THIRD SEMESTER

Sl. No.	Course Category	Subject Code	Subject Title	L	T	P	Contact Hours/ week	Credit	Full Marks
1.	Humanities Science - 2	HU 301	Effective Technical Communication	3	0	0	3	3	100
2.	Basic Science - 7	BS 302	Mathematics-III	2	1	0	3	3	100
3.	Basic Science - 8	BS 303	Biology for Engineers	2	0	0	2	2	100
4.	Engineering Science - 5	ES 304	Engineering Mechanics	2	1	0	3	3	100
5.	Program Core - 1	PC CS305	Digital Logic & Microprocessor.	3	1	0	4	4	100
6.	Program Core - 2	PC CS 306	Data Structure & Algorithm	3	0	0	3	3	100
7.	Program Core - 3	PC CS 307	Java Programming Lab	0	0	4	4	2	100
8.	Program Core - 4	PC CS 308	Data Structure Lab	0	0	2	2	1	100
9.	Program Core - 5	PC CS 309	Digital Electronics & Microprocessor Lab	0	0	2	2	1	100
10.	Mandatory Course -3	MC 310	Indian Constitution	2	0	0	2	0	100
Total :				17	3	8	28	22	1000

Effective Technical Communication

Course Code	HS 301
Course Title	Effective Technical Communication
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	1st year B.Tech
Course Category	Humanities Science (HS)
Number of classes	36 hours

Course Outcomes:

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

CO Number	CO Description	K-level
CO-1	Illustrate the nature and objective of Technical Communication relevant for the work place as Engineers	K2
CO-2	Utilize the technical writing for the purposes of Technical Communication and its exposure in various dimensions.	K3
CO-3	Develop effective verbal and non-verbal communication skills.	K3
CO-4	Analyze ethical, legal, cultural, and global issues affecting Technical Communication and Develop appropriate life skills.	K4

Module 1: Essentials of Communication (09 hrs)

What is Communication, Process of Communication, Levels of communication, The flow of Communication: Downward, Upward, Lateral or Horizontal (Peer group) Communication Barriers to communication, Non-verbal Communication, , Technology Enabled communication, Impact of Technology, Selection of appropriate communication Technology, Importance of Technical Communication, Differences between general and technical communication.

Module 2: Technical Writing Skills (09 hrs)

Technical writing process – Choosing right words, phrases and sentence patterns, clarity of purpose, planning content, effective style of writing, formatting, proofreading.
Technical Reports & Proposals: Definition & importance; Thesis/Project writing: structure & importance; synopsis writing: Methods; Technical research Paper writing: Methods & style; Seminar & Conference paper writing; Writing of Reports & Proposals.
Business letters: Sales & Credit letters; Claim and Adjustment Letters; Letters of Enquiry, Order Placement letters

Email Writing: Reasons for popularity; guiding principles for composition; some common pitfalls; maintaining common etiquette.

Module: 3 Workplace Communication (09 hrs)

Applying for a job: Skimming advertisements; Writing job applications; Preparing CV, Resume.
Group Discussions: Group Discussion types; GD as a part of selection process; Key skills to succeed in group discussions; Dos and Don'ts of group discussions; Use of body language in GDs.
Job Interviews: Objectives; Types; Stages of Interview, Face to face Interviews; Telephonic Interviews.
Effective Business Presentations: Importance in workplace communication; Planning, Preparing, Organizing, Rehearsing, and Delivering Oral presentations, Handling Questions; Visual aids in presentations; Power Point Presentations
Ethics in Communication: Communication challenges in culturally diverse workforce; Bias-free communication

Module: 4 Developing soft skills/ Life Skills (09 hrs)

Introduction to soft skills: Soft skills as a competitive weapon in today's changing workplace.
Classification of soft skills: Time management, Attitude, Responsibility, Ethics & Values, self-confidence, Teamwork and Interpersonal skills, Problem solving skills.
Personality Development: Developing Right personality to enhance Life Skills, Personality types; Personality attributes; and Leadership Qualities.
Body Language : Emotions displayed by body language: Aggressive, Submissive, Attentive, Nervous, Upset, Bored, Relaxed, Defensive; Hand Shake; Eye Contact; Posture and Positioning.
Personality traits and soft skills in early stages of career advancement and for future career advancement.

Recommended Books:

1) Sanjay Kumar & PushpLata Communications Skills , 2nd Edition,Oxford University Press
2) Meenakshi Raman & Sangeeta Sharma Technical Communication: Principles & Practice Oxford University Press
3) Barun Kumar Mitra, Personality Development and Soft Skills Oxford University Press.
4) Personality Development, Harold R. Wallace & L. Ann Masters, Cengage Learning, NewDelhi.
5) Effective Communication Skill, Kulbhusan Kumar, RS Salaria, Khanna Publishing House.
6) Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning Pvt. Ltd, 2011, New Delhi.
7) Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, McGraw Hill & Co. Ltd., 2001, New Delhi.
8) A Text Book of Scientific and Technical Writing by S.D. Sharma; Vikas Publication, Delhi.
9) Skills for Effective Business Communication by Michael Murphy, Harward University, U.S

List of Software/Learning Websites

1. http://www.free-english-study.com/ 2. http://www.english-online.org.uk/course.htm
3. http://www.english-online.org.uk/ 4. http://www.talkenglish.com/

5. http://www.learnenglish.de/

Mathematics-III

Course Code	BS 302
Course Title	Mathematics-III
Number of Credits	3 (L: 2, T: 1, P: 0)
Prerequisites	B.Tech 1st Year Mathematics
Course Category	Basic Science (BS)
Number of classes	36 hours

Course Outcome:-

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

CO No	CO Description	K-level
CO-1	Solve problems in 1st and 2nd order linear Partial Differential Equations	K3
CO-2	Show fourier series expansion of a given function and solve PDEs by variables separable method	K3
CO-3	Identify mean and variance of a given probability distribution	K3
CO-4	Solve numerically algebraic/transcendental equation and ordinary differential equations	K3

Course Content:-

Module 1: Partial Differential Equations (10 hrs)

First order partial differential equations, solutions of first order linear and quasi-linear partial differential equation (Pp + Qq =R) by Lagrange method. Homogeneous and non-homogeneous type of second order linear differential equation with constant coefficients by complimentary function and particular integral method.

Module 2: Fourier series (08 hrs)

Expansion of a function in Fourier series for a given range - Half range sine and cosine expansions. One-dimensional wave equation and one-dimensional heat flow equation - method of separation of variables - Fourier series solution.

Module 3: Probability **(08 hrs)**

Classical and axiomatic definition of probability, conditional probability, Bayes' theorem, independent events, random variables, expectation and higher order moments, probability mass function and probability density function, distribution function, Sample space, Events, Random Variables; Definitions of probability, conditional Probability, examples of discrete and continuous distributions: Normal, Poisson, Binomial distributions.

Module 4: Numerical Analysis **(10 hrs)**

Numerical solution of algebraic and transcendental equations by Regula-Falsi method Newton-Raphson's method; Finite Differences - Newton's Forward, backward difference interpolation formulae - Lagrange interpolation; Numerical Integration with Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule; Solving first order differential equations –Taylor's series method, Euler's method, modified Euler's method, Runge-Kutta method of 4th order.

References / Suggested Learning Resources:-

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 1965.
2. RajnishVerma& H.K. Dass, Higher Engineering Mathematics, S Chand, 2014.
3. S. J. Farlow, Partial Differential Equations for Scientists and Engineers, Dover Publications, 1993
4. Jain, Iyengar and Jain, Numerical methods for Scientific and Engineering Computation, New Age International Publications, 2008.
5. ErwynKreyszig, Advanced Engineering Mathematics, John Wiley and Sons, 8th Edition, 2008.

Biology for Engineers

Course Code	BS 303
Course Title	Biology for Engineers
Number of Credits	2 (L: 2, T: 0, P: 0)
Prerequisites	-
Course Category	Basic Science (BS)
Number of classes	26 hours

Course Outcome:

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

CO Number	CO Description	K-level
CO-1	Demonstrate the understanding of biology and its branches, major classifications of life, Cells, Cellular systems their functions and biological molecules.	K2
CO-2	Illustrate the molecular basis of genetic information and the flow of genetic information from DNA to RNA to protein and the concept of mutations, re-combinations and its applications.	K2
CO-3	Classify microorganisms, growth, nutrition with their various methods used for the isolation, identification, control and maintenance of microbial cultures.	K4
CO-4	Explain the fundamental principles of energy transactions in physical and biological and physiological systems, basic metabolisms.	K2

Course Content:

Module 1: Introduction to Biology, Classification and Biomolecules (8 hours)

Detailed content of the module: Introduction to Biology and its branches. Molecular taxonomy-three major kingdoms of life. Prokaryotic and Eukaryotic cells. Energy and Carbon utilization. Cells: Animal and Plant cell structures and functions. Cell cycle and Cell division. Transport across cell membrane. Cell signaling.
Molecules of life. Monomeric units and polymeric structures. Sugars, starch and cellulose. Lipids, Amino acids and proteins. Nucleotides, DNA and RNA. Proteins- structure and function. Proteins as enzymes, transporters, receptors and structural elements. Enzyme classification. Mechanism of enzyme action. Enzyme kinetics.

Module 2: Fundamentals of genetics and flow of informations (6 hours)

Detailed content of the module: General principles of genetics, Concept of segregation and independent assortment. Molecular basis of information transfer, molecular basis of coding and decoding genetic information. DNA as genetic material. Concept of genetic code. Define gene in

terms of complementation and recombination. Mutation. Recombinant DNA technology. Gene mapping. Application of recombinant DNA technology, recombinant products available in the market and at laboratory scale.

Module 3: Microbiology and applications (6 hours)

Detailed content of the module: Microorganisms and environment: Identification and classification of microorganisms. Ecological aspects of single celled organisms. Microbial integrations. Growth, nutrition and reproduction. Growth kinetics. Isolation and identification of microorganisms. Pure cultures and their characteristics. Maintenance of cultures. Sterilization. Physical and chemical methods of control of microorganisms. Management of toxic industrial wastes.

Module 4:Fundamentals of energy transaction and metabolism (6 hours)

Detailed content of the module: Thermodynamics –laws and its application in biological systems. Energy yielding and energy consuming biochemical processes.
Metabolism- Glycolysis & Krebs cycle, Role of ATP and concept of energy change. Equilibrium constant. Physiological steady-state, Living body as a thermodynamic system.
Fundamental aspects of analysis of living systems; quantitative aspects of physiology and engineering applications to clinical medicine based on body fluid balance, solute transport, basic endocrinology, reproduction physiology, neurophysiology, skeletal and smooth muscle physiology.

References / Suggested Learning Resources:

1. Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd. 12th Edition, 2020
2. Guyton and Hall, Medical Physiology, 14th Edition, Elsevier Saunders, 2020
3. Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman and Company.
4. Principles of Genetics, D. Peter Snustad and Michael J. Simmons. 7th Edition, Wiley Publisher, 2015
5. Prescott's Microbiology, Joanne Willey and Kathleen Sandman and Dorothy Wood, 2020. 11th Edition McGraw Hill

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Engineering Mechanics

Course Code	ES 304
Course Title	Engineering Mechanics
Number of Credits	3 (L: 2, T: 1, P: 0)
Prerequisites	---
Course Category	Engineering Science (ES)
Number of classes	36 hours

Course Outcome:-

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

CO No	CO Description	K-level
CO-1	Differentiate coplanar, concurrent & non-concurrent forces and their resultants and confidently tackle equilibrium equations and its applications.	K3
CO-2	Explain centroid of simple figures, centre of gravity, moment of inertia of composite sections & mass moment of inertia of circular plates, cylinder, cone, sphere & hook.	K2
CO-3	Analyze simple truss, compound truss, frame & virtual work.	K4
CO-4	Understand and be able to apply other basic dynamics concepts - the Work-Energy principle, analyze D'Alembert's principle and differentiate longitudinal, transverse, torsional and damped vibrations.	K2

Course Content:-

Module 1: Fundamentals of Engineering Mechanics: (9 Periods)

-Introduction to Engineering Mechanics covering, Force Systems Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; Static Indeterminacy

-Friction covering, Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw jack & differential screw jack;

Module 2: Centre of Gravity & Moment of Inertia: (9 Periods)

Centroid and Centre of Gravity covering, Centroid of simple figures from first principle, centroid of composite sections; Centre of Gravity and its implications;

-Area moment of inertia-Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Mass moment inertia of circular plate, Cylinder, Cone, Sphere, Hook.

Module 3: Trusses, Frames & Virtual Work: (9 Periods)

-Basic Structural Analysis covering, Equilibrium in three dimensions; Method of Sections; Method of Joints; How to determine if a member is in tension or compression; Simple Trusses; Zero force members; Beams & types of beams; Frames & Machines;

-Virtual Work and Energy Method- Virtual displacements, principle of virtual work for particle and ideal system of rigid bodies, degrees of freedom. Active force diagram, systems with friction, mechanical efficiency. Conservative forces and potential energy (elastic and gravitational), energy equation for equilibrium. Applications of energy method for equilibrium. Stability of equilibrium.

Module 4: Dynamics & Mechanical Vibrations: (9 Periods)

-Dynamics - Basic terms & General principles of dynamics, Types of motion, Instantaneous centre of rotation in plane motion, D'Alembert's principle and its application, Work energy principle and its application in plane motion of connected bodies; Kinetics of rigid body rotation.

-Vibration - Basic concepts of Longitudinal, Transverse and Torsional vibrations, Free & Forced vibration, Resonance and its effects, Damped vibration.

Text Books / References:

1. Irving H. Shames (2006), Engineering Mechanics, 4th Edition, Prentice Hall
2. F. P. Beer and E. R. Johnston (2011), Vector Mechanics for Engineers, Vol I - Statics, Vol II, – Dynamics, 9th Ed, Tata McGraw Hill
3. R.C. Hibbler (2006), Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press.
4. Andy Ruina and RudraPratap (2011), Introduction to Statics and Dynamics, Oxford UniversityPress
5. Shanes and Rao (2006), Engineering Mechanics, Pearson Education,
6. Hibler and Gupta (2010),Engineering Mechanics (Statics, Dynamics) by Pearson Education
7. Reddy Vijaykumar K. and K. Suresh Kumar(2010), Singer's Engineering Mechanics
8. Bansal R.K.(2010), A Text Book of Engineering Mechanics, Laxmi Publications
9. Khurmi R.S. (2010), Engineering Mechanics, S. Chand & Co.
10. Tayal A.K. (2010), Engineering Mechanics, Umesh Publications
11. Hibler and Gupta (2010), Engineering Mechanics (Statics, Dynamics) by Pearson Education.
12. Irving, H.Shames, Engineering Mechanics-Statics and Dynamics, by Prentice-Hall of India.
13. Khurmi R. S. (2010), Engineering Mechanics, S. Chand & Co.
14. NPTEL web or video courses on Engineering Mechanics.
15. Timoshenko & D.H.Young, EngineerringMechanics,Tata McGraw-Hill publishing Co. Ltd.

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Digital Logic and Microprocessor

Course Code	PC CS 305
Course Title	Digital Logic and Microprocessor
Prerequisites	Basic knowledge of Electronics
Course Category	Program core
Number of classes	40 hours
Number of credits	04 (L: 3, T: 1 , P: 0)

Course Outcome:

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

Course Outcomes(COs): At the end of the course, the student will be able to		
CO Number	CO Description	K-level
CO-1	Explain the Combinational Circuits using Logic Gates.	K2
CO-2	Explain the Sequential Logic Circuits using Flip-Flop.	K2
CO-3	Build Sequential Circuits such as Register, Counter and Sequence Generator.	K4
CO-4	Explain the Basic Fundamentals of 8085 Microprocessor.	K2

Module 1: (10 lectures)

Binary Systems & Code conversion, Boolean Algebra & Logic Gates – Truth Tables – Universal Gates – Simplification of Boolean functions: SOP, POS methods – K-map, – Combinational Logic: Adders & Subtractors – Multiplexer – Demultiplexer - Encoder – Decoder.

Module 2: (08 lectures)

Sequential Logic: RS, Clocked RS, D, JK, Master Slave JK, T Flip-Flops – Shift Registers – Types of Shift Registers – Counters: Ripple Counter – Synchronous Counters – Up-Down Counter.

Module 3: (10 lectures)

Introduction to Microprocessors, Microcomputers, and Assembly Language – Microprocessor Architecture and Its Operations – Memory – I/O Devices – 8085 MPU – Introduction to 8085 Instructions – Data Transfer Operations – Addressing Modes - Arithmetic, Logic and Branch Operations – Writing Assembly Language Programs .

Module 4: (12 lectures)

Time Delay Programs: Time Delay Using One Register – Using a Register Pair – Using a Loop within Loop Technique – Counter Design with Time Delay – Stack and Subroutines – BCD to Binary Conversion and Viceversa – BCD to HEX Conversion and Vice-versa – Binary to ASCII Conversion and Vice-versa – BCD Addition and Subtraction **.**

8085 Interrupt – Vectored Interrupts – Interfacing I/O Devices: Basic Interfacing Concepts – Interfacing Input Devices- Memory-Mapped I/O.

References / Suggested Learning Resources:

1. M. Morris Mano,2005, Digital Logic and Computer Design, Prentice-Hall of India Pvt. Ltd.
2. Ramesh S. Gaonkar,1999,Microprocessor Architecture, Programming, and Applications with the 8085, 5thEdition,Penram International Publishing (India) Pvt. Ltd.
3. D. P. Leach and A. P. Malvino,2002,Digital Principles and Applications,5th Edition, Tata McGraw, Hill Publishing Co. Ltd.
4. V. Vijayendran,2004,Digital Fundamentals,S. Viswanathan (Printers & Publishers) Pvt. Ltd.
5. V. Vijayendran ,2004, Fundamentals of Microprocessor – 8085, S. Viswanathan (Printers & Publishers) Pvt. Ltd.
6. N. K. Srinath,2005, 8085 Microprocessor Programming and Interfacing, Prentice-Hall of India Pvt. Ltd.

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Data Structure and Algorithm

Course Code	PC CS 306
Course Title	Data Structure and Algorithm
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	ES204
Course Category	Program Core(PC)
Number of classes	38 hours

Course Outcome:

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

CO Number	CO Description	K-level
CO-1	Explain and apply the basic concepts of data structures and algorithms	K3
CO-2	Explain and apply concepts about searching and sorting techniques	K3
CO-3	Explain and apply basic concepts about stacks, queues, lists, trees and graphs	K3
CO-4	Develop algorithms for solving problems with the help of fundamental data structures	K3

Course Content:

Module 1: Introduction (5 Hours)

Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off Searching: Linear Search and Binary Search Techniques and their complexity analysis

Module 2: Stacks and Queues (9 Hours)

ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation corresponding algorithms and complexity analysis. ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues: Algorithms and their analysis.

Module 3: Linked List and Trees (12 Hours)

Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue,

Header nodes, Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis

Trees: Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis. Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms and analysis

Module 4: Sorting Hashing and Graph (12 Hours)

Sorting and Hashing: Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods, Hashing.

Graph: Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis**.**

Suggested books:

1. "Fundamentals of Data Structures", Illustrated Edition by Ellis Horowitz, Sartaj Sahni, Computer Science Press.
2. “Data Structures using C/C++ “ Tannenbaum”

Suggested reference books:

1. Algorithms, Data Structures, and Problem Solving with C++", Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company
2. "How to Solve it by Computer", 2nd Impression by R.G. Dromey, Pearson Education.

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Java Programming Lab

Course Code	PC CS 307
Course Title	Java Programming Lab
Number of Credits	2 (L: 0, T: 0, P: 4)
Prerequisites	ES 208 (Programming for Problem Solving Lab)
Course Category	Program Core(PC)
Number of classes	40 hours

Course Outcome:

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

CO Number	CO Description	K-level
CO-1	Apply Object oriented features and Java concepts.	K3
CO-2	Apply the concept of multithreading and implement exception handling.	K3
CO-3	Compare the development of JAVA applets vs. JAVA applications.	K4
CO-4	Develop program to access data from a Database with java program.	K6

List of Experiments (*Minimum 10 experiments are to be performed. Use of virtual laboratory to perform few experiments may be explored, if available****):***

1. Write a program to swap two values using method.
2. Write a program to demonstrate method overloading by defining two different parameters in the same method.
3. Write a program to demonstrate Java Package.
4. Write a program to perform calculation based on numbers and operator entered.
5. Write a program to sum the elements of an array and determine the max element.
6. Write a program to add two matrices of the same size
7. Write three different programs to show usage of default and parameterized constructor.
8. Write a program to find area and volume of a rectangle using constructor.
9. Write a program to determine the volume of a room using inheritance.
10. Write a program to demonstrate the use of super keyword with a variable.
11. Write a program to calculate the area of circle and sphere using interface.
12. Write a program to demonstrate the usage of Runtime Polymorphism in java.

13. Write a programto demonstrate applet using appletviewer in java.
14. Write a program to demonstrate Digital clock in Applet.
15. Write a program to demonstrate JTextarea using java swing.
16. Write a program to demonstrate JCombo using java swing.
17. Write a program to demonstrate JTable using java swing.
18. Write a program to creating Edit menu for Notepad using java swing.
19. Write a program to Connect Java Application with mysql database.
20. Write a program to demonstrate transaction management in jdbc using Prepared Statement.

References / Suggested Learning Resources:

1. Introducing Java 8 Author: by Raoul-Gabriel Urma.
2. Object-Oriented vs. Functional Programming Author: by Richard Warburton
3. Data Structures and Algorithm Analysis in Java (3rd Edition) by Mark Allen Weiss, Addison Wesley,(2011).
4. Deitel & Deitel, JAVA : How to Program, Pearson education , 7e (2008)
5. Ivan BayRoss, Web Enabled Commercial Application using Java 2, bpb publication (1998)

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Data Structure Lab

Course Code	PC CS 308
Course Title	Data Structure and Algorithm Lab
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	ES208
Course Category	Program Core (PC)
Number of classes	24 hours

Course Outcome:

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

CO Number	CO Description	K-level
CO-1	analyze the algorithms to determine the time and computation complexity.	K3
CO-2	Solve Search problem (Linear Search and Binary Search)	K3
CO-3	Solve problem of Stacks, Queues and linked list and analyze the same to determine the time and computation complexity	K4
CO-4	Construct an algorithm using Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort and compare their performance in term of Space and Time complexity	K4
CO-5	Apply Graph search and traversal algorithms and determine the time and computation complexity	K4

List of Experiments (*Minimum 6 experiments are to be performed. Use of virtual laboratory to perform few experiments may be explored, if available****):***

1. Implementation of array operations
2. Stacks and Queues: adding, deleting elements Circular Queue: Adding & deleting elements
3. Problems to solve using stacks and queues as per the theory subject Data Structure and Algorithm
4. Implement different operations (insertion, deletion, searching, sorting, reversals) on Single linked list, double linked list, circular linked list.
5. Implement different sorting algorithms as listed in Data Structure and Algorithm subject
6. Implement Graph.
7. Perform Graph search operations

References / Suggested Learning Resources:

1. "Data Structures and Program Design In C", 2/E by Robert L. Kruse, Bruce P. Leung
2. "Data Structure & Algorithms Using C", 5th Ed., Khanna Publishing House
3. "Fundamentals of Data Structures of C" by Ellis Horowitz, Sartaj Sahni, Susan Andersonfreed.
4. "Data Structures in C" by Aaron M. Tenenbaum.
5. "Data Structures" by S. Lipschutz.
6. "Data Structures Using C" by Reema Thareja.
7. "Data Structure Using C", 2/e by A.K. Rath, A. K. Jagadev.
8. "Introduction to Algorithms" by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein
9. "Data Structures through C" by Yashwant Kanetkar, BPB Publications.

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Digital Electronics & Microprocessor Lab

Course Code	PC CS 309
Course Title	Digital Electronics & Microprocessor Lab
Prerequisites	Theoretical knowledge of Digital Logic and Microprocessor
Course Category	Program Core
Number of classes	24 hours
Number of credits	01 (L: 0, T: 0, P: 2)

Course Outcome:

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

Course Outcomes(COs): At the end of the course, the student will be able to		
CO Number	CO Description	K-level
CO-1	Analyze and realize different logic gates	K4
CO-2	Apply different combinational and sequential logic circuits.	K3
CO-3	Apply basic arithmetic operations in 8085	K4
CO-4	Apply searching and sorting in 8085.	K3

List of Experiments (*Minimum 6 experiments are to be performed. Use of virtual laboratory to perform few experiments may be explored, if available****):***

DIGITAL ELECTRONICS: (also can be performed using VHDL)

1. Verification of Truth Table for AND, OR, NOT, NAND, NOR and EX-OR gates.
2. Realisation of NOT, AND, OR, EX-OR gates with only NAND and only NOR gates.
3. Karnaugh Map Reduction and Logic Circuit Implementation.
4. Verification of De-Morgan's Law.
5. Implementation of Half-Adder and Half-Subtractor.
6. Implementation of Full-Adder and Full-Subtractor.
7. Four Bit Binary Adder
8. Four Bit Binary Subtractor using 1's and 2's Complement.
9. Design a 4 X 1 Multiplexer using gates.

10. To build a Flip- Flop Circuits using elementary gates. (RS, Clocked RS, D-type).

11. Design a counter using D/T/JK Flip-Flop.

12. Clocked D FF, T FF and JK FF (with Reset inputs).

MICROPROCESSOR:

1. 8 Bit Addition and Subtraction.

2. 16 Bit Addition.

3. BCD Addition .

4. BCD Subtraction.

5. 8 Bit Multiplication.

6. BCD Multiplication.

7. 8 Bit Division.

8. Searching for an Element in an Array.

9. Sorting in Ascending and Descending Orders.

10. Finding Largest and Smallest Elements from an Array.

11. Reversing Array Elements.

12. Block Move.

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Indian Constitution

Course Code	MC 310
Course Title	Indian Constitution
Number of Credits	0 (L: 2, T: 0, P: 0)
Prerequisites	Nil
Course Category	Mandatory Course (MC)
Number of classes	25 hours

Course Outcome:-

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

CO Number	CO Description	K-level
CO-1	Explain about framing and nature of Indian Constitution.	K2
CO-2	Identify the fundamental rights and duties of individual and demonstrate the knowledge on Directive Principles of State Policy.	K3
CO-3	Outline the Federal Structure, Centre- State relation, Union Executive and Amendment Procedure	K2
CO-4	Demonstrate the meaning of local self govt., types of local self govt. in rural and urban areas.	K2

Course Content:

Module 1: Constitutional Framework (05 hours)

1. Meaning of Constitutional Law and Constitutionalism.
2. Historical perspective of the Constitution of India.
3. Salient features of the Constitution of India.

Module 2: Fundamental Rights, Duties and Directive Principles of State Policy (06 hours)

1. Fundamental Rights- Articles 14, 19 and 21.
2. Fundamental Duties.
3. Directive Principles of State Policy; Its Legal Status and Significance

Module 3: Nature of India's Political system (07 hours)

1. Federal structure, Distribution of Legislative and Financial Powers between the Union and States.
2. Parliamentary Form of Government- Powers and Position of President of India.
3. Emergency Provisions.
4. Amendment Procedures of the Constitution of India.

Module 4: Rural and Urban Local Self Govt. (07 hours)

1. 73rd Amendment of the Constitution and Panchayati Raj Institutions.
2. 74th Amendment of the Constitution and Urban Local Self Govt. (Municipal Corporation, Municipal Council and Nagar Panchayat).
3. TTAADC

References / Suggested Learning Resources:

1. Fadia, B.L- "Indian Govt. and Politics"Sahitya Bhawan, Agra.

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