

BACHELOR OF SCIENCE (COMPUTER SCIENCE)

Detailed syllabi for students admitted to KIIT Deemed to be University



**SCHOOL OF COMPUTER APPLICATIONS
KIIT Deemed to be University
BHUBANESWAR - 751024**

COURSE STRUCTURE

Bachelor of Science - Computer Science
(2019– 2022)

Kalinga Institute of Industrial Technology
(Deemed to be University)

FIRST SEMESTER (AUTUMN)

THEORY						
SL. NO.	SUBJECT CODE	SUBJECT	L	T	P	CREDIT
01	BS1001	English Language	2	-	-	2
02	BC1003	Programming Fundamentals	3	1	-	4
03	BS1003	Computer Architecture	3	1	-	4
04	BS1005	Descriptive Statistics	3	1	-	4
	BS1007	or Principles of Analog Electronics				
PRACTICAL						
05	BC1093	Programming Lab - I	-	-	4	2
06	BS1095	Statistics Lab	-	-	4	2
	BS1097	or Analog Electronics Lab				
TOTAL			-	-	-	18

SECOND SEMESTER (SPRING)

THEORY						
SL. NO.	SUBJECT CODE	SUBJECT	L	T	P	CREDIT
01	BS1002	Environmental Science	2	-	-	2
02	BC1004	Data Structures and Algorithms	3	1	-	4
03	BS1006	Linear Algebra	3	1	-	4
04	BS1008	Introduction to Probability	3	1	-	4
	BS1012	or Principles of Digital Electronics				
PRACTICAL						
05	BC1094	Data Structures Lab	-	-	4	2
06	BS1096	Linear Algebra Lab	-	-	4	2
07	BS1098	Probability Lab	-	-	4	2
	BS1092	or Digital Electronics Lab				
TOTAL			-	-	-	20

THIRD SEMESTER (AUTUMN)

THEORY						
SL. NO.	SUBJECT CODE	SUBJECT	L	T	P	CREDIT
01	BS2001	Communication English and Writing Skills	2	-	-	2
02	BC2003	Database Management System	3	1	-	4
03	BS2003	Discrete Mathematics	3	1	-	4
04	BS2005	Numerical Methods	3	1	-	4
	BS2007	or Microprocessor Architecture and Programming				
PRACTICAL						
05	BS2091	Programming Lab – II	-	1	2	2
06	BC2093	Database Lab	-	-	4	2
07	BS2095	Numerical Methods Lab	-	-	4	2
	BS2097	or Microprocessor Lab				
TOTAL			-	-	-	20

FOURTH SEMESTER (SPRING)

THEORY						
SL. NO.	SUBJECT CODE	SUBJECT	L	T	P	CREDIT
01	BC2002	Web Designing and Programming	2	-	-	2
02	BS2002	Operating Systems	3	1	-	4
03	BS2004	Software Engineering	3	1	-	4
04	BS2006	Statistical Methods	3	1	-	4
	BS2008	or Communication Electronics				
PRACTICAL						
05	BC2092	Web Designing Lab	-	-	4	2
06	BS2092	Operating System Lab	-	-	4	2
07	BS2094	Software Engineering Lab	-	-	4	2
08	BS2096	Statistical Methods Lab	-	-	4	2
	BS2098	or RF Communication Lab				
TOTAL			-	-	-	22

FIFTH SEMESTER (AUTUMN)

THEORY						
SL. NO.	SUBJECT CODE	SUBJECT	L	T	P	CREDIT
01	BS3001	PHP Programming	2	-	-	2
02	BS3003	Computer Networks	3	1	-	4
03	BS3005	Operations Research	3	1	-	4
04	BC3001	JAVA Programming	3	1	-	4
PRACTICAL						
05	BS3091	PHP Programming Lab	-	-	2	1
06	BS3093	Computer Networks Lab	-	-	4	2
07	BC3091	JAVA Programming Lab	-	-	4	2
TOTAL			-			19

SIXTH SEMESTER (SPRING)

THEORY						
SL. NO.	SUBJECT CODE	SUBJECT	L	T	P	CREDIT
01	BS3002	Multimedia and Applications	2	-	-	2
02	BS3004	Introduction to Data Science	3	1	-	4
03		Elective I	3	-	-	3
04		Elective II	3	-	-	3
PRACTICAL						
05	BS3092	Multimedia and Applications Lab	-	-	4	2
06	BS3094	Data Science Lab	-	-	4	2
SESSIONAL						
07	BS3082	Project	-	-	-	6
TOTAL			-	-	-	22

ELECTIVES

ELECTIVE - I	
SUBJECT CODE	SUBJECT
BS3012	Information Security
BS3014	Artificial Intelligence
BS3016	Object Oriented Analysis and Design using UML
BS3018	Computer Graphics
ELECTIVE - II	
SUBJECT CODE	SUBJECT
BS3026	Data Warehousing and Mining
BS3028	Mobile Applications Development
BC3026	Cloud Computing and Virtualization
BC3028	E-Commerce

DETAILED SYLLABI

FIRST SEMESTER

BS1001	English Language	CREDITS- 2
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UNIT - I

Science Fiction: Sentence Structure, Vocabulary, Idioms & Phrases and Comprehension

UNIT - II

Sounds of English: Pronunciation practice for non-native sounds, strong and weak forms, Stress & tone.

UNIT - III

Strengthening Usage: Subject-Verb Agreement, Tense basics, Articles & Prepositions, and Consistency errors.

UNIT - IV

Spoken Language: Thinking in English, Situational Conversations, Role Play & other fluency boosters.

Recommended Books:

1. Kumar, Sreehari and Savithri, Essential English, Orient Black Swan, 2011.
2. John Seely, Oxford Guide to Writing & Speaking, OUP, 2013.
3. <https://classicsofsciencefiction.com/best-science-fiction-short-stories/>
4. J D O' Connor, Better English Pronunciation, Cambridge, 1980.
5. John Eastwood, Oxford Practice Grammar, OUP, 2016.
6. Raman and Sharma , Technical Communication, OUP, 2015.

BC1003	Programming Fundamentals	Credits : 4
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UNIT - I

Programming Process: Steps in developing of a program, Data Flow Diagram, Decision Table, Algorithm development, Flowchart, Pseudo Code, Testing and Debugging.

Fundamentals of C Languages: Character Set, Identifiers and Keywords, Constants, Types of C Constants, Rules for Constructing Integer, Real and character Constants, Variables, Data Types, rules for constructing variables.

Operators and Expressions: C Instructions, Arithmetic operators, Relational operators, Logical operators, Assignment Operators, Type Conversion in Assignments, Hierarchy of Operations, Standard and Formatted Statements, Structure of a C program , Compilation and Execution.

UNIT - II

Decision Control Structure: Decision making with IF-statement, IF-Else and Nested IF Else, The else if Clause.

Loop Control Structure: While and do-while, for loop and Nested for loop,

Case Control Structure: Decision using switch, The goto statement.

Functions: Library functions and user defined functions, Global and Local variables, Function Declaration, Calling and definition of function, Methods of parameter passing to functions, recursion, Storage Classes in C.

UNIT - III

Arrays: Introduction, Array declaration, Accessing values in an array, Initializing values in an array, Single and Two Dimensional Arrays, Initializing a 2-Dimensional Array, Memory Map of a 2-Dimensional Array, Passing array elements to a function: Call by value and call by reference, Arrays of characters, Insertion and deletion operations, Searching the elements in an array, Using matrices in arrays, Passing an Entire Array to a Function.

Pointers: Pointer declaration, Address operator “&”, Indirection operator “*”, Pointer and arrays, Pointers and 2-Dimensional Arrays, Pointer to an Array, Passing 2-D array to a Function, Array of Pointers.

Dynamic Memory Allocation: malloc(), calloc(), realloc(), free() functions.

UNIT - IV

String Manipulation: Declaring and Initializing string variables, Reading and writing strings, String Handling functions(strlen(), strcpy(), strcmp(), strcat()).

Structures and Unions: Declaration of structures, Structure Initialization, Accessing structure members, Arrays of structure, Nested structures, Structure with pointers, Union.

Files Handling: Introduction, Opening and Closing files, Basic I/O operation on files.

Recommended Books:

1. Reema Thareja, Computer Fundamentals and Programming in C, 2nd Edition, Oxford University Press, 2016.
2. Ashok N Kamthane: Programming in C, 2nd Edition, Pearson Edition Publication, 2011.
3. P. Dey, M. Ghosh, Programming in C, 2nd Edition, Oxford University Press, 2013.
4. K. R. Venugopal, S. R. Prasad, Mastering C, McGraw-Hill Education India, 2007.
5. R.S. Bichkar, Programming with C, University Press, 2012.

UNIT - I

Introduction to Digital Electronics: Number systems, complements, fixed and floating point representation, character representation, addition, subtraction, magnitude comparison, Logic gates, Boolean algebra, combinational circuits, circuit simplification, sequential circuits & flip flops, decoders, shift registers & counters.

UNIT - II

Register Transfer and Micro-operations: Register Transfer Language, Register Transfer, Bus Structure, Bus and Memory Transfers, Arithmetic Micro-operations, Logic Micro-operations, Shift Micro operations. **Basic Computer Organization and Design:** Computer registers, bus system, instruction set, timing and control, instruction cycle, memory reference, input-output and interrupt.

UNIT - III

Central Processing Unit: Register organization, arithmetic and logical micro-operations, stack organization, micro programmed control. **Computer Arithmetic:** Introduction, Multiplication and Division Algorithms for fixed point-members.

UNIT - IV

Programming the Basic Computer: Instruction formats, addressing modes, instruction codes, machine language, assembly language, input output programming. **Input-output Organization:** Peripheral devices, I/O interface, Modes of data transfer, direct memory access.

Recommended Books:

1. Mano M Morris, Computer System Architecture, 3rd Edition, Pearson, 2016
2. William Stallings, Computer Organization and Architecture: Designing for Performance, 9th Edition, Pearson, 2013
3. Hamacher, Computer Organization, 5th Edition, Mc Graw Hill Education, 2011
4. John P Hayes, Computer Architecture and Organization, 3rd Edition, Mc Graw Hill Education, 2017

UNIT - I

Statistical Methods: Definition and scope of Statistics, concepts of statistical population and Sample Data: quantitative and qualitative, attributes, variables, scales of measurement nominal, ordinal, interval

and ratio. Presentation: tabular and graphical, including histogram and ogives, consistency and independence of data with special reference to attributes.

UNIT - II

Measures of Central Tendency: Measures of Central Tendency: mathematical and positional. Measures of Dispersion: range, quartile deviation, mean deviation, standard deviation, coefficient of variation, Moments, absolute moments, factorial moments, skewness and kurtosis, Sheppard's corrections.

UNIT - III

Bivariate data: Definition, scatter diagram, simple, partial and multiple correlation (3 variables only), rank correlation, simple linear regression, principle of least squares and fitting of polynomials and exponential curves.

UNIT - IV

Index Numbers: Definition, construction of index numbers and problems thereof for weighted and unweighted index numbers including Laspeyre's, Paasche's, Edgeworth-Marshall and Fisher's. Chain index numbers, conversion of fixed based to chain based index numbers and vice-versa, Consumer price index numbers.

Recommended Books:

1. A.M. Goon, M.K. Gupta and B. Dasgupta, Fundamentals of Statistics, Vol. I & II, 8th Edition, The World Press, Kolkata, 2002.
2. P.N.Arora et al., Comprehensive Statistical Methods, 4th Edition, S. Chand, 2014.
3. S.C. Gupta & V.K.Kapoor, Fundamentals of Mathematical Statistics, 11th Edition, Sultan Chand & Sons, 2019.
4. S.C. Gupta, Fundamentals of Statistics, 7th Edition, Himalaya Publishing house, 2018.
5. Irwin Miller and Marylee Miller, John E. Freund's Mathematical Statistics with Applications, 7th Edition, Pearson Education, 2006.
6. A.M. Mood, F.A. Graybill and D.C. Boes, Introduction to the Theory of Statistics, 3rd Edition, McGraw Hill Publishing, 2006.

BS1007

Principles of Analog Electronics

Credits: 4

UNIT-I

Passive Components: Study of basic circuit elements and passive components (with special reference to working principle, circuit symbols, types, specifications and applications): Resistor, Capacitor, Inductor, Transformer, Cables, Connectors, Switches, Fuses, Relays, Batteries.

Basic Electrical Circuits and Circuit Theorems: Concept of Ideal Voltage and Current source, internal resistance, dc sources(voltage/current) and sinusoidal ac source(amplitude, wavelength, period, frequency, phase angle), Network terminology, Ohms law, series and parallel circuits of resistors, capacitors and inductors, voltage and current dividers, Kirchhoff's Laws (KCL, KVL), Superposition theorem, concept of black box, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem (numerical

problems with maximum two meshes), Charging-discharging of capacitor, AC applied to R, C and L, concept of impedance, LCR series resonant circuit, concept of phase difference, RC low pass and high pass filter.

UNIT-II

Semiconductor Diodes and Circuits: Study of semiconductor devices with reference to symbol, working principle, I-V characteristics, parameters, specifications: diode, Zener diode, light emitting diode, photo diode, optocoupler, varactor diode, solar cell, clipper and clamper circuits. Rectifiers (half and full wave), rectifier with capacitor-filter, Zener regulator, Block diagram of power supply.

Bipolar Junction Transistor and Circuits: Bipolar Junction Transistor (BJT) symbol, types, construction, working principle, I-V characteristics, parameters, specifications, Concept of amplification, voltage and current amplifier, Transistor amplifier configurations - CB, CC and CE, biasing circuits, voltage divider, collector feedback bias and emitter feedback bias, DC load line (CE), Q point and factors affecting the stability, transistor as a switch, concept of class A, B and class C amplifiers, emitter follower amplifier, Single stage RC coupled CE amplifier, concept of frequency response and bandwidth. Multistage amplifiers, Transformer coupled amplifiers, Feedback amplifiers, Oscillators, Feedback requirement of oscillations.

UNIT-III

UJT, FETs and Applications: Symbol, types, construction, working principle, I-V characteristics, Specifications parameters of: Uni-Junction Transistor (UJT), Junction Field Effect Transistor (JFET), Metal Oxide Semiconductor FET (MOSFET), comparison of JFET, MOSFET and BJT Applications: JFET as voltage variable resistor, MOSFET as a switch.

UNIT-IV

Operational Amplifier: Symbol, block diagram, OpAmp characteristics, basic parameters (ideal and practical) such as input and output impedance, bandwidth, differential and common mode gain, CMRR, slew rate, Concept of virtual ground, concept of feedback, Information about IC741, OpAmp as inverting and non-inverting amplifier, voltage follower, adder, subtractor OpAmp as a comparator and Schmitt trigger.

Recommended Books:

1. Jacob Millman, Electronic Devices and Circuits (SIE), 4th Edition, McGraw Hill Education, 2015.
2. Mitchel Schultz, Grob's Basic Electronics, 10th Edition, McGraw Hill Education, 2017.
3. Albert Malvino, Electronic Principles, 7th Edition, McGraw Hill Education, 2017.
4. V.K Mehta, Rohit Mehta, Principles of Electronics, 7th Edition, S Chand, 2014.
5. N.N. Bhargava, Kulshreshtha, S.C. Gupta, Basic Electronics and Linear Circuits, 2nd Edition, McGraw Hill Education, 2017.
6. R. Y. Borse, Basic Electronic Devices And Circuits, 1st Edition, Adhyayan, 2012.

SECOND SEMESTER

BS1002

Environmental Science

Credits : 2

UNIT - I

Multidisciplinary nature of environmental studies: Definition, scope and importance.

Natural Resources: Renewable and non-renewable resources, natural resources and associated problems. a) Forest resources b) Water resources c) Mineral resources d) Food resources e) Energy resources f) Land resources. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

UNIT - II

Ecosystems: Concept of an ecosystem, structure and function of an ecosystem.

Biodiversity: Introduction. Definition: genetic, species and ecosystem diversity. Bio geographical classification of India. Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, national and local levels. India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity.

Environmental Pollution: Definition, cause, effects and control measures of air pollution, water pollution, soil pollution, marine pollution, noise pollution, thermal pollution and nuclear hazards. Solid waste management: causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Disaster management: floods, earthquake, cyclone and landslides.

UNIT - III

Social Issues and the Environment: From unsustainable to sustainable development, urban problems related to energy, water conservation, rain water harvesting, watershed management, resettlement and rehabilitation of people; its problems and concerns.

Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Wasteland reclamation. Consumerism and waste products. Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, issues involved in enforcement of environmental legislation, public awareness.

UNIT - IV

Human Population and the Environment: Population growth, variation among nations, population explosion, Family Welfare Programme. Environment and human health. Human rights. Value education. HIV/AIDS. Women and Child Welfare. Role of IT in environment and human health.

Recommended Book:

1. Erach Bharucha, Textbook of Environmental Studies for Undergraduate Courses (UGC), 2nd Edition University Press, 2013.

BC1004

Data Structures and Algorithms

Credits : 4

UNIT - I

Introduction: Basic Concepts: Introduction to Complexity, Data Structure and Data Structure operations. Applications of Data Structure, Basic data Structures.

Arrays: Introduction, Types of Array, Memory representation, Applications and operations.

Stacks Introduction and primitive operations on stack, Stack application: Infix, postfix, prefix expressions, Evaluation of postfix expression, Conversion from infix to postfix.

UNIT - II

Linked List: Operations:-traversing, searching, inserting, deleting, operations on header linked list, circular linked list, doubly linked list, memory representation, Applications, polynomial manipulation.

Queue: Introduction, Types, Memory Representation and Applications.

UNIT - III

Trees – Definition and Basic concepts, Representation in Contiguous Storage, Binary Tree, Binary Tree Traversal, Searching, Insertion and deletion in Binary trees, Binary Search tree.

Graphs: Introduction, Memory Representation, Graph Traversal (DFS and BFS).

UNIT - IV

Searching: Binary and Linear Search; Sorting: Bubble sort, Insertion sort, Selection sort, Merge Sort, Quick sort. Comparison of various Searching and Sorting algorithms.

Recommended Books:

1. Reema Thareja “Data Structures using C”, 2nd Edition, Oxford University Press, 2014.
2. Gilberg and Forouzan, Data Structures A pseudocode approach with C, 2nd edition, Thomson Learning, 2005.
3. Schaum’s outline series, Data Structure, McGraw Hill, 2002.
4. R. S. Salaria, Data Structure & Algorithms, Khanna Book Publishing Co. (P) Ltd., 2002.

UNIT - I

Vector Algebra: Introduction, addition and scalar multiplication, linear combination, linear dependence and independence, Vector spaces with real field and vector subspaces, Concept of Spanning, Basis and dimension of a vector space, Euclidean Space: inner product and Orthogonality, Gram-Schmidt Orthogonalization, Orthogonal basis, Ortho-complement of Subspace.

UNIT - II

Matrix Algebra: Matrices, Matrix operations, Different types of matrices (including non-singular and orthogonal) and elementary transformations, Partition of a matrices, Isomorphisms, invertibility, change of coordinate matrix.

Determinants: Definition, Properties, Evaluation of some standard determinants.

UNIT - III

Inverse matrix: Definition & Properties .Inverse of some standard matrices.

Rank of a matrix: Row space and column space, concept of rank, standard results on rank. Methods of finding rank: Echelon Matrices, the sweep-out and the pivotal condensations, normal form, minor and rank, null space and rank, Rank factorization.

UNIT – IV

Linear Transformation: Kernel & Image, Matrix representation.

System of linear equations: Homogeneous and non-homogeneous systems – conditions for solvability.

Quadratic forms: classification and canonical reduction, properties of n.n.d /n.p.d matrices. Characteristic roots and vectors of a matrix, Properties of Characteristic roots and vectors of symmetric matrix and canonical reduction of quadratic forms, Cayley -Hamilton theorem.

Recommended Books:

1. Gilbert Strang, Linear Algebra and its Applications, 4th Edition, Cengage Learning, 2018.
2. Stephen H. Friedberg, Arnold J. Insel, Lawrence E. Spence, Linear Algebra, 4th Edition, Pearson Education, 2015.
3. Otto Bretscher, Linear Algebra with Applications, 5th Edition, Pearson Education, 2012.
4. David C. Lay, Linear Algebra and its Applications, 3rd Edition, Pearson Education, 2002
5. S. Lang, Introduction to Linear Algebra, 2nd Edition, Springer, 2012.
6. S.R. Searle, Matrix Algebra useful for Statistics, 2nd Edition Wiley-Blackwell, 2017.

UNIT - I

Probability: Introduction, random experiments, sample space, events and algebra of events.

Definitions of Probability: classical, statistical, and axiomatic, conditional probability, laws of addition and multiplication, independent events, theorem of total probability, Bayes' theorem.

UNIT - II

Random variables: discrete and continuous random variables, probability mass function, probability density function, cumulative density function, illustrations and properties of random variables, univariate transformations with illustrations.

Two dimensional random variables: discrete and continuous type, joint, marginal and conditional probability mass function, probability density function, cumulative density function, independence of variables, bivariate transformations with illustrations.

UNIT - III

Mathematical Expectation and Generating Functions: Expectation of single and bivariate random variables and its properties, moments and cumulants, moment generating function, cumulant generating function and characteristic function, Conditional expectations, Uniqueness and inversion theorems (without proof) along with applications.

UNIT - IV

Standard probability distributions: Binomial, Poisson, geometric, negative binomial, hypergeometric, uniform, normal, exponential, Cauchy, beta and gamma along with their properties and limiting/approximation cases.

Recommended Books:

1. J. L. Devore, Probability and Statistics for Engineering and the Sciences, 8th Edition, Cengage Learning, 2012.
2. S.C. Gupta and V.K.Kapoor, Fundamentals of Mathematical Statistics, 11th Edition, Sultan Chand & Sons, 2019.
3. Douglas C. Montgomery and George C. Runger, Applied Statistics and Probability for Engineers, 6th Edition, Wiley, 2016.
4. Vijay K. Rohatgi and, A.K. Md. Ehsanes Saleh, An Introduction to Probability and Statistics, Second edition, Wiley, 2008.
5. Sheldon Ross, A First Course in Probability, 9th edition, Pearson Education, 2019
6. Morris H. DeGroot and Mark J. Schervish, Probability and Statistics, 4th Edition Pearson, 2010.

UNIT-I

Number Systems and Logic Gates: Introduction to decimal, Binary and hexadecimal number systems and their interconversions, Signed and fractional binary number representations, BCD, Excess-3 and Gray codes, Alphanumeric representation in ASCII codes. Positive and Negative Logic, Basic Logic gates (NOT, OR, AND) & derived gates (NAND, NOR, EX-OR) Symbol and truth table, Applications of Ex-OR gates as parity checker and generator.

Boolean Algebra and Karnaugh maps: Boolean algebra rules and Boolean laws: Commutative, Associative, Distributive, AND, OR and Inversion laws, DeMorgan's theorem, Universal gates. Min terms, Max terms, Boolean expression in SOP and POS form, conversion of SOP/POS expression to its standard SOP/POS form., Simplifications of Logic equations using Boolean algebra rules and Karnaugh map (up to 4 variables).

UNIT-II

Arithmetic Circuits: Rules of binary addition and subtraction, subtraction using 1's and 2's complements, half adder, full adder, Half subtractor, Full subtractor, Four-bit parallel adder, Universal adder / subtractor, Digital comparator, Introduction to ALU.

Combinational Circuits: Multiplexer (2:1, 4:1), demultiplexer (1:2, 1:4) and their applications, Code converters- Decimal to binary, Hexadecimal to binary, BCD to decimal, Encoder & decoder 3x4 matrix keyboard encoder, priority encoder, BCD to seven segment decoders.

UNIT-III

Sequential Circuits: Flip flops: RS using NAND/NOR, latch, clocked RS, JK, Master slave JK, D and T. Counters: Ripple Binary counter, up down counter, concept of modulus counters, Decade counter, Counters for high-speed applications (Synchronous counters) with timing diagrams. Shift registers: SISO, SIPO, PISO, PIPO shift registers, ring counter, universal 4-bit shift register and Applications.

UNIT-IV

Logic Families: Introduction to Integrated circuit technologies TTL, ECL, CMOS, IC parameters: Logic levels, switching speed, propagation delay, power dissipation, noise margins and fanout of TTL and CMOS. TTL NAND & NOT gate, Open collector gates, Wired OR operation. CMOS - NOT, NAND, NOR gate, precautions while handling CMOS gates, tri-state logic.

Recommended Books:

1. R.P. Jain, Modern Digital Electronics, 4th Edition, McGraw Hill Education, 2009.

2. Donald Leach, Digital Principles and Applications, 7th Edition, McGraw Hill Education, 2010.
3. R. P. Jain, Thomas L. Floyd, Digital Fundamentals, Pearson Education, 2005.

THIRD SEMESTER

BS2001	Communication English and Writing Skills	Credits : 2
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UNIT - 1

Definition, Objectives, Stages of Communication, Essentials of Good/Effective Communication, Benefits of Effective Communication, Gaps in Communication, Communication and Information Technology. Business Correspondence: Structure of a Letter, Inquiry Letter, Sales Letter, Order Letter, Complaints, Complaint Handling, Telemarketing.

UNIT - 2

Writing Skills: Report Writing, Paragraphs & Essays, Composition, Note making and Summarizing, E-mail writing techniques, Preparing Persuasive messages.

UNIT - 3

Grammar: Sentence Structure, Idiomatic Usage of Language, Tenses, Direct & Indirect Parts of Speech, Active & Passive Voice, Vocabulary. Indian writing in English: R.K.Narayan, Swami and Friends.

UNIT - 4

Preparation for Jobs: Writing Applications for Jobs, Preparing Curriculum Vitae, Writing a Cover letter, Preparing for Interviews, Preparing for Group Discussions.

Recommended Books:

1. M. Raman & S. Sharma, Technical Communication, Oxford University Press, 2003.
2. John W Newstrom, Organizational Behavior: Human Behaviour at Work, 12th Edition Routledge, 2009.
3. Thomas Elliot Berry, The most common mistakes in English Usage, Indian Edition, McGraw Hill, 1976.
4. R.K.Narayan, Swami and friends, 1st Edition, Indian Thought Publications, 2008.
5. Richard H Hall, Organisations - Structures, Processes and Outcomes, 7th Edition, Pearson, 1998.

BC2003	Database Management System	Credits : 4
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UNIT - I

Introduction: Database Approach, Characteristics of a Database Approach, Database System Environment.

Roles in Database Environment: Database Administrators, Database Designers, End Users, Application Developers.

Database Management Systems: Definition, Characteristics, Advantages of Using DBMS Approach, Classification of DBMSs.

Architecture: Data Models, Categories of Data Models- Conceptual Data Models, Physical data Models, Representational Data Models, such as, Object Based Models, Record Based Models, Database Schema and Instance, Three Schema Architecture, Data Independence – Physical and Logical data Independence.

UNIT - II

Database Conceptual Modelling by E-R model: Concepts, Entities and Entity Sets, Attributes, Mapping Constraints, E-R Diagram, Weak Entity Sets, Strong Entity Sets.

Enhanced E-R Modelling: Aggregation, Generalization, Converting ER Diagrams to Tables. Relational Data Model: Concepts and Terminology, Characteristics of Relations.

Constraints: Integrity Constraints- Entity and Referential Integrity constraints, Keys- Super Keys, Candidate Keys, Primary Keys, Secondary Keys and Foreign Keys.

UNIT - III

Relational Algebra: Basic Operations, Additional Operations, Example Queries.

Database Design: Informal Design Guidelines for Relation Schemas, Problems of Bad Database Design.

Normalization: Functional Dependency, Full Functional Dependency, Partial Dependency, Transitive Dependency, Normal Forms– 1NF, 2NF, 3NF, Boyce-Codd NF.

UNIT - IV

Understanding SQL-1: Data Types, Creating Tables, Creating a Table with data from Another table, Inserting Values into a Table, Updating Column(s) of a Table, Deleting Row(s) from a Table, Dropping a Column, Querying database tables, Conditional retrieval of rows, Working with Null Values, Matching a pattern from a table, ordering the result of a Query Aggregate Functions, Grouping the Result of a Query, creation and deletion of Views, Managing privileges with Grant and Revoke Command, COMMIT and ROLLBACK, Functions: Character Functions, Date Functions, Group Functions.

Recommended Books:

1. Silbersetatz, Korth, Sudarshan , Database system concepts, 6th Edition, McGraw Hill Education, 2013.
2. Bipin C. Desai, Database Management Systems, Galgotia Publisher, 2012.
3. Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems, 3rd Edition, McGraw Hill Education, 2014.
4. Elmasri, Navathe, Fundamentals of Database Systems, 7th Edition, Pearson Education, 2017.

UNIT - I

Sets, relations, and functions: Definition, examples and basic properties of ordered sets, operations on sets. Different types of relations, power of relation and inverses. Types of functions, Function compositions and inverses.

Mathematical Logic: Logical Inferences, Methods of proof of an implication. First order logic and Predicate Calculus, Rules of inference for quantified propositions, Mathematical Induction. Finite Boolean algebra, Axioms of Boolean Algebra, Boolean Function, Logic Circuits.

UNIT - II

Counting: Fundamentals of counting techniques, Permutation and Combinations, Pigeon hole Principle, Recurrence Relation and Generating Functions.

UNIT - III

Introduction to Graph Theory: Definition, examples and basic properties of graphs, pseudographs, complete graphs, bipartite graphs, isomorphism of graphs, paths and circuits, Eulerian circuits, Hamiltonian cycles, the adjacency matrix, weighted graph, Travelling Salesman Problem, Shortest path Method using Dijkstra's algorithm.

UNIT – IV

Group Theory: Groups and properties, Subgroups (finite groups), Cyclic groups, Permutation groups, Normal Subgroup, Isomorphism and Homomorphism.
Coding of Binary Information and Error Detection, Hamming codes, Decoding and Error Correction using Parity-Check matrix decoding.

Recommended Books:

1. K. E. Rosen, Discrete mathematics and its applications, 7th Edition, McGraw Hill International, 2011.
2. B. Kolman, R. C. Busby, S. Ross, 6th Edition, Discrete Mathematical Structures, 6th Edition, Prentice Hall of India, 2010.
3. Trembley and Manohar, Discrete Mathematical Structure with Applications to Computer Science, McGraw Hill, 2001.
4. Thomas Koshy, Discrete Mathematics with Applications, Elsevier, 2008.

UNIT - I

Approximation and Error: Fixed point arithmetic, absolute and relative errors, rounding error, truncation error, loss of significance and error propagation, condition and stability, computational methods for error estimation, convergence of sequences, some mathematical preliminaries.

Numerical solution of equations: method of bisection and regular false. Method of fixed point iteration and Newton-Raphson method in one unknown, Conditions of convergence, rates of convergence and geometrical interpretation of each method.

UNIT - II

System of linear algebraic equations: Gaussian elimination method, Gauss Jordan method, Gauss Jacobi method, Gauss Seidel method, LU decomposition method, and their convergence analysis.

Eigen value problem: Computing Eigen value and eigenvectors, Determination of Eigen values and Eigen vectors of a matrix by iteration.

UNIT - III

Interpolation: Polynomial approximation, Difference Table, forward difference, backward difference and central Difference, linear and higher order, finite difference operators.

Newton's Forward, Backward and divided difference interpolation formulae and Lagrange's general interpolation formula, piecewise polynomial methods Error terms, Inverse interpolation.

UNIT – IV

Ordinary Differential Equations: Euler's method, Runge-Kutta methods of orders two and four.

Numerical differentiation and integration: Differentiation formulae, integration by trapezoidal rule.

Curve Fitting: Least square approximation of functions by linear regressing, polynomial regression.

Recommended Books:

1. Kendall Atkinson, An Introduction to Numerical Analysis, 2nd Edition, Wiley, 2008.
2. Richard L. Burden, Numerical Analysis, 9th Edition, Cengage Learning India.2012.
3. John H. Mathews and Kurtis D. Fink, Numerical Methods using MATLAB, 4th Edition, PHI Learning Private Limited, 2012.
4. Brian Bradie, A Friendly Introduction to Numerical Analysis, Pearson Education, India, 2007.
5. M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, 6th Edition, New age International Publisher, India, 2007.

BS2007

Microprocessor Architecture and Programming

Credits: 4

UNIT-I

Introduction to Microcomputer and Microprocessor: Microcomputer organization, different parts of microcomputer and operation, Microprocessor, Evaluation of Microprocessor, Generalized Microprocessors Architecture and operation, ALU, Register Array, Instruction execution, Bus operation, Memory array design and memory interfacing.

8086 Hardware Specifications: Pin functions, Bus buffering and latching, Bus timing. Detail Architecture of 8086, Addressing Modes, Assembler directives. Instruction Sets: Data movement instructions, Arithmetic instructions. Instruction Sets: Logic Instructions and Program Control Instructions, Assembly Language Programming, system design and interrupt.

UNIT-II

An Introduction to Processor Design: Processor architecture and organization, Abstraction in hardware design, MU0 - a simple processor, Instruction set design ,Processor design trade-offs ,The Reduced Instruction Set Computer, Design for low power consumption .The ARM Architecture: The Acorn RISC Machine, Architectural inheritance, The ARM programmer's model, ARM development tools.

Assembly Language Programming: Data processing instructions, Data transfer instructions, Control flow instructions, Writing simple assembly language programs. ARM Organization and Implementation: Pipeline, Types, 3-stage pipeline ARM organization, 5-stage pipeline ARM organization, ARM instruction execution, ARM implementation, The ARM coprocessor interface.

UNIT-III

ARM Assembly Language Programming: Data processing instructions, Data transfer instructions, Control flow instructions, Writing simple assembly language programs. ARM Organization and Implementation: Pipeline, Types, 3-stage pipeline ARM organization, 5-stage pipeline ARM organization, ARM instruction execution, ARM implementation, The ARM coprocessor interface.

UNIT-IV

The ARM Instruction Set: Introduction, Exceptions, Conditional execution , Branch and Branch with Link (B, BL),Branch, Branch with Link and exchange (BX, BLX) , Software Interrupt (SWI) ,Data processing instructions, Multiply instructions, Single word and unsigned byte data transfer instructions , Half-word and signed byte data transfer instructions, Multiple register transfer instructions , Status register to general register transfer instructions ,General register to status register transfer instructions , Coprocessor instructions. Coprocessor data operations, Coprocessor data transfers, Coprocessor register transfers, Breakpoint instruction (BRK - architecture v5T only), Unused instruction space, Memory faults, ARM architecture variants.

Recommended Books:

1. Steve Furber, ARM System-On-Chip Architecture, Pearson Education India, 2014.
2. Brey, The Intel Microprocessors-Architecture, Programming, and Interfacing, 8th Edition, Pearson Education India, 2008.

FOURTH SEMESTER

BC2002

Web Designing and Programming

Credits : 2

UNIT - I

Introduction to HTML: Introduction to HTML language, HTML tag and elements, essentials of web page, using tags, making ordered and unordered list using bullets or numbers.

Page Formatting and Hyperlinks in HTML: Page formatting, Background with image and text colour, Linking pages using text or image hyperlink, Changing colours of links, Changing pointer of hyperlink and creating internal links in same document.

Frames and Graphics: Dividing a window with frames, Nesting framesets and Inline frame, Adding graphics in the page, Inline Image, Floating Image, Border of image, Managing Horizontal and Vertical Space of the image and image as Hyperlink.

HTML Tables: Creating tables and arranging items into table by using tags with attributes for Cellpadding, Cellspacing, Border, Align, Valign, Bgcolor, Spanning Cell using (Colspan, Rowspan), Font, Width, Size attributes, Nesting Table, Background Image in the Cell or in Table.

UNIT - II

Cascading Style Sheet and Forms: Style and Style Sheet: Use inline style with html tags, Embedded Style, External style sheet using Use text properties, Box properties, Color and Background Properties, List Properties in Style, Making style Classes and designing forms.

UNIT - III

JavaScript Fundamentals: Client-Side Programming: JavaScript Language - History and versions of JavaScript - Introduction to JavaScript - JavaScript in Perspective - Basic Syntax - Variables and Data Types - Statements - Operators - Literals - Functions - Objects - Arrays - Built-in Objects - Host Objects: Browsers and the DOM - Introduction to the Document Object Model- Intrinsic Event Handling - DOM History and Levels

UNIT - IV

Apache HTTP Server: Concept of Web Server, Obtaining and Installing Apache Http Server on Windows and Linux, Editing httpd.conf configuration file, Configuration directives in httpd.conf -

ServerRoot, PidFile, ServerName, Add site to /etc/hosts file, DocumentRoot, ErrorLog, Listen, Directory, Files, Location, Redirect, Virtual Hosts, Modules

Recommended Books:

1. Ivan Bayross, HTML, DHTML, JavaScript, Perl & CGI, 3rd Edition, BPB Publication, 2005.
2. Jon Duckett, Beginning HTML, XHTML, CSS, and Javascript, 1st Edition, Wiley India Pvt Ltd, 2010.
3. Julie C. Meloni, Sams Teach Yourself HTML, CSS, and JavaScript All in One, 1st Edition, Pearson, 2012.
4. Thomas Powell, HTML & CSS: The Complete Reference, 5th Edition, McGraw Hill Education, 2017.
5. Thomas Powell and Fritz Schneider, JavaScript: The Complete Reference, 3rd Edition, McGraw Hill Education, 2017.

BS2002

Operating Systems

Credits : 4

UNIT - I

Introduction: System Software, Resource Abstraction, OS strategies.

Types of operating systems - Multiprogramming, Batch, Time Sharing, Single user and Multiuser, Process Control & Real Time Systems.

Operating System Organization: Factors in operating system design, basic OS functions, implementation consideration; process modes, methods of requesting system services – system calls and system programs.

UNIT - II

Process Management : System view of the process and resources, initiating the OS, process address space, process abstraction, resource abstraction, process hierarchy, Thread model.

Scheduling: Scheduling Mechanisms, Strategy selection, non-pre-emptive and pre-emptive strategies.

UNIT - III

Memory Management: Mapping address space to memory space, memory allocation strategies, fixed partition, variable partition, paging, virtual memory.

Deadlock: Deadlock criteria, prevention, avoidance, detection and recovery algorithm.

UNIT - IV

File Systems: File system implementation, directories, security and protection mechanism.

Shell introduction and Shell Scripting: Shell and its types, editors in Linux, modes of operation in vi editor, shell scripting, writing and executing shell scripts, shell variables, system calls, pipes and filters, decision making in shell scripts, functions, utility programs and pattern matching utility.

Recommended Books:

1. A Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, 9th Edition, Wiley Publications, 2016.
2. A.S. Tanenbaum, Herbert Bos, Modern Operating Systems, 4th Edition, Pearson, 2016.
3. W. Stallings, Operating Systems, Internals & Design Principles, 5th Edition, Prentice Hall of India, 2008.
4. M. Milenkovic, Operating Systems- Concepts and design, 2nd Edition, Tata McGraw Hill Education, 2001.
5. G. Nutt, Operating Systems: A Modern Perspective, 2nd Edition Pearson Education, 1997.

BS2004

Software Engineering

Credits : 4

UNIT - I

Software Process: Introduction, S/W Engineering Paradigm, life cycle models (water fall, incremental, spiral, evolutionary, prototyping, object oriented), System engineering, computer based system, verification, validation, life cycle process, development process, system engineering hierarchy.

Software requirements: Functional and non-functional, user, system, requirement engineering process, feasibility studies, requirements, elicitation, validation and management, software prototyping, prototyping in the software process, rapid prototyping techniques, user interface prototyping, S/W document. Analysis and modelling, data, functional and behavioural models, structured analysis and data dictionary.

UNIT - II

Design Concepts and Principles: Design process and concepts, modular design, design heuristic, design model and document, Architectural design, software architecture, data design, architectural design, transform and transaction mapping, user interface design, user interface design principles. Real time systems, Real time software design, system design, real time executives, data acquisition system, monitoring and control system.

UNIT - III

Testing: Taxonomy of software testing, levels, test activities, types of s/w test, black box testing testing boundary conditions, structural testing, test coverage criteria based on data flow, mechanisms, regression testing, testing in the large. S/W testing strategies, strategic approach and issues, unit testing, integration testing, validation testing, system testing and debugging.

UNIT - IV

Software Project Management: Measures and measurements, S/W complexity and science measure, size measure, data and logic structure measure, information flow measure. Estimations for Software Projects, Empirical Estimation Models, Project Scheduling.

Trends in Software Engineering: Reverse Engineering and Re-engineering – wrappers – CASE tools.

Recommended Books:

1. Roger S. Pressman, Software engineering- A practitioner's Approach, 7th Edition, Tata McGraw Hill 2017.
2. Ian Sommerville, Software engineering, 8th Edition, Pearson 2011.
3. Pankaj Jalote, Software Engineering: A precise approach, Wiley 2010.
4. James F Peters and Witold Pedrycz, Software Engineering – An Engineering Approach, John Wiley 2010.

BS2006

Statistical Methods

Credits: 4

UNIT - I

Sampling from a distribution: Concept of a statistic and its sampling distribution, Point estimate of a parameter, concept of bias and standard error of an estimate, standard errors of sample mean, sample proportion, sampling distribution of sum of binomial, Poisson and mean of normal distributions.

UNIT - II

The basic idea of significance test: Null and alternative hypothesis, Type I and Type II errors, level of significance, concept of p-value. Tests of hypotheses for the parameters of a normal distribution (one sample and two sample problems). Estimation of population mean, confidence intervals for the parameters of a normal distribution (one sample and two sample problems).

UNIT - III

Categorical data: Tests of proportions, tests of association and goodness-of-fit using Chi-square test, Yates' correction t, and F statistics, Fisher's Z transformation and its uses, contingency table and test of independence in a contingency table.

UNIT – IV

Nonparametric tests: Definition of order statistics and their distributions, Non-parametric tests, Sign test for univariate and bivariate distributions, Wilcoxon-Mann-Whitney test, Run test, median test, and Spearman's rank correlation test, Analysis of variance.

Recommended Books:

1. R.V. Hogg, E.A. Tanis and J.M. Rao, Fundamentals of Statistics, Vol. I & II, 8th Edn. The World Press, Kolkata, 2002.
2. P.N.Arora et al., Comprehensive Statistical Methods, 4th Edition, S. Chand, 2014.
3. S.C. Gupta & V.K.Kapoor, Fundamentals of Mathematical Statistics, 11th Edition, Sultan Chand & Sons, 2019.
4. S.C. Gupta, Fundamentals of Statistics, 7th Edition, Himalaya Publishing house, 2018.
5. Irwin Miller and Marylee Miller, John E. Freund's Mathematical Statistics with Applications, 7th Edition, Pearson Education, 2006.
6. A.M. Mood, F.A. Graybill and D.C. Boes, Introduction to the Theory of Statistics, 3rd Edition, McGraw Hill Publishing, 2006.

BS2008

Communication Electronics

Credits: 4

UNIT-I

Basics of Communication Systems and Noise: Block diagram of communication system. Types of Electronic Communication systems: Simplex, Duplex. Analog /Digital Signals. Noise in communication: External noise Atmospheric, space noise, man-made noise, internal noise- Thermal, Shot noise Definitions and relationship between Bit rate, Band rate, Bandwidth and signal to Noise Ratio.

UNIT-II

Modulation & Demodulation: Need for modulation. Types of Modulation: AM, FM, & PM. Amplitude modulation, Modulation index, frequency spectrum, generation of AM (balanced modulator,), Amplitude Demodulation (diode detector), other forms of AM: Double side band suppressed carrier, DSBSC generation (Balanced modulator), Single side band suppressed carrier, SSBSC generation (Filter method, phase cancellation method, third method), SSB detection, Introduction to other forms of AM (Pilot carrier modulation, Vestigial side band modulation). Frequency and phase modulation, modulation index and frequency spectrum, equivalence between FM and PM, Generation of FM (Direct and indirect methods), FM detector (Slope detector, balanced slope detector, PLL). Comparison between AM, FM and PM.

UNIT-III

Transmitters & Receivers: Transmitters: Communication channels for AM and FM broadcast, AM transmitter: Low level and high-level modulation, FM transmitter.
Receivers: Receiver parameters, sensitivity, selectivity and fidelity, Super Heterodyne receiver, AM receivers, FM receivers. Frequency division multiplexing.
Antenna & Wave propagation: Antenna action, Radiation and electric doublet, Total effective resistance of antenna, Types of antennas, Wave propagation, Wave guides, Basic concepts of waves, Maxwell's equation guided waves between parallel planes.

UNIT-IV

Digital Communication: D/A and A/D convertor, Data transmission, TDM in PCM, Amplitude shift keying, Frequency shift keying, Phase shift keying. Error detection and correction.

Recommended Books:

1. H. Taub and D. Schilling, Principles of Communication Systems, 3rd Edition, McGraw Hill Education, 2007.
2. W.Tomasi, Electronic Communication Systems: Fundamentals through Advanced, 5th Edition Pearson Education, 2008.
3. L.E.Frenzel, Communication Electronics, Principle and Applications, 4th Edition, McGraw-Hill Education, 2019.
4. L. W. Couch, Digital and Analog Communication Systems, 8th Edition, Pearson Education, 2013.
5. S.Haykin, Communication Systems, 4th Edition, Wiley, 2006.

FIFTH SEMESTER

BS3001

PHP Programming

Credits : 2

UNIT - I

Introduction to PHP: PHP introduction, inventions and versions, important tools and software requirements. PHP with other technologies, scope of PHP. Basic Syntax, PHP variables and constants. Types of data in PHP , expressions, scopes of a variable (local, global).

PHP Operators : Arithmetic, assignment, relational, logical operators, bitwise, ternary and MOD operator. PHP operator precedence and associativity.

UNIT - II

Handling HTML form with PHP: Capturing Form Data, GET and POST form methods. Dealing with multi value fields. Redirecting a form after submission

PHP conditional events and Loops: PHP 'if else' conditional statements (Nested 'if' and 'else'). 'switch case, while, for and do while loop'. 'goto, break ,continue and exit'.

PHP Functions: Function, need of function, declaration and calling of a function. PHP Function with arguments, default arguments in function, function argument with call by value, call by reference. Scope of function- global and local.

UNIT - III

String Manipulation and Regular Expression: Creating and accessing String, Searching and Replacing String. Formatting, joining and splitting String. String related library functions. Use and advantage of regular expression over inbuilt function. Use of preg_match(), preg_replace(), preg_split() functions in regular expression.

Array: Anatomy of an Array, creating index based and associative array. Accessing array. Looping with index based array, with associative array using each() and foreach(). Some useful library functions.

Recommended Books:

1. Steven Holzner, PHP: The Complete Reference, Indian Edition, Mc Graw Hill Education 2017.
2. Vikram Vaswani, PHP: A beginner's guide, Indian Edition, Mc Graw Hill Education, 2017.
3. Julie C. Meloni, Sams Teach Yourself: PHP MySQL & JavaScript, 6th Edition, Pearson 2017

BS3003**Computer Networks****Credits : 4**

UNIT - I

Basic concepts : Components of data communication, standards and organizations, Network Classification, Network Topologies ; network protocol; layered network architecture; overview of OSI reference model; overview of TCP/IP protocol suite.

Signals: Analog and digital signals, Time and frequency domains, Frequency Spectrum and Bandwidth, Decomposition of a digital signal. Encoding and modulating: Digital to digital conversion: Unipolar, Polar, Bipolar, Analog to digital conversion: PAM, PCM, Digital to Analog conversion: ASK, FSK, PSK, QAM and Analog to Analog conversion: AM, FM, PM

UNIT - II

Physical Layer : Cabling, Network Interface Card, Transmission Media Devices- Repeater, Hub, Bridge, Switch, Router, Gateway, Multiplexing: Frequency division, wave division and time division multiplexing.

Data Link Layer : Framing techniques; Error Control; Flow Control Protocols; Shared media protocols - CSMA/CD and CSMA/CA.

UNIT - III

Network Layer : Virtual Circuits and Datagram approach, IP addressing methods – Subnetting; Routing Algorithms (adaptive and non-adaptive).

Transport Layer: Transport services, Transport Layer protocol of TCP and UDP.

UNIT - IV

Application Layer : Application layer protocols and services – Domain name system, HTTP, WWW, telnet, FTP, SMTP.

Network Security : Common Terms, Firewalls, Virtual Private Networks.

Recommended Books:

1. B.A. Forouzan, Data Communication and Networking, 5th Edition, Tata McGraw Hill, 2017.
2. W. Stalling, Data and Computer Communication, 10th edition, Pearson, 2017.
3. D.E. Comer, Internetworking with TCP/IP, Vol. I, 6th Edition, Pearson, 2015.
4. D. Bertsekas, R. Gallager, Data Networks, 2nd edition, Prentice Hall of India, 1992.

BS3005**Operations Research****Credits: 4**

UNIT - I

Introduction

Nature and Features of Operations Research- Advantages and limitations of OR. Mathematical Formulation of Linear Programming Problem, Graphical Solution of LPP. General LPP – Canonical and Standard Forms of LPP, Computational Procedure. Simplex Method, Big-M Method, Two Phase Simplex Method. Duality Concepts- Formulation of a Dual Problem, Standard results on Duality, Advantages of Duality.

UNIT – II

Transportation and Assignment Problem

General structure of Transportation Problem, Initial Basic Solution procedure for Transportation Problem, Test for optimality. Maximization of Transportation Problem. Mathematical Formulation of an Assignment Problem, Solution Methods of an Assignment Problem- Hungarian Method, Maximization in an Assignment Problem, Unbalanced Assignment Problem.

UNIT - III

Project Management-PERT and CPM

Introduction, Basic Differences between PERT and CPM, Phases of Project Management, PERT/CPM Network Components and Precedence Relationships, constraints in network, Critical Path Analysis, Time-Cost Trade-off aspects in network technique, Advantages of network.

UNIT – IV

Theory of Games: Two –person, Zero –sum, Games, the maximin and minimax principle, Saddle point and value of the Game. Game without saddle points, mixed strategies, Solution for 2X2 games, Dominance property.

Recommended Books:

1. P.K.Gupta & Hira, Operations Research, 5th Edition, S Chand, 2015.
2. Hamdy A. Taha, Operations Research : An Introduction, 8th Edition, PHI New Delhi, 2008.
3. Kanti Swarup, Gupta, P.K.and Man Mohan , Operations Research, Sultan Chand & Sons, 2010.

BC3001**JAVA Programming****Credits : 2**

UNIT - I

Fundamentals Of Object Oriented Programming–: Introduction, Object Oriented paradigm, Basic Concepts of OOP, Benefits of OOP, Applications of OOP.

Java Features: Overview of Java Language: Introduction, Simple Java program structure, Java tokens, Java Statements, Implementing a Java Program, Java Virtual Machine, Command line arguments.

Constants, Variables & Data Types: Introduction, Constants, Variables, Data Types, Declaration of Variables, Giving Value to Variables, Scope of variables, Symbolic Constants, Type casting, Getting Value of Variables, Standard Default values; operator & expressions.

UNIT - II

Decision Making & Branching: Introduction, Decision making with if statement, Simple if statement, if. Else statement, Nesting of if. else statements, the else if ladder, the switch statement, the conditional operator. **Looping:** Introduction, The While statement, the do-while statement, the for statement, Jumps in loops.

Classes, Objects & Methods: Introduction, Defining a class, Adding variables, Adding methods, Creating objects, Accessing class members, Constructors, Method overloading, Static members, Nesting of methods.

UNIT - III

Inheritance: Extending a class, Overriding methods, Final variables and methods, Final classes, Abstract methods and classes;

Arrays, Strings And Vectors: Arrays, One-dimensional arrays, Creating an array, Two – dimensional arrays, Strings, Vectors, Wrapper classes;

Interfaces: Multiple Inheritance: Introduction, Defining interfaces, Extending interfaces, Implementing interfaces, Assessing interface variables;

Managing Errors And Exceptions: Types of errors : Compile-time errors, Runtime errors, Exceptions, Exception handling, Multiple Catch Statements, Using finally statement

Packages: Introduction, Java API Packages, Using System Packages, Naming conventions, Creating Packages, Accessing a Package, using a Package.

UNIT - IV

Multithreaded Programming: Introduction, Creating Threads, Extending the Threads, Stopping and Blocking a Thread, Lifecycle of a Thread, Using Thread Methods, Thread Exceptions, Thread Priority, Synchronization, Implementing the 'Runnable' Interface.

Applet Programming: local and remote applets, Applets and Applications, Building Applet code, Applet Life cycle: Initialization state, Running state, Idle or stopped state, Dead state, Display state.

Managing Input/Output Files in Java: Introduction, Concept of Streams, Stream classes, Byte Stream Classes, Input Stream Classes, Output Stream Classes, Character Stream classes: Reader stream classes, Writer Stream classes, Using Streams, Reading and writing files.

Recommended Books:

1. Patric Naughton, Herbert Schildt, Java 2 Complete Reference, 9th Edition, McGraw Hill Education, 2017.
2. R. Nageswara Rao, Core Java: An Integrated Approach, 1st Edition, Dreamtech Press, 2016.

3. Ivor Horton, Beginning Java, 7th Edition, Wiley, 2011.
4. James Goodwill , Developing Java Servlets, 2nd Edition, Sams Publishing, 2001.
5. Jim Keogh, Complete Reference- J2EE, 1st Edition, McGraw Hill Education, 2017.
6. Paul Deital & Harvey Deital, Java: How to Program, 9th Edition, Pearson Education, 2011.

SIXTH SEMESTER

BS3002

Multimedia and Applications

Credits: 2

UNIT-I

Introduction: Multimedia Basics, The Multimedia Highway, use of Multimedia, Introduction to making multimedia, Multimedia skills and Training: The team.

UNIT II

Multimedia hardware: Macintosh and Windows Production Platforms: Macintosh versus PC, the Macintosh Platform, the windows multimedia PC Platform, Hardware peripherals: Connections, Memory and storage devices, input and output hardware, communication devices.

UNIT III

Multimedia software: Basic Tools: Text editing and word processing tools, OCR Software, painting and drawing tools, 3D modelling and animation tools, Image editing tools, Sound editing tools, Animation video and Digital Movie Tools. Making instant Multimedia: Linking multimedia objects, Office suites.

Authoring tools and text: Types of Authoring Tools, Card and page based, Icon based, time Based, Object Oriented Authoring Tools, Text: The power of meaning, about fonts and Faces, using text in multimedia, computer and text, Font editing and designing tools. Hypermedia and hypertext.

UNIT IV

Images and animation: Images: Before you start to create, Making still images, colour Image file formats. Animation: Principles of Animation, Making Animations that Work. Video: Using video, how video works, Broadcast video standards, video tips, Recording formats, Digital video.

Recommended Books:

1. Tay Vaughan, Multimedia: Making it Work, 9th Edition, McGraw Hill Education, 2017.
2. Nahrstedt & Steinmetz, Multimedia: Computing, Communications & Applications, 1st Edition, Pearson Education, 2002.
3. Ranjan Parekh, Principles of Multimedia, 2nd Edition, McGraw Hill Education, 2017.
4. Ashok Banerji, Ananda Mohan Ghosh, Multimedia Technologies, McGraw Hill Education, 2009.

BS3004

Introduction to Data Science

Credits : 4

UNIT - I

Introduction: Introduction to data science. Big data and data science. Datafication. Roles of data scientist in Academia and Industry.

Statistical Inference: Population and samples, Statistical modelling, probability distributions, fitting a model.

Exploratory Data Analysis: Basic tools of EDA, Philosophy of EDA, Data Science Process.

UNIT - II

Algorithms: Machine Learning Algorithms, Linear Regression, k-Nearest Neighbors (k-NN), k-means, Naive Bayes, Data Wrangling

Feature Generation and Feature Selection: Extracting meaning from data, Feature selection algorithms: Filters, Wrappers, Decision Trees, Random Forests

UNIT - III

Recommendation Engines: Algorithmic ingredients of a Recommendation Engine, Dimensionality Reduction, Singular Value Decomposition, Principal Component Analysis

Mining Social-Network Graphs: Social networks as graphs, Clustering of graphs, Direct discovery of communities in graphs, Partitioning of graphs, Neighborhood properties in graphs

UNIT - IV

Data Visualization: Data visualization history, basic principles, ideas and tools for data visualization. Examples of data visualization projects.

Data Science and Ethical Issues: Data science and risk. Detecting suspicious activity using Machine Learning. Privacy, security and ethics.

Recommended Books:

1. Rachel Schutt and Cathy O'Neil, Doing Data Science - Straight from the Frontline, O'Reilly, 2013.
2. SinanOzdemir, Principles of Data Science, Packt Publication, 2016
3. Joel Grus, Data Science from Scratch, O'Reilly, 2015
4. Murtaza Haider, Getting Started with Data Science: Making Sense of Data with Analytics, IBM Press, 2016

ELECTIVE - 1

UNIT - I

Introduction: Elements of Information Security (CIA), Security Techniques, Steps for Better Security, Category of Computer Security, Security Services, Basic Network Security Terminology, Security Threats and Attacks.

Data Encryption Techniques: Cryptography, Classical Methods, Substitution Ciphers, Transposition Ciphers, Cryptanalysis, Steganography.

UNIT - II

Data Encryption Standards: Modern Block Ciphers, Feistel Ciphers, Data Encryption Standard (DES), Block Cipher Modes of Operation, Triple DES, Stream Ciphers.

Public Key Cryptosystems: Public Key Cryptography, RSA Algorithm.

Key Management: Key Distribution, Diffie–Hellman Key Exchange.

UNIT - III

Authentication: Message Digest, Secure Hash Algorithm, Digital Signatures, X.509 Digital Certificate Standard, Access Control- Owner, Custodian and User.

Virtual Private Networks: Security at Network Layer, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Wireless Network Security- SSIDs, MAC filtering, OS Security-Windows.

UNIT - IV

Monitoring Networks: Intrusion Detection, Firewalls, Worms, viruses, Trojans, Virus Countermeasures.

Cyber Security: India IT act 2000, Penalties & Offences under the Information Technology Act, 2000, Cyber forensics.

Recommended Books:

1. V. K. Pachghare, Cryptography and Information Security, 2nd Edition, PHI, 2015
2. M. Stamp, Information Security: Principles and Practice, 2nd edition, Wiley-Blackwell, 2011.
3. Michael E. Whitman, Principles of Information Security, Cengage, 5th Edition, 2015
4. William Stallings, Cryptography and Network Security Principles and Practices, Pearson Education, 7th Edition, 2017.
5. Mark Rhodes-Ousley, Information Security: The Complete Reference, McGraw Hill Education, 2nd Edition, 2013.

BC3014**Artificial Intelligence****Credits : 3**

UNIT - I

Introduction: Overview of A.I, Introduction to AI, Importance of AI, AI and its related field, AI techniques, Criteria for success.

Intelligent Agents:

Agents and environment, Rationality, The nature of environment, The structure of agents.

UNIT - II**Solving Problems by Searching:**

Problem-solving agents, Well defined problems & solutions, Formulating problems, Searching for solution.

Uninformed search strategies: (BFS, DFS, DLS, IDDFS, Bidirectional Search).

Informed Search and Exploration: Informed search strategies, Heuristic functions, On-line search agents and unknown environment.

UNIT - III**Constraint Satisfaction Problems:**

Constraint satisfaction problems, Backtracking search for CSPs, Local search for CSPs.

Adversarial search:

Games, Optimal decisions in games, Alpha-Beta pruning.

UNIT - IV

Logical Agents: Knowledge-based agents, The wumpus world as an example world, Logic: Propositional logic, Reasoning patterns in propositional logic.

First-order Logic: Syntax and semantics of first-order logic; Use of first-order logic.

Recommended Books:

1. Stuart Russel, Peter Norvig Artificial Intelligence: A Modern Approach, 3rd Edition, Pearson, 2009.
2. Elaine Rich, Kevin Knight and Shivashankar B Nair, Artificial Intelligence 3rd Edition, Tata McGraw Hill, 2008.
3. Introduction to Artificial Intelligence and Expert Systems- Dan W. Patterson 2nd Edition, PHI, 2009.
4. Nils J. Nilsson, Artificial Intelligence: A new Synthesis –1st Edition, Elsevier, 1997.

BS3016**Object Oriented Analysis and Design using UML****Credits : 3**

UNIT - I

Introduction to UML: Models and modelling, process and methodologies, unified modelling language, analysis and design models, process models, software development process.

Modelling with Objects: Object models, classes and objects, object properties, data redundancy avoidance, links, associations, message passing, polymorphism and dynamic binding.

UNIT - II

Business Modelling: Importance of business modelling, informal requirements, use case modelling, use case factoring techniques and use case packaging.

Class and Object Diagrams: Classes and objects, associations, generalization and specialization, inheritance of attributes and operations, aggregation and composition, association classes, N-ary associations, interfaces and templates.

UNIT - III

Interaction Diagrams: Collaborations, classifier roles, association roles, interaction diagrams, object creation and destruction, role multiplicity and iterated messages, multi objects, conditional messages and messages to self.

State charts: State dependent behaviour, states, events and transitions, initial and final states, guard conditions, actions and activities, composite states and time events

UNIT - IV

Component Diagrams: Dependencies, components and artefacts, component diagrams, compilation dependencies and dependency graphs.

Constraints: Standard constraints, Object Constraint Language, context of a constraint, class and association Constraints, OCL data types and operations.

Recommended Books:

1. Mark Priestley, Practical Object Oriented Design with UML, 2nd Edition, Mc Graw Hill, 2005.
2. Michael R Blaha and James R Rumbaugh, Object Oriented Modeling and Design with UML, 2nd Edition, Pearson, 2007.
3. Grady Booch, Object Oriented Analysis and Design with Applications, 3rd Edition, Pearson, 2009.
4. Bharna Dathan and Sarnath Ramnath, Object Oriented Analysis, Design and Implementation, 2nd Edition, University Press, 2013.

UNIT - I

Introduction, what is computer graphics? Elements of graphics workstation, Video Display Devices- Raster Scan Systems, Random Scan Systems, Input Devices Algorithms: Line drawing algorithms- DDA Algorithm, Bresenham's Line Algorithm, Frame Buffers.

Circle and ellipse generating algorithms- Midpoint Circle Algorithm, Midpoint Ellipse Algorithm, Polynomials and spline curves, Filled -Area Primitives, Scan-Line Polygon Fill Algorithm, Inside-Outside Tests, Scan-Line Fill of Curved Boundary Areas, Boundary-Fill Algorithm, Flood-Fill Algorithm.

UNIT - II

Attributes of Output Primitives, Line Attributes- Line Type, Line Width, Pen and Brush Options, Line Color, Color and Grayscale levels- Color Tables, Grayscale, Area-Fill Attributes- Fill Styles, Pattern Fill, Soft Fill, Character Attributes, Text Attributes. Geometric Transformations: Matrices, 2D transformations, Homogeneous representations – other transformation, Two-Dimensional Viewing, The viewing pipeline, Viewing Coordinate Reference Frame, Window-to-viewport Coordinate Transformation, Two-Dimensional Viewing Functions, Clipping Operations- Point Clipping, Line Clipping, Cohen-Sutherland Line Clipping, Polygon Clipping, Sutherland-Hodgeman Polygon Clipping.

UNIT - III

Three -Dimensional Concepts: Three -Dimensional Display Methods- Parallel Projection, Perspective Projection, Visible Line and surface Identification, Surface Rendering, Three -Dimensional Object Representations- 3D transformations. Bezier Curves and surfaces.

UNIT – IV

Visibility, Image and object precision, Z-buffer algorithm, Floating horizons- Computer Animations, Design of Animation Sequences, General Computer –Animation Functions- Raster Animations, Key-Frame Systems, Morphing, Motion Specifications.

Recommended Books:

1. D. Hearn, M.P. Baker, Computer Graphics C Version, 4th Edition, Pearson Education, 2013.
2. Rajesh K. Maurya, Computer Graphics with Virtual Reality Systems, 2nd Edition, Wiley, 2014.
3. J.D.Foley, V.Dam, S.K.Feiner, J.F.Huges - Computer Graphics Principles Practice, 2nd Edition, Pearson Education, 2002.
4. Zhigang Xiang, Computer Graphics, 2nd Edition, McGraw Hill Education, 2006.
5. Rajiv Chopra, Computer Graphics, 4th Edition, S. Chand Publication, 2015.

ELECTIVE - 2

BS3026

Data Warehousing and Mining

Credits : 3

UNIT - I

Introduction – Data warehouse delivery method – system process – typical process flow within a data ware house – query management process – process architecture – meta data-data mart.

Design aspects – Designing dimension tables – Designing star flake schema – Multi dimensional schema – data ware house modelling data cube and OLAP-partitioning strategy aggregations – Data mart- Meta data – System Data warehouse process manager.

UNIT - II

Introduction to Data Mining, Fundamentals of data mining, data mining functionalities, data and attribute types, statistical description of data.

Data Pre-processing: Data cleaning, data integration, data reduction, data transformation and data discretization.

UNIT - III

Mining Frequent Patterns and Associations: Basic methods, frequent Item set mining methods any two algorithms, pattern evaluation methods.

Classification: Basic concepts, decision tree induction, Bayes classification, any two advanced methods, model evaluation.

UNIT – IV

Cluster Analysis: Basic concepts, clustering structures, major clustering approaches, partitioning methods, hierarchical methods, density based methods, the expectation maximization method, cluster based outlier detection Essential Reading.

Recommended Books:

1. J. Han and M. Kamber, Data Mining: Concepts and Techniques, 3rd Edition, Morgan Kaufman, 2012.
2. M. H. Dunham, Data Mining: Introductory and Advanced Topics, Pearson Education, 2001.
3. I. H. Witten and E. Frank, Data Mining: Practical Machine Learning Tools and Techniques. Morgan Kaufmann, 2000.
4. D. Hand, H. Mannila and P. Smyth, Principles of Data Mining, Prentice-Hall, 2001.

BS3028

Mobile Application Development

Credits: 4

UNIT I

Introduction: Introduction to Mobile Computing, Introduction to Android Development Environment, Factors in Developing Mobile Applications, Mobile Software Engineering, Frameworks and Tools, Generic UI Development, Android User.

UNIT II

Intents on UIs VUIs and Mobile Apps: Text-to-Speech Techniques Designing the Right UI Multichannel and Multimodal UIs and Services, Android Intents and Services, Characteristics of Mobile Applications, Successful Mobile Development, Storing and Retrieving Data, Synchronization and Replication of Mobile Data, Getting the Model Right, Android Storing and Retrieving Data, Working with a Content Provider.

UNIT III

Communications Via Network and the Web: State Machine, Correct Communications Model, Android Networking and Web, Telephony, Deciding Scope of an App, Wireless Connectivity and Mobile Apps, Android Telephony, Notifications and Alarms, Performance, Performance and Memory Management, Android Notifications and Alarms.

UNIT IV

Graphics: Performance and Multithreading, Graphics and UI Performance, Android Graphics and Multimedia, Mobile Agents and Peer-to-Peer Architecture, Android Multimedia, Location, Mobility and Location Based Services in Android. Packaging and Deploying, Performance Best Practices, Android Field Service App, Security and Hacking, Active Transactions, More on Security, Hacking Android, Platforms and Additional Issues, Development Process, Architecture, Design, Technology Selection, Mobile App Development Hurdles, Testing.

Recommended Book:

1. John Horton, Android Programming for Beginners, 2nd Edition, Packt Publishing, 2018.
2. Jeff Mcherter and Scott Gowell, Professional Mobile Application Development, Jeff Mcherter and Scott Gowell, Wrox (Wiley), 2012.
3. Lorn Potter, Hands-On Mobile and Embedded Development with Qt 5 Build apps for Android, iOS, and Raspberry Pi with C++ and Qt. , Packt Publishing, 2019.
4. Prajyot Mainkar, Salvatore Giordano, Google Flutter Mobile Development Quick Start, Packt Publishing, 2018.

BC3026

Cloud Computing and Virtualization

Credits : 3

UNIT - I

Introduction: Cloud Computing Overview, Origins of Cloud computing, Cloud components, Essential characteristics, On-demand self-service , Broad network access , Location independent resource pooling , Rapid elasticity , Measured service.

Cloud scenarios: Benefits, scalability, simplicity, vendors, security. Limitations, Sensitive information, Application development, Security concerns, privacy concern with a third party, security level of third party, security benefits, Regularity issues, Government policies.

UNIT - II

Cloud architecture: Cloud delivery model, SPI framework, SPI evolution, SPI vs. traditional IT Model

Software as a Service (SaaS): SaaS service providers, Google App Engine, Salesforce.com and google platfro, Benefits, Operational benefits, Economic benefits, Evaluating SaaS.

Platform as a Service (PaaS): PaaS service providers, Right Scale, Salesforce.com, Rackspace, Force.com, Services and Benefits.

UNIT - III

Infrastructure as a Service (IaaS): IaaS service providers – Amazon EC2 , GoGrid – Microsoft soft implementation and support – Amazon EC service level agreement – Recent developments – Benefits
Cloud deployment model : Public clouds – Private clouds – Community clouds - Hybrid clouds - Advantages of Cloud computing.

UNIT - IV

Virtualization: Virtualization and cloud computing, Need of virtualization, cost, administration, fast deployment , reduce infrastructure cost, limitations Types of hardware virtualization, Full virtualization - partial virtualization, para virtualization Desktop virtualization: Software virtualization, Memory virtualization, Storage virtualization, Data virtualization, Network virtualization.

Microsoft Implementation: Microsoft Hyper V: Vmware features and infrastructure, Virtual Box - Thin client.

Recommended Books:

1. Rajkumar Buyya, James Broberg and Andrzej Goscinski , Cloud Computing Principles and Paradigms, 1st Edition, Wiley Publication, 2011.
2. Judith Hurwitz, Robin Bloor, Marcia Kaufman and Fern Halper, Cloud Computing for Dummies, Wiley Publication, 2009.
3. Divyakant Agrawal, K. G. Selcuk Candan, Wen-Syan Li (Eds.), New frontiers in information and software as a service, Springer Proceedings, 2011.
4. Thomas Erl, Cloud Computing: Concepts, Technology & Architecture, 1st Edition, Prentice Hall, 2013.
5. Michael Miller, Cloud computing, 1st Edition, Que Publishing, 2008.

BC3028

E-Commerce

Credits : 3

UNIT - I

Introduction, Types of E-commerce, Advantages and Disadvantages of E-commerce, Key concepts in E-commerce, Difference between E-commerce and E-Business, E-commerce opportunities for Industries, Threats of E-commerce, Growth of E-commerce, E-Commerce Business Models and Concepts.

UNIT - II

Technology Infrastructure for E-commerce, Key Technology Concepts, Internet Protocols, Hypertext, Building an E-commerce Presence, Choosing Software and Hardware, Web Server Software, Software Packages, The Hardware Platform.

UNIT - III

The E-commerce Security Environment, E-commerce Payment Systems, Types of Payment Systems, Online Credit Card Transactions: Mobile Payment Systems, Bitcoin, Digital signature, E-commerce Marketing And Advertising Concepts, Digital Commerce Marketing and Advertising Strategies and Tools, The Web Site as a Marketing Platform.

UNIT - IV

Understanding Ethical, Social, and Political Issues in E-commerce, A Model for Organizing the Issues, Basic Ethical Concepts, E-customer Relationship management and E-Supply Chain Management.

Recommended Books:

1. Kenneth C. Laudon, Carol Guercio Traver, E-commerce Business. Technology. Society, 10th Edition, Pearson, 2014.
2. P. T. Joseph, S.J. E-Commerce-An Indian Perspective, 3rd Edition, PHI, 2009.
3. Dave Chaffey, E-Business and E-Commerce Management Strategy, Implementation and Practice, Fourth Edition, Prentice Hall, 2009.
4. Gary P. Schneider, Electronic Commerce, Eleventh Edition, Cengage, 2015.
