. Post- performance on FB, Use of Facebook Business Manager; Social campaigns. Measuring and Analyzing social campaigns, defining goals and evaluating outcomes, Network Analysis. (LinkedIn, Instagram, YouTube Twitter etc.

UNIT-IV

Processing and Visualizing Data, Influence Maximization, Link Prediction, Collective Classification. Applications in Advertising and Game Analytics (Use of tools like Unity30 / PyCharm).

Introduction to Python Programming, Collecting and analyzing social media data; visualization and exploration.

UNIT-V

Practical: Students should analyze the social media of any ongoing campaigns and present the findings.

TEXT BOOKS:

1. M.Ganis "social media analytics, IBM Press 2015.
2. Jim Sterne "Social media metrics" Wiley publishers.
3. Oliver Blachnad "Social media ROI" Que publishing.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)****21CS884PE: IOT AUDIT CONTROL AND SECURITY (Professional Elective-V)**

B.Tech. IV Year II Sem.

L T P C
3 0 0 3

Course Description: Management and boards continue to recognize the importance of effectively managing information technology (IT) assets — to meet business objectives and to thoughtfully manage IT related business risks. This course examines the key principles related to auditing information technology processes and related controls and is designed to meet the increasing needs of audit, compliance, security and risk management professionals.

Course Objectives:

- Establish an understanding of the IT environment and the role of the IT auditor,
- Recognize how corporate and IT governance practices impact the IT audit process,
- Develop an understanding of the IT audit process i.e., risk assessment, planning, standards, guidelines and best practices, and
- Survey IT audit approaches to:
 - Systems development and maintenance,
 - IT security,
 - IT service delivery and support,
 - Business continuity and disaster recovery, and Data analytics and fraud detection.

UNIT I: IT environment and role of the IT auditor, corporate governance, Board, audit committee, management and other stakeholder expectations, Audit standards and pronouncements (AICPA, GAAP, GAAS, IIA, ISACA), Audit and other frameworks (tools of the trade) COSO, COBIT, FFIEC, ISO, ITIL.

UNIT II: IT Audit process: *Part 1 – Developing the IT audit plan:* Risk assessment, Audit universe, Audit planning, IT audit process.

UNIT III: *Part 2 – Conducting the IT audit,* Design risk-based audit procedures, Perform risk-based testing, Communication and reporting

UNIT IV: Auditing IT service delivery and support, Risks defined, IT delivery and support processes, Auditing business continuity and disaster recovery, Risks defined, Policy and impact assessment, Plan design and response strategies.

UNIT V: Data analytics and fraud investigations, Risks defined, Key concepts related to data analytics
When a fraud happens – what now? Cloudy days – managing third party risk: Risks defined, what is the cloud? How can companies manage the risk?

TEXT BOOKS:

1. Information Technology Control and Audit, Fourth Edition, Sandra Senft
2. IT Standards, Guidelines, and Tools and Techniques for Audit and Assurance and Control Professionals.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)****21CS885PE: DESIGN PATTERNS (Professional Elective-V)**

B.Tech. IV Year II Sem.

L T P C
3 0 0 3**Course Objectives:**

- The aim of the course is to appreciate the idea behind Design Patterns in handling common problems faced during building an application
- This course covers all pattern types from creational to structural, behavioral to concurrency and highlights the scenarios when one pattern must be chosen over others.

Course Outcomes:

- Create software designs that are scalable and easily maintainable
- Understand the best use of Object Oriented concepts for creating truly OOP programs
- Use creational design patterns in software design for class instantiation
- Use structural design patterns for better class and object composition
- Use behavioral patterns for better organization and communication between the objects
- Use refactoring to compose the methods for proper code packaging
- Use refactoring to better organize the class responsibilities of current code

UNIT - I

Introduction: What is a design pattern? design patterns in Smalltalk MVC, Describing Design Patterns, The Catalog of Design Patterns, Organizing the Catalog, How Design Patterns Solve Design Problems, How to Select a Design Pattern, How to Use a Design Pattern.

UNIT - II

Designing a Document Editor: Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations Spelling Checking and Hyphenation, Summary

UNIT - III

Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns.

UNIT - IV

Structural Pattern: Adapter, Bridge, Composite, Decorator, Façade, Flyweight, Proxy

UNIT - V

Behavioral Patterns: Chain of Responsibility, Command, Interpreter, Iterator, Mediator, Memento, Observer, State, Strategy, Template Method, Visitor.

TEXT BOOK:

1. Design Patterns, Erich Gamma, Pearson Education

REFERENCE BOOKS:

1. Pattern's in Java, Vol -I, Mark Grand, Wiley Dream Tech.
2. Patterns in Java, Vol-II, Mark Grand, Wiley Dream Tech.
3. Java Enterprise Design Patterns Vol-III, Mark Grand, Wiley Dream Tech.
4. Head First Design Patterns, Eric Freeman, O'reilly publications

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)****21CS886PE: CYBER LAWS (Professional Elective-V)**

B.Tech. IV Year II Sem.

L T P C
3 0 0 3**Course Objectives:** Concepts of Technology and Law

- Providing elementary understanding the authorities under IT Act
- Penalties & Offences under IT Act
- Cyber Space Jurisdiction
- Scope of Cyber Laws.

Course Outcomes:

- The student is able to understand the technicalities of law in Cyber World.
- Extensive knowledge regarding jurisdictional issues in IT Act.
- Various important national and international cyber laws.
- Understands the scope of Cyber Law
- The students is able to understand the basic concept of International Technology

Unit 1: Cyber Space- Fundamental definitions -Interface of Technology and Law – Jurisprudence and-Jurisdiction in Cyber Space - Indian Context of Jurisdiction - Enforcement agencies – Need for IT act - UNCITRAL – E-Commerce basics .Information Technology Act, 2000 - Aims and Objects — Overview of the Act – Jurisdiction

Unit 2: Electronic Governance – Legal Recognition of Electronic Records and Electronic Evidence -Digital Signature Certificates - Securing Electronic records and secure digital signatures - Duties of Subscribers - Role of Certifying Authorities - Regulators under the Act –

Unit 3: The Cyber Regulations Appellate Tribunal - Internet Service Providers and their Liability– Powers of Police under the Act – Impact of the Act on other Laws . Cyber Crimes -Meaning of Cyber Crimes –Different Kinds of Cyber crimes – Cyber crimes under IPC,

Unit 4: Cr.P.C and Indian Evidence Law - Cyber crimes under the Information Technology Act,2000 - Cyber crimes under International Law - Hacking Child Pornography, Cyber Stalking, Denial of service Attack, Virus Dissemination, Software Piracy,

Unit 5: Internet Relay Chat (IRC) Crime, Credit Card Fraud, Net Extortion, Phishing etc - Cyber Terrorism Violation of Privacy on Internet - Data Protection and Privacy – Indian Court cases.

TEXT BOOKS:

1. Justice Yatindra Singh: Cyber Laws, Universal Law Publishing Co., New Delhi
2. Farouq Ahmed, Cyber Law in India, New Era publications, New Delhi
3. S.R.Myneni: Information Technology Law(Cyber Laws), Asia Law House, Hyderabad.
4. Chris Reed, Internet Law-Text and Materials, Cambridge University Press.
5. Pawan Duggal: Cyber Law- the Indian perspective Universal Law Publishing Co., New Delhi

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)****21CS887PE: REAL TIME SYSTEMS (Professional Elective-VI)**

B.Tech. IV Year II Sem.

L T P C
3 0 0 3**Course Objectives:**

- To provide broad understanding of the requirements of Real Time Operating Systems.
- To make the student understand, applications of these Real Time features using case studies.

Course Outcomes:

- Be able to explain real-time concepts such as pre-emptive multitasking, task priorities, priority inversions, mutual exclusion, context switching, and synchronization, interrupt latency and response time, and semaphores.
- Able describe how a real-time operating system kernel is implemented.
- Able explain how tasks are managed.
- Explain how the real-time operating system implements time management.
- Discuss how tasks can communicate using semaphores, mailboxes, and queues.
- Be able to implement a real-time system on an embedded processor.
- Be able to work with real time operating systems like RT Linux, Vx Works, MicroC /OSII, Tiny Os

UNIT – I

Introduction: Introduction to UNIX/LINUX, Overview of Commands, File I/O,(open, create, close, lseek, read, write), Process Control (fork, vfork, exit, wait, waitpid, exec).

UNIT - II

Real Time Operating Systems: Brief History of OS, Defining RTOS, The Scheduler, Objects, Services, Characteristics of RTOS, Defining a Task, asks States and Scheduling, Task Operations, Structure, Synchronization, Communication and Concurrency. Defining Semaphores, Operations and Use, Defining Message Queue, States, Content, Storage, Operations and Use

UNIT - III

Objects, Services and I/O: Pipes, Event Registers, Signals, Other Building Blocks, Component Configuration, Basic I/O Concepts, I/O Subsystem

UNIT - IV

Exceptions, Interrupts and Timers: Exceptions, Interrupts, Applications, Processing of Exceptions and Spurious Interrupts, Real Time Clocks, Programmable Timers, Timer Interrupt Service Routines (ISR), Soft Timers, Operations.

UNIT - V

Case Studies of RTOS: RT Linux, MicroC/OS-II, Vx Works, Embedded Linux, and Tiny OS.

TEXT BOOK:

1. Real Time Concepts for Embedded Systems – Qing Li, Elsevier, 2011.

REFERENCE BOOKS:

1. Embedded Systems- Architecture, Programming and Design by Rajkamal, 2007, TMH.
2. Advanced UNIX Programming, Richard Stevens.
3. Embedded Linux: Hardware, Software and Interfacing – Dr. Craig Hollabaugh.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)**

21CS888PE: DATA SCIENCE (Professional Elective-VI)

B.Tech. IV Year II Sem.

L T P C

3 0 0 3

Course Objectives:

- Learn concepts, techniques and tools they need to deal with various facets of data science practice, including data collection and integration
- Understand the basic types of data and basic statistics
- Identify the importance of data reduction and data visualization techniques

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

- Understand basic terms what Statistical Inference means.
- Identify probability distributions commonly used as foundations for statistical modelling. Fit a model to data describe the data using various statistical measures utilize R elements for data handling
- Perform data reduction and apply visualization techniques.

UNIT – I : Introduction: Definition of Data Science- Big Data and Data Science hype – and getting past the hype- Datafication - Current landscape of perspectives - Statistical Inference - Populations and samples - Statistical modeling, probability distributions, fitting a model – Over fitting.

Basics of R: Introduction, R-Environment Setup, Programming with R, Basic Data Types.

UNIT – II : Data Types & Statistical Description Types of Data: Attributes and Measurement, What is an Attribute? The Type of an Attribute, The Different Types of Attributes, Describing Attributes by the Number of Values, Asymmetric Attributes, Binary Attribute, and Nominal Attributes, Ordinal Attributes, Numeric Attributes, Discrete versus Continuous Attributes. Basic Statistical Descriptions of Data: Measuring the Central Tendency: Mean, Median, and Mode, Measuring the Dispersion of Data: Range, Quartiles, Variance, Standard Deviation, and Inter-quartile Range, Graphic Displays of Basic Statistical Descriptions of Data.

UNIT – III: Vectors: Creating and Naming Vectors, Vector Arithmetic, Vector sub setting, Matrices: **Creating and Naming Matrices, Matrix Sub setting, Arrays, Class.**

Factors and Data Frames: Introduction to Factors: Factor Levels, Summarizing a Factor, Ordered Factors, Comparing Ordered Factors, Introduction to Data Frame, subsetting of Data Frames, Extending Data Frames, Sorting Data Frames. **Lists:** Introduction, creating a List: Creating a Named List, Accessing List Elements, Manipulating List Elements, Merging Lists, Converting Lists to Vectors

UNIT – IV : Conditionals and Control Flow: Relational Operators, Relational Operators and Vectors, Logical Operators, Logical Operators and Vectors, Conditional Statements.

Iterative Programming in R: Introduction, While Loop, For Loop, Looping Over List.

Functions in R: Introduction, writing a Function in R, Nested Functions, Function Scoping, Recursion, Loading an R Package, Mathematical Functions in R.

UNIT – V : Data Reduction: Overview of Data Reduction Strategies, Wavelet Transforms, Principal Components Analysis, Attribute Subset Selection, Regression and Log-Linear Models: Parametric Data Reduction, Histograms, Clustering, Sampling, Data Cube Aggregation. Data Visualization: Pixel-Oriented Visualization Techniques, Geometric Projection Visualization Techniques, Icon-Based Visualization Techniques, Hierarchical Visualization Techniques, Visualizing Complex Data and Relations.

TEXT BOOKS:

1. Doing Data Science, Straight Talk from The Frontline. Cathy O’Neil and Rachel Schutt, O’Reilly, 2014
2. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, 3rd ed. The Morgan Kaufmann Series in Data Management Systems.
3. K G Srinivas, G M Siddesh, “Statistical programming in R”, Oxford Publications.

REFERENCE BOOKS:

1. Introduction to Data Mining, Pang-Ning Tan, Vipin Kumar, Michael Steinbach, Pearson Education.
2. Brain S. Everitt “A Handbook of Statistical Analysis Using R”, Second Edition, 4 LLC, 2014.
3. Dalgaard, Peter, “Introductory statistics with R”, Springer Science & Business Media, 2008.
4. Paul Teetor, “R Cookbook”, O’Reilly, 2011.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)**

21CS889PE: DISTRIBUTED SYSTEM (Professional Elective-VI)

B.Tech. IV Year II Sem.

L T P C

3 0 0 3

Course Objectives

- This course provides an insight into Distributed systems.
- Topics include- Peer to Peer Systems, Transactions and Concurrency control, Security and Distributed shared memory

Course Outcomes

- Ability to understand Transactions and Concurrency control.
- Ability to understand Security issues.
- Understanding Distributed shared memory.
- Ability to design distributed systems for basic level applications.

UNIT - I

Characterization of Distributed Systems-Introduction, Examples of Distributed systems, Resource sharing and web, challenges, System models -Introduction, Architectural and Fundamental models, Networking and Internetworking, Interprocess Communication, Distributed objects and Remote Invocation-Introduction, Communication between distributed objects, RPC, Events and notifications, Case study-Java RMI.

UNIT - II

Operating System Support- Introduction, OS layer, Protection, Processes and Threads, Communication and Invocation, Operating system architecture, Distributed File Systems-Introduction, File Service architecture.

UNIT - III

Peer to Peer Systems-Introduction, Napster and its legacy, Peer to Peer middleware, Routing overlays, Overlay case studies- Pastry, Tapestry, Application case studies-Squirrel, OceanStore.

Time and Global States-Introduction, Clocks, events and Process states, Synchronizing physical clocks, logical time and logical clocks, global states, distributed debugging.

Coordination and Agreement-Introduction, Distributed mutual exclusion, Elections, Multicast communication, consensus and related problems.

UNIT - IV

Transactions and Concurrency Control-Introduction, Transactions, Nested Transactions, Locks, Optimistic concurrency control, Timestamp ordering. Distributed Transactions-Introduction, Flat and Nested Distributed Transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery.

UNIT - V

Replication-Introduction, System model and group communication, Fault tolerant services, Transactions with replicated data.

Distributed shared memory, Design and Implementation issues, Consistency models.

TEXT BOOKS:

1. Distributed Systems Concepts and Design, G Coulouris, J Dollimore and T Kindberg, Fourth Edition, Pearson Education.
2. Distributed Systems, S.Ghosh, Chapman & Hall/CRC, Taylor & Francis Group, 2010.

REFERENCE BOOKS:

1. Distributed Systems – Principles and Paradigms, A.S. Tanenbaum and M.V. Steen, Pearson Education.
2. Distributed Computing, Principles, Algorithms and Systems, Ajay D. Kshemakalyani and Mukesh Singhal, Cambridge, rp 2010.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)**

21CS890PE: HUMAN COMPUTER INTERACTION (Professional Elective-VI)

B.Tech. IV Year II Sem.

L T P C

3 0 0 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;

Course Outcomes:

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

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:

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

REFERENCE BOOKS:

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.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)**

21CS891PE: COMPUTER ETHICS (Professional Elective-VI)

B.Tech. IV Year II Sem.

L T P C

3 0 0 3

Course Objectives

- After completing CS core and elective courses, UMD students have a solid technological foundation on which to complete their degrees and build successful careers.
- This course is intended to give students a chance to reflect on the humanitarian, social, and professional impact of computer technology by focusing on ethical issues faced by and brought about by computing professionals, including those related to networking and the internet, intellectual property, privacy, security, reliability, and liability.
- We will also focus on issues raised by the possible emergence in the future of highly intelligent machines.

UNIT I: Computer Ethics - History and Nature: Ethical challenges to citizens of 'the automatic age': Norbert Wiener on the information society, Terrell Ward Bynum; Some Moral and technical consequences of automation, Norbert Wiener; Rules of ethics in information processing

UNIT II: The 2 cultures of the computer age, On the impact of the computer on society: how does one insult a machine? What is computer ethics? Ethical issues of the information age, Richard

Cyberspace: Balancing intellectual property rights and the intellectual commons: a Lockean analysis, What is so bad about internet content regulation The computer revolution and the problem of global ethics, Computer-mediated colonization, the renaissance, and educational imperatives for an intercultural global village,; Shaping the web: why the politics of search engines matters

UNIT III: Online Identity, Ethical commitment to Internet, Anonymity and Pseudo anonymity, Information gathering on Internet, Epistemic bubbles, Echo chambers, Fake news, and Intellectual virtues.

UNIT IV: Hacker Ethics, Activism, Freedom of speech on the Internet, Discrimination on the Internet, Digital Democracy, Networked Protest

UNIT V: The Role of AI and its impact on human life, Ethics of AI, Cyber warfare, extended mind, advancements in AI such as Sex Robots and its impact on human values

TEXT BOOKS:

1. Computer Ethics By John Weckert -2019Edition.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)**

21CS6178OE: JAVA PROGRAMMING (Open Elective-I)

B.Tech. III Year II Sem.

L	T	P	C
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Course Objectives:

- To introduce the object-oriented programming concepts.
- To understand object-oriented programming concepts, and apply them in solving problems.
- To introduce the principles of inheritance and polymorphism; and demonstrate how they relate to the design of abstract classes
- 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 applets and swing controls.

Course Outcomes:

- Able to solve real world problems using OOP techniques.
- Able to understand the use of abstract classes.
- Able to solve problems using java collection framework and I/o classes.
- Able to develop multithreaded applications with synchronization.
- Able to develop applets for web applications.
- Able to design GUI based applications

Unit - I

Object-Oriented Thinking- Why Java? History Features Of Java, JVM and Its Architecture, Object-Oriented Concepts. Java Buzzwords, Data Types, Variables and Arrays, Operators, Expressions, Control Statements, Introducing Classes And Objects, String Handling Methods.

Inheritance– Inheritance Concept, Inheritance Basics, Types of Inheritance, Pros and Cons of Inheritance. Member Access, Constructors, Creating Multilevel Hierarchy, Super Keyword Uses, Using Final Keyword With Inheritance, Polymorphism, Method Overloading, Method Overriding, Abstract Classes, java.lang.Object Class.

Unit - II

Packages- Defining a Package, Classpath, Access Protection, Importing Packages.

Interfaces- Defining an Interface, Implementing Interfaces, Nested Interfaces, Applying Interfaces, Variables in Interfaces and Extending Interfaces.

Stream Based I/O (java.io) – The Stream Classes-Byte Streams and Character Streams, Reading Console Input and Writing Console Output, File Class, Reading and Writing Files, Random Access File Operations, The Console Class, Serialization, Enumerations, Boxing, Auto Boxing.

Unit - III

Exception Handling - Fundamentals of Exception Handling, Exception Types, Using Try And Catch, Multiple Catch Clauses, Nested Try Statements, throw, throws and finally, Built- In Exceptions, Creating Own Exceptions.

Multithreading- Thread, Differences Between Thread-Based Multitasking and Process-Based Multitasking, Thread Life Cycle, Creating Threads, Thread Priorities, Synchronizing Threads, Inter Thread Communication.

Unit - IV

The Collections Framework (java.util)- Collections Overview, Collection Interfaces, The Collection Classes-Array List, Linked List, Hash Set, Tree Set. Accessing A Collection Via An Iterator, Using An Iterator, The For-Each Alternative, Comparators, Arrays, Dictionary, Hash Table, Map Properties, Stack, Vector. More Utility Classes, String Tokenizer, Bit Set, Date, Calendar, Random, Formatter, Scanner

Unit - V

GUI Programming with Swing – Introduction, Limitations of AWT, MVC Architecture, Components, Containers. Exploring AWT Controls, Understanding Layout Managers, Flow Layout, Border Layout, Grid Layout, Card Layout, Grid Bag Layout.

Event Handling- The Delegation Event Model- Events, Event Sources, Event Listeners, Event Classes, Handling Mouse And Keyboard Events, Adapter Classes, Inner Classes, Anonymous Inner Classes.

A Simple Swing Application, Applets – Applets and HTML, Security Issues, Applets and Applications, Passing Parameters to Applets. Exploring Swing Controls- JLabel and Image Icon, JText Field, The Swing Buttons- JButton, JToggleButton, JCheckBox, JRadioButton, JTabbedPane, JScrollPane, JList, JComboBox, Swing Menus, Dialogs.

TEXT BOOKS:

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1. Java The complete reference, 9th edition, Herbert Schildt, McGraw Hill Education (India) Pvt. Ltd.
2. Understanding Object-Oriented Programming with Java, updated edition, T. Budd, Pearson Education.

REFERENCE BOOKS:

1. An Introduction to programming and OO design using Java, J. Nino and F.A. Hosch, John Wiley & sons
 2. Introduction to Java programming, Y. Daniel Liang, Pearson Education.
 3. Object Oriented Programming through Java, P. Radha Krishna, University Press.
 4. Programming in Java, S. Malhotra, S. Chudhary, 2nd edition, Oxford Univ. Press.
- Java Programming and Object-oriented Application Development, R. A. Johnson, Cengage Learning.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)**

21CS6179OE: FUNDAMENTALS OF IoT (Open Elective-I)

B.Tech. III Year II Sem.

L	T	P	C
3	0	0	3

Course Objectives:

The objectives of the course are to:

- Understand the concepts of Internet of Things and able to build IoT applications
- Learn the programming and use of Arduino and Raspberry Pi boards.
- Known about data handling and analytics in SDN.

Course Outcomes:

Upon completing this course, the student will be able to

- Known basic protocols in sensor networks.
- Program and configure Arduino boards for various designs.
- Python programming and interfacing for Raspberry Pi.
- Design IoT applications in different domains.

UNIT – I

Introduction to Internet of Things, Characteristics of IoT, Physical design of IoT, Functional blocks of IoT, Sensing, Actuation, Basics of Networking, Communication Protocols, Sensor Networks, Applications of IoT., Introduction to OSI networks.

UNIT - II

Machine-to-Machine Communications, Difference between IoT and M2M, Interoperability in IoT, Introduction to Arduino Programming, Integration of Sensors and Actuators with Arduino, Types of Sensors.

UNIT – III

Introduction to Python programming, Introduction to Raspberry Pi, Interfacing Raspberry Pi with basic peripherals, Implementation of IoT with Raspberry Pi

UNIT - IV

Implementation of IoT with Raspberry Pi, Introduction to Software defined Network (SDN), SDN for IoT, Data Handling and Analytics.

UNIT - V

Cloud Computing, Sensor-Cloud, Smart Cities and Smart Homes, Connected Vehicles, Smart Grid, Industrial IoT.

Case Study: Agriculture, Healthcare, Activity Monitoring

TEXT BOOKS:

1. "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C.Raman (CRC Press)
2. "Make sensors": Terokarvinen, kemo, karvinen and villey valtokari, 1st edition, maker media, 2014.
3. "Internet of Things: A Hands-on Approach", by Arshdeep Bahga and Vijay Madiseti

REFERENCE BOOKS:

1. Vijay Madiseti, Arshdeep Bahga, "Internet of Things: A Hands-On Approach"
2. Walteneagus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice"
3. Beginning Sensor networks with Arduino and Raspberry Pi – Charles Bell, Apress, 2013

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)**

21CS61800E: INFORMATION SECURITY (Open Elective-I)

B.Tech. III Year II Sem.

L	T	P	C
3	0	0	3

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, IDEA, Block cipher operation, Stream ciphers,
Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, 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, 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
Web Security Requirements:, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET). Firewall: Design principles, Trusted Systems. Intrusion Detection Systems.

TEXT BOOKS

1. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education.
2. Hack Proofing your network by Ryan Russell, Dan Kaminsky, Rain Forest Puppy, Joe Grand, David Ahmad, Hal Flynn Ido Dubrawsky, Steve W. Manzuik and Ryan Permech, wiley Dreamtech,

REFERENCES

1. Fundamentals of Network Security by Eric Maiwald (Dreamtech press)
2. Network Security - Private Communication in a Public World by Charlie Kaufman, Radia Perlman and Mike Speciner, Pearson/PHI.
3. Cryptography and network Security, Third edition, Stallings, PHI/Pearson
4. Principles of Information Security, Whitman, Thomson.
5. Network Security: The complete reference, Robert Bragg, Mark Rhodes, TMH
6. Introduction to Cryptography, Buchmann, Springer.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)**

21CS7181OE: MACHINE LEARNING (Open Elective-II)

B.Tech. IV Year I Sem.

L	T	P	C
3	0	0	3

Course Objectives

- This course explains machine learning techniques such as decision tree learning, Bayesian learning etc.
- To understand computational learning theory.
- To study the pattern comparison techniques.

Course Outcomes

- Understand the concepts of computational intelligence like machine learning
- Ability to get the skill to apply machine learning techniques to address the real time problems in different areas
- Understand the Neural Networks and its usage in machine learning application.

UNIT - I

Introduction - Well-posed learning problems, designing a learning system, Perspectives and issues in machine learning
 Concept learning and the general to specific ordering – introduction, a concept learning task, concept learning as search, find-S: finding a maximally specific hypothesis, version spaces and the candidate elimination algorithm, remarks on version spaces and candidate elimination, inductive bias.

Decision Tree Learning – Introduction, decision tree representation, appropriate problems for decision tree learning, the basic decision tree learning algorithm, hypothesis space search in decision tree learning, inductive bias in decision tree learning, issues in decision tree learning.

UNIT - II

Artificial Neural Networks-1– Introduction, neural network representation, appropriate problems for neural network learning, perceptions, multilayer networks and the back-propagation algorithm.

Artificial Neural Networks-2- Remarks on the Back-Propagation algorithm, An illustrative example: face recognition, advanced topics in artificial neural networks.

Evaluation Hypotheses – Motivation, estimation hypothesis accuracy, basics of sampling theory, a general approach for deriving confidence intervals, difference in error of two hypotheses, comparing learning algorithms.

UNIT - III

Bayesian learning – Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum Likelihood and least squared error hypotheses, maximum likelihood hypotheses for predicting probabilities, minimum description length principle, Bayes optimal classifier, Gibbs algorithm, Naïve Bayes classifier, an example: learning to classify text, Bayesian belief networks, the EM algorithm.

Computational learning theory – Introduction, probably learning an approximately correct hypothesis, sample complexity for finite hypothesis space, sample complexity for infinite hypothesis spaces, the mistake bound model of learning.

Instance-Based Learning- Introduction, k -nearest neighbour algorithm, locally weighted regression, radial basis functions, case-based reasoning, remarks on lazy and eager learning.

UNIT- IV

Genetic Algorithms – Motivation, Genetic algorithms, an illustrative example, hypothesis space search, genetic programming, models of evolution and learning, parallelizing genetic algorithms.

Learning Sets of Rules – Introduction, sequential covering algorithms, learning rule sets: summary, learning First-Order rules, learning sets of First-Order rules: FOIL, Induction as inverted deduction, inverting resolution.

Reinforcement Learning – Introduction, the learning task, Q -learning, non-deterministic, rewards and actions, temporal difference learning, generalizing from examples, relationship to dynamic programming.

UNIT - V

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Analytical Learning-1- Introduction, learning with perfect domain theories: PROLOG-EBG, remarks on explanation-based learning, explanation-based learning of search control knowledge.

Analytical Learning-2-Using prior knowledge to alter the search objective, using prior knowledge to augment search operators.

Combining Inductive and Analytical Learning – Motivation, inductive-analytical approaches to learning, using prior knowledge to initialize the hypothesis.

TEXT BOOK

1. Machine Learning – Tom M. Mitchell, - MGH

REFERENCE BOOK

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)**

21CS7182OE: PYTHON PROGRAMMING (Open Elective-II)

B.Tech. IV Year I Sem.

L	T	P	C
3	0	0	3

Course Objectives:

- Learn Syntax and Semantics and Create Functions in Python.
- Handle Strings and Files in Python.
- Understand Lists, Dictionaries and Regular Expressions in Python.
- Implement Object Oriented Programming Concepts in Python.
- Build Web Services and Introduction to Network and Database Programming in Python.

Course Outcomes:

- Examine Python Syntax and Semantics and be Fluent in the Use of Python Flow Control and Functions.
- Demonstrate Proficiency in Handling Strings and File Systems.
- Create, Run and Manipulate Python Programs Using Core Data Structures like Lists, Dictionaries and Use Regular Expressions.
- Interpret the Concepts of Object-Oriented Programming as Used in Python.
- Implement Exemplary Applications Related to Network Programming, Web Services and Databases in Python.

UNIT - I

Python Basics, Objects- Python Objects, Standard Types, Other Built-in Types, Internal Types, Standard Type Operators, Standard Type Built-in Functions, Categorizing the Standard Types, Unsupported Types Numbers - Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators, Built-in Functions, Related Modules Sequences - Strings, Lists, and Tuples, Mapping and Set Types

UNIT - II

FILES: File Objects, File Built-in Function [open()], File Built-in Methods, File Built-in Attributes, StandardFiles, File System, File Execution.

Exceptions: Exceptions in Python, Detecting and Handling Exceptions, Exceptions as Strings, RaisingExceptions, Assertions, Standard Exceptions, *Creating Exceptions, Functions. Types of Arguments. Why Exceptions (Now)? Why Exceptions at All? Exceptions and the sys Module, RelatedModules.

Modules: Built-in Functions, User Defined Functions, Packages, Other Features of Modules

UNIT - III

Regular Expressions: Introduction, Special Symbols and Characters, Res and Python

Multithreaded Programming: Introduction, Threads and Processes, Python, Threads, and the Global InterpreterLock, Thread Module, Threading Module, Related Modules

UNIT - IV

GUI Programming: Introduction, Tkinter and Python Programming, Brief Tour of Other GUIs, Related Modulesand Other GUIs

WEB Programming: Introduction, Web Surfing with Python, Creating Simple Web Clients, Advanced WebClients, CGI-Helping Servers Process Client Data, Building CGI Application, Web (HTTP) Servers.

UNIT - V

Database Programming: Introduction, Advantages of DBMS, Types of Databases: MySQL Database, Working with MySQL Database, Python Database Application Programmer's Interface (DB-API), Using MySQL from Python.

TEXT BOOK:

1. Core Python Programming, Wesley J. Chun, Second Edition, Pearson.

REFERENCE BOOKS:

1. Think Python, Allen Downey, Green Tea Press
2. Introduction to Python, Kenneth A. Lambert, Cengage
3. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
4. Learning Python, Mark Lutz, O'Really
5. Core Python Programming, R. Nageshwar Rao, Dreamtech Press, Third Edition

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)**

21CS7183OE: C++ PROGRAMMING (Open Elective-II)

B.Tech. IV Year I Sem.

L	T	P	C
3	0	0	3

Prerequisites: A course on “Programming for Problem Solving using C”.

Course Objectives:

- Introduces Object Oriented Programming concepts using the C++ language.
- Introduces the principles of data abstraction, inheritance and polymorphism;
- Introduces the principles of virtual functions and polymorphism
- Introduces handling formatted I/O and unformatted I/O
- Introduces exception handling

Course Outcomes:

- Able to develop programs with reusability
- Develop programs for file handling
- Handle exceptions in programming
- Develop applications for a range of problems using object-oriented programming techniques

UNIT - I

Object-Oriented Thinking: Different paradigms for problem solving, need for OOP paradigm, differences between OOP and Procedure oriented programming, Overview of OOP concepts-Abstraction, Encapsulation, Inheritance and Polymorphism.

C++ Basics: Structure of a C++ program, Data types, Declaration of variables, Expressions, Operators, Operator Precedence, Evaluation of expressions, Type conversions, Pointers, Arrays, Pointers and Arrays, Strings, Structures, References. Flow control statement- if, switch, while, for, do, break, continue, go to statements. Functions - Scope of variables, Parameter passing, Default arguments, inline functions, Recursive functions, Pointers to functions. Dynamic memory allocation and de-allocation operators-new and delete, Preprocessor directives.

UNIT - II

C++ Classes and Data Abstraction: Class definition, Class structure, Class objects, Class scope, this pointer, Friends to a class, Static class members, Constant member functions, Constructors and Destructors, Dynamic creation and destruction of objects, Data abstraction, ADT and information hiding.

UNIT - III

Inheritance: Defining a class hierarchy, Different forms of inheritance, Defining the Base and Derived classes, Access to the base class members, Base and Derived class construction, Destructors, Virtual base class.

Virtual Functions and Polymorphism: Static and Dynamic binding, virtual functions, Dynamic binding through virtual functions, Virtual function call mechanism, Pure virtual functions, Abstract classes, Implications of polymorphic use of classes, Virtual destructors.

UNIT - IV

C++ I/O: I/O using C functions, Stream classes hierarchy, Stream I/O, File streams and String streams, Overloading operators, Error handling during file operations, Formatted I/O.

UNIT - V

Exception Handling: Benefits of exception handling, Throwing an exception, The try block, Catching an exception, Exception objects, Exception specifications, Stack unwinding, Rethrowing an exception, Catching all exceptions.

TEXT BOOKS:

1. The Complete Reference C++, 4th Edition, Herbert Schildt, Tata McGraw Hill.
2. Problem solving with C++: The Object of Programming, 4th Edition, Walter Savitch, Pearson Education.

REFERENCE BOOKS:

1. The C++ Programming Language, 3rd Edition, B. Stroutstrup, Pearson Education.
2. OOP in C++, 3rd Edition, T. Gaddis, J. Walters and G. Muganda, Wiley Dream Tech Press.
3. Object Oriented Programming in C++, 3rd Edition, R. Lafore, Galigotia Publications Pvt Ltd.

B.TECH. CSE**R21 Regulations****BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)****21CS8184OE: WEB TECHNOLOGIES (Open Elective-III)**

B.Tech. IV Year II Sem.

L	T	P	C
3	0	0	3

Course Objectives:

1. To introduce PHP language for server-side scripting
2. To introduce XML and processing of XML Data with Java
3. To introduce Server-side programming with Java Servlets and JSP
4. To introduce Client-side scripting with Javascript and AJAX.

Course Outcomes

1. gain knowledge of client-side scripting, validation of forms and AJAX programming
2. understand server-side scripting with PHP language
3. understand what is XML and how to parse and use XML Data with Java
4. To introduce Server-side programming with Java Servlets and JSP

UNIT- I Introduction to PHP: Declaring variables, data types, arrays, strings, operators, expressions, control structures, functions, Reading data from web form controls like text boxes, radio buttons, lists etc., Handling File Uploads. Connecting to database (MySQL as reference), executing simple queries, handling results, Handling sessions and cookies

File Handling in PHP: File operations like opening, closing, reading, writing, appending, deleting etc. on text and binary files, listing directories.

UNIT- II HTML Common tags- List, Tables, images, forms, Frames; Cascading Style sheets;

XML: Introduction to XML, Defining XML tags, their attributes and values, Document Type Definition, XML Schemes, Document Object Model, XHTML Parsing XML Data – DOM and SAX Parsers in java.

UNIT – III Introduction to Servlets: Common Gateway Interface (CGI), Life cycle of a Servlet, deploying a servlet, The Servlet API, Reading Servlet parameters, Reading Initialization parameters, Handling Http Request & Responses, Using Cookies and Sessions, connecting to a database using JDBC.

UNIT – IV Introduction to JSP: The Anatomy of a JSP Page, JSP Processing, Declarations, Directives, Expressions, Code Snippets, implicit objects, Using Beans in JSP Pages, Using Cookies and session for session tracking, connecting to database in JSP.

UNIT – V Client-side Scripting: Introduction to Javascript, Javascript language – declaring variables, scope of variables, functions. Event handlers (onclick, onsubmit etc.), Document Object Model, Form validation.

TEXT BOOKS

1. Web Technologies, Uttam K Roy, Oxford University Press
2. The Complete Reference PHP — Steven Holzner, Tata McGraw-Hill

REFERENCE BOOKS

1. Web Programming, building internet applications, Chris Bates 2' edition, Wiley Dreamtech
2. Java Server Pages —Hans Bergsten, SPD O'Reilly,
3. Java Script, D.Flanagan
4. Beginning Web Programming-Jon Duckett WROX.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)**

21CS8185OE: DATABASE MANAGEMENT SYSTEMS (Open Elective-III)

B.Tech. IV Year II Sem.

L	T	P	C
3	0	0	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.

Course Outcomes:

- 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

UNIT - I

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

Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes, Weak Entity sets 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 data base 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, and EXCEPT,

Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and activatedata bases.

Schema Refinement: Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, FIRST, SECOND, THIRD normal forms, BCNF, lossless join decomposition, multi-valued dependencies, FOURTH normal form, FIFTH normal Form, E.F.Codd rules.

UNIT - IV

Transaction Processing Concept: Transaction Concept, Transaction State, Implementation of Atomicity and Durability.

Concurrency Control Techniques: 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

Indexing: Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree base Indexing, Indexed Sequential

Access Methods (ISAM), B+ Trees: A Dynamic Index Structure.

Database Security & Authorization: Introduction to DB Security issues, Discretionary access control based on granting /recovery of privileges.

TEXT BOOKS:

130

1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill 3rd Edition
2. Database System Concepts, Silberschatz, Korth, Mc Graw hill, V edition.

REFERENCE BOOKS:

1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems, Elmasri Navrate, Pearson Education
3. Introduction to Database Systems, C. J. Date, Pearson Education
4. Oracle for Professionals, The X Team, S.Shah and V. Shah, SPD.
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL,Shah, PHI.

**BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)**

21CS8186OE: DATA ANALYTICS USING R (Open Elective-III)

B.Tech. IV Year II Sem.

L	T	P	C
3	0	0	3

Course Objectives

- To explore the fundamental concepts of data analytics.
- To learn the principles and methods of statistical analysis
- Discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of the algorithms.
- To understand the various search methods and visualization techniques.

Course Outcomes

After completion of this course students will be able to

- Understand the impact of data analytics for business decisions and strategy
- Carry out data analysis/statistical analysis
- To carry out standard data visualization and formal inference procedures
- Design Data Architecture
- Understand various Data Sources

UNIT - I

Data Management: Design Data Architecture and manage the data for analysis, understand various sources of Data like Sensors/Signals/GPS etc. Data Management, Data Quality (noise, outliers, missing values, duplicate data) and Data Processing & Processing.

UNIT - II

Data Analytics: Introduction to Analytics, Introduction to Tools and Environment, Application of Modeling in Business, Databases & Types of Data and variables, Data Modeling Techniques, Missing Imputations etc. Need for Business Modeling.

UNIT - III

Regression – Concepts, Blue property assumptions, Least Square Estimation, Variable Rationalization, and Model Building etc.

Introducing to R: R Data Structures – Help functions in R – Vectors – Scalars – Declarations – recycling – Common Vector operations – Using all and any – Vector zed operations – NA and NULL values – Filtering – Victories if-then else – Vector Equality – Vector Element names

UNIT – IV

Interfacing R– Parallel R – Basic Statistics – Linear Model – Generalized linear models – Non-linear models – Time Series and Auto-correlation – Clustering ,Creating Data Frames – Matrix-like operations in frames – Merging Data Frames – Applying functions to Data frames.

UNIT – V– Factors and Tables – factors and levels – Common functions used with factors – Working with tables - Other factors and table related functions

TEXT BOOKS

1. Student’s Handbook for Associate Analytics – II, III.
2. Norman Mat off, “The Art of R Programming: A Tour of Statistical Software Design”, No Starch Press, 2011

REFERENCES:

1. Jared P. Lander, “R for Everyone: Advanced Analytics and Graphics”, Addison-Wesley Data & Analytics Series, 2013
2. Mark Gardener, “Beginning R – The Statistical Programming Language”, Wiley, 2013.
3. Robert Knell, “Introductory R: A Beginner's Guide to Data Visualization, Statistical Analysis and Programming in R”, Amazon Digital South Asia Services Inc, 2013.’