

Scheme and Syllabus of Bachelor of Computer Applications (BCA)

3 YEARS PROGRAMME

**CHOICE BASED CREDIT SYSTEM
(70:30)**

(w.e.f. session 2020-21)



Department of Computer Science & Engineering
Guru Jambheshwar University of Science & Technology, Hisar

**Scheme of Examination for
Bachelor of Computer Applications (BCA)
Three-Year Programme under CBCS Scheme
w.e.f. Academic Session 2020-21**

BCA SEMESTER-I

Course Code	Course Title	Credit	Int.	Ext.	Total
BCA-PC(L)-111	Environmental Studies	4	30	70	100
BCA-PC(L)-112	Mathematical Foundation	3	30	70	100
BCA-PC(L)-113	Computer and Programming Fundamentals	3	30	70	100
BCA-PC(L)-114	PC Software	3	30	70	100
BCA-PC(L)-115	Problem Solving Through C	3	30	70	100
BCA-PC(P)-116	Problem Solving Through C Lab	2	30	70	100
BCA-PC(P)-117	PC Software Lab	2	30	70	100
Total		20	210	490	700

BCA SEMESTER –II

Course No.	Course Title	Credit	Int.	Ext.	Total
BCA-PC(L)-121	Communication Skills and Personality Development	3	30	70	100
BCA-PC(L)-122	Computer Oriented Numerical Methods	3	30	70	100
BCA-PC(L)-123	Data Structures	3	30	70	100
BCA-PC(L)-124	Operating System	3	30	70	100
BCA-PC(L)-125	Management Information System	3	30	70	100
BCA-PC(P)-126	Data Structures Lab	2	30	70	100
BCA-PC(P)-127	Operating System Lab	2	30	70	100
Total		19	210	490	700

BCA SEMESTER-III

Course No.	Course Title	Credit	Int.	Ext.	Total
BCA-PC(L)-231	Object Oriented Programming using C++	3	30	70	100
BCA-PC(L)-232	Web Designing	3	30	70	100
BCA-PC(L)-233	Digital Electronics	3	30	70	100
BCA-PC(L)-234	Introduction to Database Systems	3	30	70	100
BCA-PC(L)-235	Advanced Data Structures	3	30	70	100
BCA-PC(P)-236	Object Oriented Programming using C++ Lab	2	30	70	100
BCA-PC(P)-237	Web Designing Lab	2	30	70	100
Total		19	210	490	700

BCA SEMESTER-IV

Course No.	Course Title	Credit	Int.	Ext.	Total
BCA-PC(L)-241	Java Programming	3	30	70	100
BCA-PC(L)-242	RDBMS	3	30	70	100
BCA-PC(L)-243	Computer Architecture	3	30	70	100
BCA-PC(L)-244	Computer Networks	3	30	70	100
	Elective-I	3	30	70	100
BCA-PC(P)-246	Java Programming Lab	2	30	70	100
BCA-PC(P)-247	RDBMS Lab	2	30	70	100
Total		19	210	490	700

Paper No	Elective 1 Choice
BCA-PE(L)-241	Advanced Web Designing
BCA-PE(L)-242	Mobile Application Development
BCA-PE(L)-243	System Administration & Maintenance

BCA SEMESTER-V

Course No.	Course Title	Credit	Int.	Ext.	Total
BCA-PC(L)-351	Programming using Python	3	30	70	100
BCA-PC(L)-352	Computer Graphics	3	30	70	100
BCA-PC(L)-353	Software Engineering	3	30	70	100
BCA-PC(L)-354	Data Warehousing and Data Mining	3	30	70	100
	Elective 2	3	30	70	100
BCA-PC(P)-356	Python Programming Lab	2	30	70	100
BCA-PC(P)-357	Computer Graphics Lab	2	30	70	100
BCA-PC(P)-358	Minor Project*	2	30	70	100
Total		21	240	560	800

Paper No	List of Elective Courses(Elective 2)
BCA-PE(L)-351	Theory of Computation
BCA-PE(L)-352	Open Source Software
BCA-PE(L)-353	Cloud Computing

BCA SEMESTER-VI

Course No.	Course Title	Credit	Int.	Ext.	Total
BCA-PC(L)-361	Internet Technology	3	30	70	100
BCA-PC(L)-362	E-Commerce	3	30	70	100
BCA-PC(L)-363	Data Analytics using R	3	30	70	100
BCA-PC(L)-364	Artificial Intelligence	3	30	70	100
	Elective 3	3	30	70	100
BCA-PC(P)-365	Data Analytics using R Lab	2	30	70	100
BCA-PC(P)-366	Major Project *	5	30	70	100
Total		22	210	490	700

Paper No	List of Elective Courses(Elective 3)
BCA-PE(L)-361	Information and Cyber Security
BCA-PE(L)-362	Multimedia Technologies
BCA-PE(L)-363	Software Testing and Quality Assurance

For minor project in Vth semester students will be evaluated on the basis of the synopsis of the problem to be addressed/ implemented during the sixth semester. The major project will be evaluated based on the quality of the solution provided for the problem undertaken and the project report.

ENVIRONMENTAL STUDIES

Course Code: BCA-PC(L)-111

Course Credit: 4

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT-I

Multidisciplinary nature of environment Studies: Definition, Scope and Importance, Need for Public Awareness; Concept, Structure and Function of an ecosystem; Producer, Consumers and Decomposition, Energy Flow in the ecosystem, Ecological Succession, Food Chains, Food Webs and Ecological Pyramids; Introduction, characteristics, features, Structure and Functions of different ecosystems such as Forest Ecosystem, Grassland Ecosystem, Dessert Ecosystem, Aquatic Ecosystem (Pond, Stream, Lake, River, Ocean, Estuaries); Biodiversity: Introduction, Definition: Generic, Species and Ecosystem diversity. Bio-geographical classification of India, Ecosystem and Biodiversity services: Ecological, Economic, Social, Consumptive use, Social Ethical, aesthetic and option Values; Biodiversity at global, national and local level, India as a mega-diversity nation, Global Hot-Spot of Biodiversity. Threats to biodiversity: habitat loss, Poaching of Wildlife, Man-Wildlife Conflicts, Biological Invasions, Endangered and endemic species of India, Conservation of Biodiversity: In-Situ and Ex-situ conservation of biodiversity.

UNIT-II

Renewable and non-renewable resources, Natural Resources and associated problems, Forest resources: use and over-exploitation, Deforestation, Case studies, Timber extraction, Mining, Dams and their effects on forests and tribal people; Water resources: Use and Over Utilization of Surface and ground water, Floods, Droughts conflicts over water, Dams benefits and problems; Minerals, resources: use and exploitation, environmental effects of extracting and mineral resources: World food problems; changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity; Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies; Land resources: land as a resources, Land degradation, man induced landslides, soil erosion and desertification.

UNIT-III

Definition of Environment Pollution: Cause, effects and control measures of Air Pollution, Soil Pollution, Noise Pollution, Nuclear hazards and human health risk; Soil Waste Management: Cause, effects and control measures of urban and industrial waste: Pollution case studies; Disaster Management: Floods, Earthquake, Cyclone and Landslides; Climate Change, Global Warming, Acid Rain, Ozone Layer Depletion; Different Laws related to environment: Environment Protection Act,

Air (Prevention and Control of Pollution) Act, Water (Prevention and Control) Act, Wildlife Protection Act, Forest Conservation Act; International Agreements: Montreal & Kyoto Protocol & Nature reserves, Tribal Populations and Human Health.

UNIT-IV

Concept of Sustainability & Sustainable development, Water conservation, Rain Water Harvesting, Watersheds management, Resettlement and rehabilitation of Project affected persons; Case Studies; Environment ethics: role of Indian and other religions and cultures in environment conservation, Environment Communication and Public awareness, case studies (e.g. CNG vehicles in Delhi); Human Population growth: Impact on environment, Human health & welfare, Environmental Movements: Chipko, Silent Valley, Bishnois of Rajasthan.

Field Work: Visit to a Local area of document environmental assets- River/Forest/Grassland/Mountain; Study of Simple ecosystem-Ponds, River, Hill Slopes etc; Study of common Plants, Insects, birds; Visit to a local Polluted Site- Urban/Rural/Industrial/Agriculture.

TEXT AND REFERENCE BOOKS:

1. Dr. D. D. Mishra, Fundamental Concepts in Environmental Studies, S. Chand Publications, New Delhi, 2008.
2. ErachBharucha, Environmental Studies for Undergraduates Courses, University Granted Commission and BharatiVidyapeeth Institute of Environmental Education and Research, Pune, University Press Pvt. Ltd., 2013.
3. Dr. S.V.S. Rana, Essentials of Ecology and Environmental Sciences, PHI Learning Pvt. Ltd. Delhi, 2013.
4. Anil Kumar, Environmental Chemistry, De.Wiley Eastern Ltd, 2007.
5. T.G. Miller, Environment Science, Wadsworth Publishing Co., 2010.
6. P.D. Sharma, Ecology and Environment, Rastogi Publications, 2011.

MATHEMATICAL FOUNDATION

Course Code: BCA-PC(L)-112

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT-I

Set, Subsets and operations on sets, Venn Diagram of Sets, Power set of a set. Equivalence relation on a set and partition of a set, Partially ordered sets. Boolean Algebra (definition and examples).

UNIT-II

Basic properties of limits, Continuous functions and classifications of discontinuities, Derivative of a function, Derivatives of Logarithmic, Exponential, Trigonometric, Inverse Trigonometrically and hyperbolic functions. Higher order derivatives.

UNIT-III

Addition and multiplication of matrices, Laws of matrix algebra, Singular and non-singular matrices, Inverse of a matrix, Rank of a matrix, Rank of the Product of two matrices, System of Linear equations i.e. $AX=0$ and $AX=B$

UNIT-IV

Characteristic equations of a square matrix, Cayley-Hamilton Theorem, Eigenvalues and eigenvectors, Eigenvalues and eigenvectors of symmetric skew symmetric, Hermitian and skew- Hermitian matrices.

TEXT AND REFERENCE BOOKS:

1. D. A. Murray, Introductory course in Differential Equations, Orient Blackswan, 1967.
2. S. L. Ross, Differential Equations, Wiley, 2007
3. Babu Ram, Discrete Mathematics, Pearson Education India, 2010.
4. Shanti Naryana, A Textbook of Matrices, S Chand & Company, 2010.

COMPUTER AND PROGRAMMING FUNDAMENTALS

Course Code: BCA-PC(L)-113

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT-I

Computer Fundamentals: Definition, Block Diagram along with its components, characteristics and classification of computers, Applications of computer in various fields.

Memory: Concept of primary and secondary memory, RAM, ROM, types of ROM, flash memory, Secondary storage devices, Sequential and direct access devices, viz. magnetic tape, magnetic disk, CD, DVD.

UNIT-II

Computer hardware & software: I/O Devices, definition of software, relationship b/w hardware and software, types of software.

Overview of operating system: Definition, functions of operating system, concept of multiprogramming, multi-tasking, multi-threading, multi-processing, time-sharing, real time, single user & multi-user operating system.

UNIT-III

Planning the Computer Program: Concept of problem solving, Problem definition, Program design, Debugging, Types of errors in programming, Documentation.

Techniques of problem solving: Flowcharting, algorithm, pseudo code, decision table, Structured programming concepts, Programming methodologies viz. top-down and bottom-up programming.

UNIT-IV

Searching, Sorting & Merging: Linear and binary searching, Bubble, Selection and Insertion sorting.

Computer Languages: Analogy with natural language, machine language, assembly language, high-level language, compiler, interpreter, assembler, characteristics of a good programming language.

Computer Virus: Definition, Types of viruses, Characteristics of viruses, anti-virus software.

TEXT AND REFERENCE BOOKS:

1. P. K. Sinha and Priti, Computer Fundamentals, BPB, 2007.
2. R. G. Dromey, How to Solve it by Computer, PHI, 2010.
3. E. Balagurusamy, Computing Fundamentals and C Programming, Tata McGraw Hill, 2008.
4. Norton and Peter, Introduction to Computer, McGraw Hill, 2008.
5. Leon, Alexis & Leon, Mathews, Introduction to Computers, Leon Tech World, 2009

PC SOFTWARE

Course Code: BCA-PC(L)-114

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT-I

MS Windows: Operating system- Definition and functions, basics of Windows, Basic components of windows, icons, types of icons, taskbar, activating windows, using desktop, title bar, running applications, exploring computer, managing files and folders, copying and moving files and folders. Control panel- display properties, adding and removing software and hardware, setting date and time, screen saver and appearance.

UNIT-II

Documentation using MS-Word- Introduction to Office Automation, Creating and Editing Document, Formatting Document, Auto-text, Autocorrect, Spelling and Grammar Tool, Document Dictionary, Page Formatting, Bookmark. Advance Features of MS-Word-Mail Merge, Macros, Tables, Printing, Styles, linking and embedding objects, Template.

UNIT-III

Electronic Spreadsheet using MS-Excel- Introduction to MS-Excel, Creating and Editing Worksheet, Formatting and Essential Operations, Formulas and Functions, Charts, Advance features of MS-Excel-Pivot table & Pivot Chart, Linking and Consolidation, Database Management using Excel- Sorting, Filtering, Table, Validation.

UNIT-IV

Presentation using MS- PowerPoint: Presentations, Creating, Manipulating & Enhancing Slides, Organizational Charts, Excel Charts, Word Art, Layering art objects, Animations and Sounds, Inserting Animated Pictures or Accessing through object, Inserting Recorded Sound Effects or In-Built- Sound Effect.

TEXT AND REFERENCE BOOKS:

1. Russell A. Stultz, Learn Microsoft Office, BPB Publications, 2000.
2. Courter, G Marquis, Microsoft Office 2000: Professional Edition. BPB, 1999.
3. Koers, D, Microsoft Office XP Fast and Easy. PHI, 2001.
4. Microsoft Office- Complete Reference- BPB Publications.

PROBLEM SOLVING THROUGH C

Course Code: BCA-PC(L)-115

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT-I

Overview of C: History of C, Importance of C, Structure of a C Program.

Elements of C: C character set, identifiers and keywords, Data types, Constants and Variables, Assignment statement, Symbolic constant.

Operator & Expression: Arithmetic, relational, logical, bitwise, unary, assignment, conditional operators and special operators. Arithmetic expressions, evaluation of arithmetic expression, type casting and conversion, operator hierarchy & associativity.

UNIT-II

Decision making & looping: Decision making with IF Statement, IF-ELSE statement, Nested IF statement, ELSE-IF ladder, switch statement, goto statement, while and do-while loop, jump in loops, break, continue statement.

Functions: Definition, Prototype, Passing parameters, Recursion.

UNIT-III

Arrays in 'C': definition, types, initialization, processing an array, passing arrays to functions.

Strings & Arrays: Declaration and initialization of string, String I/O, Array of strings, String manipulation functions: String length, copy, compare, concatenate, search for a substring.

UNIT-IV

Storage classes in C: auto, extern, register and static storage class, their scope, storage, & lifetime.

Pointers: Introduction, Pointer variables, Pointer operators, Pointer assignment, Pointer conversion, Pointer arithmetic, Pointer comparison, Pointers and arrays, Pointers and functions, Pointers and strings, dynamic allocation using pointers.

TEXT AND REFERENCE BOOKS:

1. Byron S. Gottfried, Programming with C, Tata McGraw Hill, 2005.
 2. E. Balagurusamy, Programming in ANSI C, 4th Edition, Tata McGraw Hill, 2010.
 3. Yashwant Kanetker, Let Us C, BPB, 16th Edition, 2017
 4. V. Rajaraman, Computer Programming in C, PHI, 1994
- Yashwant Kanetker, Working with C, BPB, 2003

PROBLEM SOLVING THROUGH C LAB

Course Code: BCA-PC(P)-116

Course Credit: 2

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: An internal practical examination is conducted by the course coordinator. The end semester practical examination is conducted jointly by external and internal examiners.

Students are given eight to ten laboratory assignments based on BCA-PC(L)-115. The lab assignments are evenly spread over the semester. Every student is required to prepare a file of laboratory experiments done.

PC SOFTWARE LAB

Course Code: BCA-PC(P)-117

Course Credit: 2

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: An internal practical examination is conducted by the course coordinator. The end semester practical examination is conducted jointly by external and internal examiners.

Students are given eight to ten laboratory assignments based on BCA-PC(L)-114. The lab assignments are evenly spread over the semester. Every student is required to prepare a file of laboratory experiments done.

SEMESTER 2

COMMUNICATION SKILLS AND PERSONALITY DEVELOPMENT

Course Code: BCA-PC(L)-121

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT-I

Personality: Definition, Elements, Determinants.

Personal Grooming: Personal Hygiene, Social Effectiveness, Business Etiquettes (Power Dressing).

UNIT-II

Body Language: Non-Verbal Communication, Types of Body Language, Functions of Body Language, Role of Body Language, Proxemics.

Art of Good Communication: Verbal & Non-Verbal Communication, Difference between Oral and Written Communication, 7' Cs of Effective Communication, Importance of Effective Communication.

UNIT-III

Team: Team Behaviour, Types of Teams, Team Roles and Behaviour.

Group Discussion: Do's and Don't.

UNIT-IV

Interview Preparation: Introduction, Resume Writing, Dress Code, Mock- Interview, How to be successful in an Interview.

TEXT AND REFERENCE BOOKS:

1. C. S. Venkata Ratanam and B. K. Srivastava, Personal management and Human Resources, Tata McGraw Hill Publishing Ltd. New Delhi, 2005.
2. Keith Davis, Human Behaviour at Work, Tata McGraw Hill Publishing Ltd. New Delhi, 1975.
3. Thomas A. Harris, I m OK, You re OK, Pan Books, London and Sydney, 1973.
4. Ranjana Salgaocar, Pleasure of your Company, Pyramid Publishers, Goa, 1995.
5. Arun Agarwal, How to get the job you want, Vision Books, New Delhi, 1997.
6. Rohit Anand and Sanjeev Bikhchandani, Get That Job, Harper Collins, 1996.

COMPUTER ORIENTED NUMERICAL METHODS

Course Code: BCA-PC(L)-122

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External:70

Internal:30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT-I

Computer Arithmetic: Floating point representation of numbers, Arithmetic Operations with normalized floating- point numbers and their consequences, significant figure.

Error in Number Representation: inherent error, truncation, absolute, related, percentage and round off errors.

Iterative Methods: Bisection, False position, Newton-Raphson method. Iteration method, discussion of convergence.

UNIT-II

Solution of Simultaneous Linear Equations & Ordinary Differential Equations: Gauss Elimination method, pivoting, Ill-conditioned equation, refinement of solutions. Gauss-Seidel iterative method, Euler method, Euler modified method, Taylor-series method, Runge-Kutta methods, Predictor-Corrector methods.

UNIT-III

Interpolation and Approximation:

Polynomial Interpolation: Newton, Lagranges, Difference tables, Approximation of functions by Taylor Series.

UNIT-IV

Numerical Differentiation and Integration: Differentiation formula based on polynomial fit, pitfalls in differentiation, Trapezoidal & Simpson Rules, Gaussian Quadrature.

TEXT AND REFERENCE BOOKS:

1. V. Rajaraman, Computer Oriented Numerical Methods, Prentice Hall, India, 1993.
2. S.S. Sastry, Introductory Methods of Numerical Analysis, 2012.
3. H.C. Saxena, Finite Differences and Numerical Analysis, 2010.
4. Modes A, Numerical Analysis for Computer Science.
5. M. K. Jain, S. R. K. Iyengar and R. K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Publication, 2007.

DATA STRUCTURE

Course Code: BCA-PC(L)-123

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External:70

Internal:30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT-I

Introduction: Elementary data organization, Data Structure definition, Data type vs. Data structure, Categories of data structure, Data structure operations, Applications of data structure, Algorithms complexity and time-space trade-off, Big-O notation.

UNIT-II

Strings: Introduction, Storing strings, String operations.

Array: Introduction, Linear Arrays, Representation of linear array in memory, Traversal, Insertion, Deletion in an array, Multi-dimensional arrays.

UNIT-III

Linked List: Introduction, Array vs. Linked List, Representation of Linked lists in memory, Traversal, Insertion, Deletion and Searching in a Linked List, Header Linked List, Circular Linked List, Two-Way Linked List, Applications of Linked Lists.

Stack: Introduction, Array and Linked representation of stack, operations on stack, Applications of stack: Polish Notation, Recursion.

UNIT-IV

Stack: Introduction, Array and linked representation of stacks, Operations on stacks, Applications of Stacks: Polish Notation, Recursion.

Queue: Introduction, Array and linked representation of Queue, Operations on Queues, Dequeues, Priority Queues, Applications of Queues.

TEXT AND REFERENCE BOOKS:

1. Seymour Lipschutz, Data Structure, Tata McGraw Hill, 2014.
2. Horowitz, Sahni and Anderson-Freed, Fundamentals of Data Structure in C, Orient Longman, BlackSwan, 2008
3. Trembley, J.P. And Sorenson P.G., An Introduction to Data Structures with Applications, McGraw- Hill International Student Edition, New York, 1984.

4. Yedidyan Langsam, Moshe J. Augenstein and Aaron M. Tenenbaum, Data Structures using C, Prentice Hall of India Pvt. Ltd., New Delhi, 1996.
5. Mark Allen Weiss, Data structures and Algorithm Analysis in C, Addison-Wesley (An Imprint of Pearson Education), Mexico City, Prentice-Hall of India Pvt. Ltd., New Delhi, 2008.

OPERATING SYSTEM

Course Code: BCA-PC(L)-124

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External:70

Internal:30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT-I

Introduction: Introduction to Operating System Concepts (Including Multitasking, Multiprogramming, Multi User, Multithreading etc.), Types of Operating Systems: Batch Operating System, Time-Sharing System, Distributed Operating System, Network Operating System, Real Time Operating System, Various Operating System services, architecture, System Programs and Calls.

UNIT-II

Process Management: Process Concept, Process Scheduling, Operations on Processes; CPU Scheduling, Scheduling Criteria, Scheduling Algorithms- First come First Serve(FCFS), Shortest- Job-First (SJF), Priority Scheduling, Round Robin(RR).

Deadlock: Methods for handling deadlock- Deadlock prevention, Avoidance & Detection.

UNIT-III

Memory Management: Logical & Physical Address Space, Swapping, Contiguous Memory allocation, non-contiguous memory allocation paging and segmentation techniques; Virtual Memory Management- Demand Paging & Page Replacement Algorithm; Demand Segmentation.

UNIT-IV

File System: Different types of files and their access methods, directory structures, various allocation methods, disk scheduling and management and its associated algorithms.

TEXT AND REFERENCE BOOKS:

1. Silberschatz et al, Operating System Concepts, 5th Edition, Addison-Wesley, 1998.
2. A. Tanenbaum, Modern Operating System, Prentice Hall, 1992.
3. Peterson, Operating System, AW, 1985.
4. Milankovik, Operating System, THM, 1990.
5. Colin Ritche, Operating System Incorporating with Unix & Windows, THM, 1974.

MANAGEMENT INFORMATION SYSTEM

Course Code: BCA-PC(L)-125

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External:70

Internal:30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT-I

Introduction to System and Basic System Concepts, Types of Systems, The Systems Approach, Information System: Definition & Characteristics, Types of information, Role of Information in Decision-Making.

UNIT-II

An overview of Management Information System: Definition & Characteristics, Components of MIS, Framework for Understanding MIS: Information requirements & Levels of Management, Simon's Model of decision-Making, Structured Vs Unstructured decisions, Formal vs. Informal Systems.

UNIT-III

Developing Information Systems: Analysis & Design of Information Systems, Implementation & Evaluation, Pitfalls in MIS Development.

UNIT-IV

Functional MIS: A Study of Personnel, Financial and Production MIS, Introduction to E-Business Systems, E-Commerce- Technologies, Applications, Decision Support Systems- Support Systems for Planning, Control and Decision- Making.

TEXT AND REFERENCE BOOKS:

1. J. Kanter, Management/Information Systems, PHI, 1983.
2. Gordon B. Davis, M. H. Olson, Management Information Systems- Conceptual Foundations, Structure and Development, McGraw Hill, 1985.
3. James A. O'brien, Management Information Systems, Tata McGraw Hill, 2006.
4. Lucas, Analysis, Design & Implementation, McGraw Hill
5. James A. Senn, Analysis, Design of Information Systems, Second Edition, McGraw Hill, 1984

DATA STRUCTURES LAB

Course Code: BCA-PC(P)-126

Course Credit: 2

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: An internal practical examination is conducted by the course coordinator. The end semester practical examination is conducted jointly by external and internal examiners.

Students are given eight to ten laboratory assignments based on BCA-PC(L)-123. The lab assignments are evenly spread over the semester. Every student is required to prepare a file of laboratory experiments done.

OPERATING SYSTEM LAB

Course Code: BCA-PC(P)-127

Course Credit: 2

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: An internal practical examination is conducted by the course coordinator. The end semester practical examination is conducted jointly by external and internal examiners.

Students are given eight to ten laboratory assignments based on BCA-PC(L)-124. The lab assignments are evenly spread over the semester. Every student is required to prepare a file of laboratory experiments done.

SEMESTER 3

OBJECT ORIENTED PROGRAMMING USING C++

Course Code: BCA-PC(L)-231

Course Credit: 3

Maximum Marks: 100

Minimum Pass marks: 40

Time: 3 hours

External: 70

Internal: 30

Note: Examiner will be required to set Nine Questions in all. First Question will be compulsory, consisting of objective type/short-answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each Unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory Question No. 1. All questions will carry equal marks.

UNIT- I

Introduction to C++, C++ Standard Library, Basics of a Typical C++ Environment, Header Files and Namespaces, Library files. Introduction to Objects and Object Oriented Programming, Encapsulation, Access Modifiers; Controlling access to a class, method or variable (public, private, protected, package), Other Modifiers, Polymorphism; overloading, Inheritance, Overriding Methods, Abstract classes, Reusability.

UNIT- II

Classes and Data Abstraction: Introduction, Structure Definitions, Accessing Members of Structure, Class Scope and Accessing Class Members, Initializing Class Objects, Constructor, Using Default Arguments with Constructor, Using Destructor, Classes: Const(Constant) Object and Const Member Function, Object as Member of Classes, Friend Function and Friend class, Function Overloading.

Operator Overloading: Introduction, Fundamentals of Operator Overloading, Restrictions on Operator Overloading, Operator Functions as Class Members vs. as Friend Function, Overloading, <<, >> Overloading Unary Operators, Overloading Binary Operators.

UNIT- III

Inheritance: Introduction, Inheritance: Base Classes and Derived Classes, Protected Members, Casting Base-Class Pointers to Derived-Class Pointer, Using Member Functions, Overriding Base-class members in a Derived class, Public, Protected, and Private Inheritance, Using Constructors and Destructors in Derived Classes, Implicit Derived-Class Object to Base-Class Object Conversion.

UNIT- IV

Virtual Functions and Polymorphism: Introduction to Virtual Functions, Abstract Base Classes and Concrete Classes, Polymorphism, New Classes and Dynamic Binding, Virtual Destructor, Polymorphism, Dynamic Binding.

File and I/O Streams: Files and Streams, Creating a Sequential Access File, Reading Data From A Sequential Access File, Updating Sequential Access File, Random Access File, Creating A Random

Access File, Writing Data Randomly to a Random Access File, Reading Data Sequential from a Random Access File.

TEXT AND REFERENCE BOOKS:

1. H. M Deitel and P.J Deitel, C++ How to Program, Prentice Hall, 1998.
2. Robert Lafore, Object Oriented Programming in Turbo C++, Galgotia Publications Pvt. Ltd., 1994.
3. D. Raichandan, Programming with C++, T.M.H, 2003.
4. Balagurusamy, Object Oriented Programming with C++ , Tata McGraw-Hill, 2001.

WEB DESIGNING

Course Code: BCA-PC(L)-232

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT- I

Introduction to Internet and World Wide Web; Evolution and History of Word Wide Web; Basic features; Web Browsers; Web servers; Hypertext Transfer Protocol; URLs; Searching and Web-Casting Techniques; Search Engines and Search Tools;

UNIT- II

Web Publishing: Hosting your Site; Internet Services provider; Planning and designing your Web Site; Steps for developing Your site; Choosing the contents; Home page; Domain Names;

UNIT- III

Web Development: Introduction to HTML; Hypertext and HTML; HTML Document Features; HTML command Tags; Creating Links; Headers; Text styles; Text Structuring; Text colors and Background; Formatting text; Page layouts;

UNIT- IV

Images; Ordered and Unordered lists; Inserting Graphics; Table Creation and Layouts; Frame Creation and layouts; Working with Forms and menus; Working with Radio buttons; Checks Boxes; Text Boxes;

TEXT AND REFERENCE BOOKS:

1. Raj Kamal, Internet and Web Technologies, Tata McGraw- Hill, 2002.
2. Ramesh Bangia, Multimedia and Web Technologies, Firewall Media, 2007
3. Thomas A. Powell, Web Design: The complete Reference, 4/e, Tata McGraw- Hill, 2003.
4. Wendy Willard, HTML Beginners Guide, Tata McGraw- Hill, 2009.
5. Deitel and Goldberg, Internet and World Wide Web, How to Program, PHI, 2004.

DIGITAL ELECTRONICS

Course Code: BCA-PC(L)-233

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT- I

Information Representation: Number Systems, Binary Arithmetic Operations, Fixed-point and Floating point representation of numbers, BCD Codes, Error detecting and correcting codes, Character Representation – ASCII, EBCDIC, Unicode, Binary Logic: Boolean Algebra, Boolean Theorems, Boolean Functions Truth Tables, Canonical and Standard forms of Boolean functions, Simplification of Boolean Functions - Venn Diagram, Karnaugh Maps,

UNIT- II

Digital Logic: Basic Gates -AND, OR, NOT, Universal Gates - NAND, NOR, Other Gates - XOR, XNOR etc. NAND, NOR, AND-OR-INVERT and OR-AND-INVERT implementations of digital circuits, Combinational Logic – Characteristics, Design Procedures, analysis procedures, Multilevel NAND and NOR circuits.

UNIT- III

Combinational Circuits: Half-Adder, Full-Adder, Half-Subtractor, Full-Subtractor, Encoders, Decoders, Multiplexers, Demultiplexers, Comparators, Code Converters BCD to Seven Segment Decoder.

UNIT- IV

Sequential Logic: Characteristics, Flip-Flops, Clocked RS, D type, JK, T type and Master Slave flip-flops. State table, State diagram and State equations. Flip-flop excitation tables.

TEXT AND REFERENCE BOOKS:

1. M. Morris Mano, Digital Logic and Computer Design, Prentice Hall of India Pvt. Ltd., 2004.
2. V. Rajaraman and T. Radhakrishnan, An Introduction to Digital Computer Design, Prentice Hall of India Pvt. Ltd., 2004
3. Andrew S. Tanenbaum, Structured Computer Organization, Prentice Hall of India Pvt. Ltd., 1984.
4. Nicholas Carter, Schaum's Outlines Computer Architecture, Tata McGraw-Hill., 2002.

INTRODUCTION TO DATABASE SYSTEMS

Course Code: BCA-PC(L)-234

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT- I

Basic Concepts- Data, Information, Records and Files. Traditional file –based System- File based Approach-Limitations of File based Approach, Database Approach- Characteristics of File based Approach, Database Management System(DBMS), Components of DBMS Environment, DBMS Functions and Components, Advantages and Disadvantages of DBMS.

UNIT- II

Roles In the Database Environment – Data and Database Administrator, Database Designers, Applications Developers and Users. Database System Architecture – Three Levels of Architecture, External, Conceptual and Internal Levels, Schemas, Mappings and Instances. Data Independence – Logical and Physical data Independence.

UNIT- III

Classification of Database Management System, centralized and Client Server Architecture to DBMS. Data Models: Records-based data Models, Object-based Data models, Physical Data Models and Conceptual Modeling.

UNIT- IV

Entity-Relationship model – Entity Types, Entity Sets, Attributes relationship Types, Relationship Instances and ER Diagrams. Basic Concepts of Hierarchical and Network Data Model.

TEXT AND REFERENCE BOOKS:

1. Elmasri and Navathe, Fundamentals of Database System, 5th Edition, Pearson Education, 2006.
2. Thomas Connolly, Carolyn Begg., and Carolyn E. Begg., DS: A practical Approach to Design, Implementation and Management, 3rd Edition, Pearson Education, 2002.
3. C.J. Date, An Introduction to Database System, 8th Edition, Addison Wesley N.Delhi, 2003.

ADVANCED DATA STRUCTURES

Course Code: BCA-PC(L)-235

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External:70

Internal:30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT-I

Tree: Introduction, Definition, Representing Binary tree in memory, Traversing binary trees, Traversal algorithm using stacks, Header nodes, Threads, Binary search trees- Searching, Insertion and Deletion.

UNIT-II

AVL search trees: Introduction, Insertion and Deletion, m-way search tree: searching, insertion and deletion, B-tree: Insertion and deletion. Hashing: Introduction, Collision resolution.

UNIT-III

Graphs: Introduction, Graph theory terminology, Sequential and linked representation of graphs, Warshall's algorithm for shortest path, Dijkstra algorithm for shortest path, Operations on graphs, Traversal of graph.

UNIT-IV

Sorting: Internal & external sorting, Radix sort, Quick sort, Heap sort, Merge sort, Comparison of various sorting and searching algorithms on the basis of their complexity.

TEXT AND REFERENCE BOOKS:

1. Seymour Lipschutz, Data Structure, Tata McGraw Hill, 2014.
2. Horowitz, Sahni and Anderson-Freed, Fundamentals of Data Structure in C, Orient Longman, BlackSwan, 2008
3. Trembley, J.P. And Sorenson P.G., An Introduction to Data Structures with Applications, McGraw- Hill International Student Edition, New York, 1984.
4. Yedidyan Langsam, Moshe J. Augenstein and Aaron M. Tenenbaum, Data Structures using C, Prentice Hall of India Pvt. Ltd., New Delhi, 1996.

OBJECT ORIENTED PROGRAMMING USING C++ LAB

Course Code: BCA-PC(P)-236

Course Credit: 2

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: An internal practical examination is conducted by the course coordinator. The end semester practical examination is conducted jointly by external and internal examiners.

Students are given eight to ten laboratory assignments based on BCA-PC(L)-231. The lab assignments are evenly spread over the semester. Every student is required to prepare a file of laboratory experiments done.

WEB DESIGNING LAB

Course Code: BCA-PC(P)-237

Course Credit: 2

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: An internal practical examination is conducted by the course coordinator. The end semester practical examination is conducted jointly by external and internal examiners.

Students are given eight to ten laboratory assignments based on BCA-PC(L)-232. The lab assignments are evenly spread over the semester. Every student is required to prepare a file of laboratory experiments done.

SEMESTER 4

JAVA PROGRAMMING

Course Code: BCA-PC(L)-241

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT-I

Introduction to JAVA & Principles of Object Oriented Programming: Basic Concepts of OOPs and its Benefits; Applications of OOPs; The Creation of JAVA; Importance of JAVA for the Internet; JAVA's Magic: The Byte-code; Features of Java.

Data Type, Array & Strings: Data types & Operators available in JAVA; Control Structures: if, while, do while, for, switch; Break & Continue Statement;

Array and Strings: Arrays, Arrays of Characters, String handling Using String Class; Operations of String Handling; String Buffer Class.

UNIT-II

Object Oriented: Object Oriented Programming in JAVA, JAVA Program Structure. Defining of a Class, Definition of Methods, Constructors, Creating Objects of a Class, Assigning Object Reference Variables, The keyword "this", Defining and Using a Class, Automatic Garbage Collection. Extending Class and Inheritance: Using Existing Classes, Classes Inheritance, Choosing Base Class, Access Attributes, Polymorphism, Multiple Levels of Inheritance, Abstraction through Abstract Classes, Using Final Modifier, the Universal Super class-Object Class.

UNIT-III

Package & Exception Handling: Understanding Packages, Defining Package, Packaging up your Classes, Adding Classes from a Package to your Program, Understanding CLASSPATH, Standard Packages, Access Protection in Package.

Exception Handling: The Idea behind Exceptions, Types of Exceptions, Dealing with Exceptions, Exception Objects, Defining your own Exception, Checked and Unchecked Exceptions.

UNIT-IV

Creating Applets in JAVA: Applet basics, Applets architecture, Applets life cycle, simple Applet display methods; requesting repainting; using the status window; the html applet tag; passing parameters to applets.

Multithreading Programming: The JAVA Thread Model, Understanding Threads, The Main Thread, Creating a Thread: extending Thread and implementing Runnable Interface, Creating

multiple Threads, Threads Priorities, Synchronization, Deadlocks Inter-thread Communication, Deadlocks.

Input/Output in JAVA : I/O Basics, Byte and Character Structure, I/O classes, Reading Console Input, Writing to Console, Reading and Writing on Files, Random Access Files, Storing and Retrieving Objects from File, Stream Benefits.

TEXT AND REFERENCE BOOKS:

1. E. Balagurusamy, Programming with JAVA, Tata McGraw Hill, 2014.
2. Herbert Schildt, The Complete Reference JAVA, TMH Publication, 2017.
3. Ivor Horton, Beginning JAVA, WROX Public, 2005.
4. JAVA 2 UNLEASHED, Tech Media Publications / **Jamie Jaworski, Java 2 Platform Unleashed, SAMS, 1999.**
5. Patrick Naughton and Herbertz Schildt, Java-2 The Complete Reference, TMH, 1999.

RDBMS

Course Code: BCA-PC(L)-242

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT - I

Relational Model concepts, Codd's Rules for Relational Model, Relational Algebra:- Selection and Projection, Set Operation, Renaming, Join and Division. Relational calculus: Tuple Relational Calculus and Domain Relational Calculus.

UNIT-II

Functional Dependencies and Normalization: Purpose, Data Redundancy and Update Anomalies. Functional Dependencies: Full Functional Dependencies and Transitive Functional Dependencies, Characteristics of Functional Dependencies. Decomposition and Normal Forms (1NF, 2NF, 3NF & BCNF)

UNIT – III

SQL: Data Definition and data types, Specifying Constraints in SQL, Schema, change statement, Basic Queries in SQL, Insert, Delete and Update Statement, Views.

UNIT - IV

PL/SQL: Introduction Advantages of PL/SQL, The Generic PL/SQL Block: PL/SQL Exception Environment, PL/SQL Character set and Data Types, Control Structure in PL/SQL.

TEXT AND REFERENCE BOOKS:

1. Elmasri and Navathe, Fundamentals of Database systems, 5th Edition, Pearson Education, 2006.
2. Ivan Bayross, SQL, PL/SQL-The Program Language of ORACLE, BPB Publication, 2010.
3. H. Korth, A. Silberschatz and S. Sudarshan, Database System Concept, 4th Edition, McGraw Hill International Edition, 2001.
4. C.J.Date, An Introduction to Databases Systems, 8th Edition, Addison Wesley, New Delhi, 2003.

COMPUTER ARCHITECTURE

Course Code: BCA-PC(L)-243

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT – I

Architecture Unit: Main sub-units:Memory data register, accumulator, multiplier quotient register, adder and logic processor, shift counter, status flip-flops. Arithmetic operations – addition and subtraction, shifting, data transfer, multiplication, division, logic operations, storing.

Innovations in Arithmetic Unit: Speed of addition: addition without carries, carry storage adders, carry anticipation, the carry look ahead scheme.

UNIT – II

Memory Systems: Speed imbalance between the arithmetic and memory units, advantages of memory hierarchies, memory interleaving, problems of management of memory hierarchies, operation of virtual memories. Associative memories. Cache memories – operation of the cache, comparison of cache and virtual memory system, schemes for cache organization, word or block replacement, writing into the cache, multi level caches.

UNIT - III

General Organization and Control: Addressing schemes – one, two and three address schemes, no-address scheme, address modification and index registers, general purpose registers, addressing modes, stack organization, use of stack for evaluation of expressions, interrupt processing, subroutine return, storing local variables, storing parameters, implementation of stacks, stack organized processors. Register Transfer Language.

UNIT – IV

I/O Units: Early I/O devices, dot-matrix printers, inkjet printers, laser printers. Information exchange between devices – serial and parallel modes of transfer, synchronous and asynchronous modes of transfer–source-initiated, destination-initiated asynchronous data transfer, handshaking. Buffered I/O, Internal buffering. DMA & transfer modes. Data Channel organization, I/O bus, external interface, device controller and internal interface, processor and memory interfaces, ways of connecting devices on a bus, PCI.

TEXT AND REFERENCE BOOKS:

1. P.V.S. Rao, ComputerSystem Architecture, PHI, 2009.
2. John D. Carpinelli, Computer System Organization and Architecture, Pearson, 2009.
3. M. Morris Mano, Computer Architecture”, 3rd Edition, PHI, 2001.

4. John P. Hayes, Computer Architecture and Organization, McGraw-Hill, 1998.
5. W. Stallings, Computer Organization & Architecture, Pearson Education, 2006.

COMPUTER NETWORKS

Course Code: BCA-PC(L)-244

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT – I

Introduction to Computer Communications and Networking Technologies, Uses of Computer Networks, Network Devices, Nodes, and Hosts, Types of Computer Networks and their Topologies; Network Software: Network Design issues and Protocols; Connection-Oriented and Connectionless Services; Network Applications and Application Protocols; Computer Communications and Networking Models: Decentralized and Centralized Systems, Distributed Systems, Client/Server Model; Network Architecture and the OSI Reference Model, Example Network: The Internet, X.25, Frame relay;

UNIT – II

Analog and Digital Communications Concepts: Representing Data as Analog Signals, Representing Data as Digital Signals, Data Rate and Bandwidth, Capacity, Baud Rate; Digital Carrier Systems; Guided and Wireless Transmission Media; Communication Satellites; Switching and Multiplexing; Dial Up Networking; Analog Modem Concepts; DSL Service

UNIT - III

Data Link Layer: Framing, Flow Control, Error Control, Error Detection and Correction, Sliding Window Protocols, Media Access Control, Random Access Protocols, Token Passing Protocols, Token Ring, Introduction to LAN technologies: Ethernet, switched Ethernet, VLAN, Fast Ethernet, gigabit Ethernet, token ring, FDDI, Wireless LANs; Bluetooth;

UNIT – IV

Network Hardware Components: Connectors, Transceivers, Repeaters, Hubs, Network Interface Cards and PC Cards, Bridge, Switches, Routers, Gateways;
Routing Concepts: Virtual Circuits and Datagrams, Routing Algorithms, Flooding, Shortest Path Routing, Distance Vector Routing, Link State Routing, Hierarchical Routing, Congestion Control Algorithms, Internetworking;

TEXT AND REFERENCE BOOKS:

1. Michael A. Gallo and William M. Hancock, Computer Communications and Networking Technologies, Course Technology, 2001.
2. Andrew S. Tanenbaum, Computer Networks, 5th Edition, Pearson Education, 2013.

3. James F. Kurose, Keith W. Ross, Computer Networking, Pearson Education, 2013.
4. Behrouz A Forouzan, Data Communications and Networking, McGraw Hill, 2017.

ADVANCED WEB DESIGNING

Course Code: BCA-PE(L)-241

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT - I

Brief Introduction to Interactivity tools: CGI; Features of Java; Java Script; Features of ASP; VBScript; Macromedia Flash; Macromedia Dreamweaver; PHP

UNIT - II

Introduction and Features of Adobe Photoshop; Microsoft FrontPage Introduction; Features; Title Bar, Menu bar, Front Page Toolbar, Style, Front Face and Formatting Bar; Scroll Bars

UNIT - III

Introduction to DHTML and its features; Events; Cascading Style Sheets, Creating Style Sheets; Common Tasks with CSS: Text, Font, Margins, Links, Tables, Colors; Marquee; Mouseovers; Filters and Transitions; Adding Links; Adding Tables; Adding Forms; Adding Image and Sound

UNIT - IV

Extensible Mark-up Language(XML): Introduction, Features, XML Support and Usage, Structure of XML Documents, Structures in XML, Creating Document Type Declarations, Flow Objects, Working with Text and Font, Color and Background properties.

TEXT AND REFERENCE BOOKS:

1. Raj Kamal, Internet and Web Technologies, Tata McGraw-Hill, 2002.
2. Ramesh Bangia, Multimedia and Web Technology, Firewall Media, 2011.
3. DOAEC, Internet and Web Design, ITLES Research and Development Wing, Macmillan India.
4. Thomas A. Powell, Web Design: The Complete Reference, 4 Edition, Tata McGraw-Hill, 2003.
5. H. M. Deitel, P. Deitel and A. B. Goldberg, Internet and World Wide Web, How to Program, PHI, 2004.

MOBILE APPLICATION DEVELOPMENT

Course Code: BCA-PE(L)-242

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT – I

Getting started with Mobility: Mobility landscape, mobile platform, mobile apps development, overview of android platform, setting up the mobile app development environment along with an emulator, a case study on mobile app development.

UNIT – II

Building blocks of mobile apps: Apps user: Interface designing-mobile UI resources (Layout, UI elements, Draw-able, Menu), activity-states and life-cycle, interaction amongst activities. app-functionality beyond user interface- threads, async task, service –state and life cycle, notification, broadcast receivers, telephony and smsapis native data handling- on device file I/O, shared preferences, mobile database such as SQLite, and enterprise data access (via Internet/Intranet)

UNIT - III

Sprucing up mobile apps: Graphics and animation- custom views, canvas, animation APIs, multimedia-audio/video playback and record, location awareness, and native hardware access (sensor such as accelerometer and gyroscope).

UNIT – IV

Testing mobile apps: Debugging mobile apps, white box testing, black box testing, and test automation of mobile app, JUnit for Android, Robotium, Monkey Talk. Taking apps to market: Versioning signing and packaging mobile apps, distributing apps on mobile marketplace.

TEXT AND REFERENCE BOOKS:

1. Barry Burd, Android Application Development All in One for Dummies, John Wiley & Sons Inc., Edition I , 2011.
2. Anubhav Pradhan and Anil V Deshpandy, Mobile App Development, Edition I.

SYSTEM ADMINISTRATION AND MAINTENANCE

Course Code: BCA-PE(L)-243

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT-I

Exploring different Operating Systems: Introduction to Linux/Unix based operating systems, introduction to Windows based operating systems, difference between Linux/Unix and other operating systems, introduction to server based operating systems, difference between desktop based (Windows 10) and server based operating systems like Windows server 2003/2008.

UNIT-II

Linux/Ubuntu System Environment: Configuring desktop environment and desktop settings, installing and configuring software and hardware, exploring file structure, terminal, shell, basic Unix Commands like cat, ls, cd, date, cal, man, echo, pwd, mkdir, rm, rmdirps, kill etc.

UNIT-III

Windows System Environment: Configuring desktop environment and desktop settings, installing and configuring software and hardware, explore system configuration using control panel, creating users, add/ delete users, difference between workgroup and domain, concept of user profiles – creating and roaming, concept of Active Directory, process and disk management, Windows task manager, exploring file structure and file properties, backup and recovery.

UNIT-IV

Network Administration: Examine network settings using commands like ipconfig/ifconfig, hostname, net, netstat, whoami etc., troubleshoot network connectivity issues using commands like: ipconfig, ping, tracert, route etc., sharing resources (files, printers etc.) on the network, accessing a system remotely using remote desktop.

TEXT AND REFERENCE BOOKS:

1. W. Panek and T. Wentworth, Mastering Windows 7 administration, Wiley Publishing Inc., 2010.
2. G. Snyder, T. R. Hein, and B. W. EviNemeth, UNIX and Linux System Administration Handbook, 5th Edition, Pearson, 2018.
3. M. S. Sobell, A Practical Guide to Ubuntu Linux, 4th Edition, Prentice Hall, 2014.
4. M. Burges, Principles of Network and System Administration. John Wiley & sons Ltd., 2003.

5. T.A. Limoncelli, C. Hogan and S. R. Chalup, *The Practice of System and Network Administration*, Addison-Wesley, 2007.

JAVA PROGRAMMING LAB

Course Code: BCA-PC(P)-246

Course Credit: 2

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: An internal practical examination is conducted by the course coordinator. The end semester practical examination is conducted jointly by external and internal examiners.

Students are given eight to ten laboratory assignments based on BCA-PC(L)-241. The lab assignments are evenly spread over the semester. Every student is required to prepare a file of laboratory experiments done.

RDBMS LAB

Course Code: BCA-PC(P)-247

Course Credit: 2

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: An internal practical examination is conducted by the course coordinator. The end semester practical examination is conducted jointly by external and internal examiners.

Students are given eight to ten laboratory assignments based on BCA-PC(L)-242. The lab assignments are evenly spread over the semester. Every student is required to prepare a file of laboratory experiments done.

SEMESTER 5

PROGRAMMING USING PYTHON

Course Code: BCA-PC(L)-351

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT - I

Introduction to Python: History and Features of Python Programming, Python Interpreter. Variable, identifiers and literal. Token, keywords. Data Types. Arithmetic operators, Relational operators, Logical operators, Bitwise operators, Assignment operators, Membership operators, Identity operators. Operator precedence. Comment, Indentation, Need for indentation
Built-in Functions: input, eval, composition, print, type, round, min and max, pow. Type Conversion, Random Number Generation. Mathematical Functions. Getting help on a function, Assert Statement.

UNIT - II

Control Statements: if Conditional Statement, for and while Statements. break, continue and pass statements. Functions: Function Definition and Call, Function Arguments-Variable Function Arguments, Default Arguments, Keyword Arguments, Arbitrary Arguments. Command Line Arguments. Global and local Variables. Accessing local variables outside the scope, Using Global and Local variables in same code, Using Global variable and Local variable with same Name.

UNIT - III

Strings: String as a compound data type. String operations- Concatenation, Repetition, Membership operation, Slicing operation. String methods-count, find, rfind, capitalize, title, lower, upper, swapcase, islower, isupper, istitle, replace, isalpha, isdigit, isalnum. String Processing examples.

Lists: List operations-multiplication, concatenation, length, indexing, slicing, min, max, sum, membership operator; List functions-append, extend, remove, pop, count, index, insert, sort, reverse.

UNIT - IV

Object Oriented Programming: Introduction to Classes, Method, Class object, Instance object, Method object. Class as abstract data type, Date Class. Access attributes using functions-getattr, hasattr, setattr, delattr. Built-In Class Attributes of Class object (__dict__, __doc__, __name__, module__).

TEXT AND REFERENCE BOOKS:

1. Sheetal Taneja and Naveen Kumar, Python Programming A modular Approach, Pearson, 2017.
2. Reema Thareja, Python Programming Using Problem Solving Approach, Oxford Publications.
3. Y. Daniel Liang, Introduction to Programming Using Python, Pearson, 2013.

4. Ashok Namdev Kamthane, Programming and Problem Solving with Python, Mc Graw Hill Education Publication, 2018.

COMPUTER GRAPHICS

Course Code: BCA-PC(L)-352

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT-I

Graphics Primitives: Introduction to computer graphics, Basics of Graphics systems, Application areas of Computer Graphics, overview of graphics systems, video-display devices, and raster-scan systems, random scan systems, graphics monitors and workstations and input devices.

Output Primitives: Points and lines, line drawing algorithms, mid-point circle and ellipse algorithms.

Filled area primitives: Scan line polygon fill algorithm, boundary fill and floodfill algorithms .

UNIT-II

2-D Geometrical Transforms: Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems.

2-D Viewing: The viewing pipeline, viewing coordinate reference frame, window to viewport coordinate transformation, viewing functions, Cohen-Sutherland and Cyrus-beck line clipping algorithms, Sutherland –Hodgeman polygon clipping algorithm.

UNIT-III

3-D Object Representation: Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-Spline curves, Bezier and B-Spline surfaces. Basic illumination models, polygon-rendering methods.

UNIT-IV

3-D Geometric Transformations: Translation, rotation, scaling, reflection and shear transformations, composite transformations.

3-D Viewing: Viewing pipeline, viewing coordinates, view volume and general projection transforms and clipping.

SUGGESTED READINGS

1. Donald Hearn and M. Pauline Baker, Computer Graphics, PHI Publications, 1997.
2. Plastock, Theory & Problem of Computer Gaphics, Schaum Series, 1986.
3. Foley and Van Dam, Fundamentals of Interactive Computer Graphics, Addison-Wesley, 1982.

4. M. W. Newman, Principles of Interactive Computer Graphics, McGraw Hill, 2016.
5. L.K. Tosijasus, Computer Graphics, Springer-Verlag.

SOFTWARE ENGINEERING

Course Code: BCA-PC(L)-353

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT- I

Software Crisis – problem and causes, Software life cycle models: Waterfall, Prototype, Evolutionary and Spiral models. Software Project Planning: Cost estimation: COCOMO model, Project scheduling, project monitoring.

UNIT- II

Software Requirement Analysis and Specifications: Structured Analysis, Data Flow Diagram, Data Dictionaries, Software Requirement and Specifications, Behavioral and non-behavioral requirements. Software Design: Design fundamentals, problem partitioning and abstraction, design methodology, Cohesion & Coupling, Classification of Cohesiveness & Coupling.

UNIT- III

Software Configuration Management, Quality Assurance, Risk Management, Software Maintenance: Type of maintenance, Management of maintenance..

UNIT- IV

Coding: Programming style, structured programming. Software testing: Testing fundamentals, Functional testing: Boundary Value Analysis, Equivalence class testing, Decision table testing, Cause effect graphing, Software testing strategies: Unit testing, integration testing, validation testing, System testing, Alpha and Beta testing.

TEXT AND REFERENCE BOOKS:

1. R.S. Pressman, Software Engineering- A Practitioner's Approach, Tata McGraw- Hill, 2014.
2. K.K. Aggarwal and Yogesh Singh, Software Engineering, New Age Pub, 2008.
3. P. Jalote, An Integrated approach to Software Engineering, Narosa, 2005.
4. Sommerville, Software Engineering, Addison Wesley, 2006.
5. R. Fairley, Software Engineering Concepts, Tata McGraw- Hill, 1997.
6. James Peter, W Pedrycz, Software Engineering, John Wiley & Sons, 2000.

DATA WAREHOUSING AND DATA MINING

Course Code: BCA-PC(L)-354

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

Unit I

Data Mining: Introduction, Kind of data to be mined, Data Mining Functionalities, Technologies used in Data Mining, Applications of data Mining, Major Issues in Data Mining.

Unit II

Data Pre-Processing: Introduction, Need of preprocessing, Data Objects and Attribute type, Statistical description of data, Data Visualization, Measuring similarity and dissimilarity of data, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization

Unit III

Data Warehouse: Introduction, Data Warehouse and Database Systems, Data Warehouse Architecture, Data Warehouse Models, Data Cube and OLAP, Multidimensional data Model, Concept Hierarchies, OLAP operations, Data Warehouse Implementation

Unit IV

Mining Frequent Patterns, Associations and Correlations: Introduction, Frequent Itemset Mining using Apriori Algorithm, Generating Association Rule from Frequent Itemsets. Improving efficiency of Apriori, Pattern Growth Approach for Mining Frequent Itemsets, Pattern evaluation Methods.

TEXT AND REFERENCE BOOKS:

1. Jiawei Han, MichelineKamber and Jian Pei, Data Mining Concepts and Techniques, 3rd Edition, Morgan Kaufmann Publishers, July 2011
2. AlexBerson And Stephen J. Smith, Data Warehousing, Data Mining & Olap, TataMcgraw – Hill Edition, 2004.
3. Michael Steinbach and Vipin Kumar, Introduction To Data Mining, Pang-Ning Tan, Pearson Education, 2014.
4. K.P. Soman, Shyam Diwakar and V. Ajay, Insight Into Data Mining Theory And Practice, Easter Economy Edition, Prentice Hall Of India, 2009.
5. G. K. Gupta, Introduction To Data Mining With Case Studies, Easter Economy Edition, Prentice Hall Of India, 2006.

6. Daniel T. Larose, Data Mining Methods And Models, Wiley, 2006.
7. W.H. Inmon, Building The Data Warehouse, 4th Edition, Wiley India,2005.

THEORY OF COMPUTATION

Course Code:BCA-PE(L)-351

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT-I

Finite Automata and Regular Expressions: Definition and Description of Finite Automaton , Non-Deterministic finite automata (NFA), Deterministic finite automata (DFA), Equivalence of DFA and NFA, Finite automata with E-moves, Regular Expressions, Equivalence of finite automata and Regular Expressions, Regular expression conversion and vice versa

UNIT-II

Introduction to Machines: Concept of basic Machine, Properties and limitations of FSM. Moore and mealy Machines, Equivalence of Moore and Mealy machines, Conversion of NFA to DFA by Arden's Method.

Properties of Regular Sets: The Pumping Lemma for Regular Sets, Applications of the pumping lemma, Closure properties of regular sets, Minimization of finite Automata

UNIT-III

Grammars: Definition, Language generated by a Grammar, Chomsky Classification of Languages, Relation between classes of Languages, Operations on Languages

Context Free Language: Context Free Grammar, Ambiguity in Context Free Grammar, Reduced Form, Removal of Useless Symbols and Unit Production, Chomsky Normal Form

UNIT-IV

Pushdown Automata: Introduction to Pushdown Machines, Application of Pushdown Machines

Turing Machines: Deterministic and Non-Deterministic Turing Machines, Design of T.M, Halting problem of T.M.

TEXT AND REFERENCE BOOKS:

1. Introduction to automata theory, language & computations- Hopcroft & O.D.Ullman, R Mothwani, 2001, AW.

2. Theory of Computer Sc. (Automata, Languages and computation):K.L.P.Mishra & N.Chandrasekaran, 2000, PHI.
3. Introduction to Formal Languages & Automata-Peter Linz, 2001, Narosa Publ.
4. Introduction to languages and the Theory of Computation by John C. Martin 2003, T.M.H.

OPEN SOURCE SOFTWARE

Course Code: BCA-PE(L)-352

Course Credit: 3

Maximum Marks: 100

Minimum Pass marks: 40

Time: 3 hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT-I

Introduction: History of Open Source Software (OSS), commercial software vs OSS, free software vs freeware, open source software examples - the GNU projects, copy right issues about open source software.

UNIT 2

The Linux operating system : Linux installation and hardware configuration – boot process - Linux loader (LILO) – Grand Unified Boot loader (GRUB), user account, accessing, starting and shutting processes, log in and log out, command line, simple commands, Unix file system, Unix files, i-node structure and file system related commands.

UNIT 3

Basic principles of copyright law, open source licensing, issues with copyright and patent, warranty, MIT license, BSD License, Apache license, Academic Free License, Mozilla Public License, GPL, LGPL. 59

UNIT 4

Study of commercial application software vs OSS, Open Office.

GIMP: Installation, GIMP user interface, creating new windows.

GIMP: Freehand drawing in GIMP, drawing regular shapes, image editing- cropping and resizing, masking.

GIMP: Language support

TEXT AND REFERENCE BOOKS:

1. A.M. Laurent, Understanding Open Source and Free Software Licensing. O'Reilly Media, 2004.
2. M. N. Rao, Fundamentals of Open Source Software, 1st Edition, PHI Learning, 2014.
3. W.E. Shotts, The Linux Command Line: A Complete Introduction, No Starch Press, 2012.
4. O. Lecarme and K. Delvare, The Book of GIMP, No Starch Press, 2013.
5. J. Smith and R. Joost, GIMP for Absolute Beginners, Apress, 2012.

CLOUD COMPUTING

Course Code: BCA-PE(L)-353

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT -I

Cloud Computing: Introduction to client server computing, Peer to Peer computing, Distributed computing, collaborative computing and cloud computing, Importance of cloud computing in current era, Characteristics, advantages and disadvantages of cloud computing.

UNIT -II

Cloud Services: Functioning of cloud computing, Classification of cloud on the basis of services: Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS): Definition, characteristics and their benefits.

UNIT- III

Cloud Architecture: Cloud computing Logical and service architecture, Types of clouds: Private cloud, Public cloud and Hybrid cloud, Comparison of a Private, public and hybrid clouds, Migrating to a cloud, Seven step model to migrate.

UNIT -IV

Applications: Business opportunities using cloud, Managing Desktop and devices in cloud, cloud as a type of distributed infrastructure, Application of cloud computing for centralizing Email communication, collaboration on schedules, calendars. Overview of major cloud service providers - Amazon Ec2, Google App Engine.

TEXT AND REFERENCE BOOKS:

1. Srinivasan, A. Cloud Computing: A Practical Approach for Learning and Implementation, Pearson Education India, 2014.
2. Velte, Anthony T., Toby J. Velte, Robert C. Elsenpeter, and Robert C. Elsenpeter, Cloud computing: a practical approach, New York: McGraw-Hill, 2010.

PYTHON PROGRAMMING LAB

Course Code: BCA-PC(P)-356

Course Credit: 2

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: An internal practical examination is conducted by the course coordinator. The end semester practical examination is conducted jointly by external and internal examiners.

Students are given eight to ten laboratory assignments based on BCA-PC(L)-351. The lab assignments are evenly spread over the semester. Every student is required to prepare a file of laboratory experiments done.

COMPUTER GRAPHICS LAB

Course Code: BCA-PC(P)-357

Course Credit: 2

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: An internal practical examination is conducted by the course coordinator. The end semester practical examination is conducted jointly by external and internal examiners.

Students are given eight to ten laboratory assignments based on BCA-PC(L)-352. The lab assignments are evenly spread over the semester. Every student is required to prepare a file of laboratory experiments done.

MINOR PROJECT

Course Code: BCA-PC(P)-358

Course Credit: 2

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: An internal practical examination is conducted by the course coordinator. The end semester practical examination is conducted jointly by external and internal examiners.

Project work will be carried out under supervision of teacher of the College/Department. Evaluation & viva-voce to be done jointly by internal and external examiners.

SEMESTER 6

INTERNET TECHNOLOGY

Course Code: BCA-PC(L)-361

Course Credit: 3

Maximum Marks: 100

Minimum Pass marks: 40

Time:3 hours

External: 70

Internal: 30

Note: Examiner will be required to set Nine Questions in all. First Question will be compulsory, consisting of objective type/short-answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each Unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory Question No. 1. All questions will carry equal marks.

UNIT- I

Internet and TCP/IP: Introduction to the Internet, Internet History, Internet Administration; Internet and Intranet; Internet Service; TCP/IP Model and its protocols; IP addresses: IPv4; Subnetting, IPv4 addresses; Supernetting; Next generation Internet Protocol(IPv6); The need for IPv6; Packet Format; IPv6 Addresses; Extension Headers.

UNIT- II

TCP/IPs Transport and Network Layer Protocols: Role of TCP, UDP, IP and Port Numbers; Format of TCP, UDP and IP; TCP services; TCP connection management; Remote Procedure Call; SCTP; IP address resolution- Domain Name Space; DNS mapping; Recursive and Iterative resolution; Resource records; Mapping Internet Address to Physical Addresses; ARP, RARP, BOOTP, DHCP; ICMP; IGMP.

UNIT- III

TCP/IP Application Level Protocols; Electronic Mail: Architecture; SMTP, MIME, POP, IMAP; Web Based Mail; File Access and transfer: FTP, Anonymous FTP, TFTP, NFS; Remote login using TELNET; Voice and Video over IP: RTP, RTCP, IP Telephony and Signaling, Resource Reservation and Quality of service, RSVP.

UNIT- IV

Routing in Internet: RIP, OSPF, BGP; Internet Multicasting; Mobile IP; Private Network Interconnection: Network Address Translation(NAT), Virtual Private network(VPN); Internet Management: SNMP; Internet Security; IPSec, EMail Security; Web Security, Firewalls; Digital Signatures; Certificates.

TEXT AND REFERENCE BOOKS:

1. Douglas E. Comer, Internetworking with TCP/IP Volume-I, Principles, Protocols, and Architecture, Fourth Edition, Pearson Education, 2018.
2. Andrew S. Tanenbaum, Computer networks, Pearson Education, 2013.
3. Behrouz A Forouzan, Data Communications and Networking, McGraw Hill, 2017.
4. Michael A. Gallo and William M. Hancock, Computer Communications and Networking Technologies, Course Technology, 2001.

5. James F. Kurose and Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Pearson Education.
6. Wayne Tomasi, "Introduction to Data Communications and Networking", Pearson Education.

E-COMMERCE

Course Code: BCA-PC(L)-362

Course Credit: 3

Maximum Marks: 100

Minimum Pass marks: 40

Time: 3 hours

External: 70

Internal: 30

Note: Examiner will be required to set Nine Questions in all. First Question will be compulsory, consisting of objective type/short-answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each Unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory Question No. 1. All questions will carry equal marks.

UNIT-I

Introduction to E-Commerce-Business operations, E-commerce practices vs. traditional business practices; concepts of b2b,b2c,c2c,b2g,g2c; Features of E-Commerce, Types of Ecommerce Systems, Elements of E-Commerce, Benefits and Limitations of E-Commerce.

UNIT-II

Concepts of EDI (Electronic Data Interchange), EDI vs. Traditional methods, Benefits of EDI, Drawbacks of EDI, Components of EDI, EDI Implementation, Applications of EDI, Financial EDI, Concept of E-Governance.

UNIT-III

Products in b2c model, e-brokers; Broker-based services on-line; Benefits and impact of e-commerce on travel industry; Online banking and its benefits; On-line financial services, E-auctions- implementations and benefits.

UNIT-IV

Electronic Payment System and its types, define E-money and E-wallets, Electronic fund transfer, Security Issues in E-commerce, Essential Security Requirements for safe Electronic Payments, Security Schemes.

TEXT AND REFERENCE BOOKS:

1. E. Turban, J. Lee, D. King and H. M Chung, Electronic commerce-a Managerial Perspective, Prentice-Hall International, Inc., 2002.
2. V. Bhatia, E-commerce, Khanna Book Pub. Co.(P) Ltd., Delhi, 2000
3. Bharat Bhasker, Electronic Commerce -Framework, technologies and Applications, TMH Publications, 2013
4. David Whitely, Electronic Commerce, TMH, N Delhi, 2000.
5. Shurety, E-business with Net Commerce, Addison Wesley Longman, 1999.
6. Kosiur, Understanding E—Commerce, Prentice Hall of India, N. Delhi

DATA VISUALIZATION USING R

Course Code: BCA-PC(L)-363

Course Credit: 3

Maximum Marks: 100

Minimum Pass marks: 40

Time: 3 hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT- I

Introduction to R: Installation of R, features of R, applications of R programming, data types in R, scripting in R, data editing, use of R as a calculator, control structures in R.

UNIT- II

Data Handling in R: Importing data in R (loading Tables and CSV files), Reading and writing files in R.

UNIT- III

Basic data structures in R: Vectors, matrices, array, lists, data frames.

UNIT- IV

Visualization Tools: Introduction to simple graphics and plots, bar charts, histograms, pie charts, scatter plots (plotting multiple variables), line plots and regression, word clouds, radar charts, waffle charts, box plots, exporting plots as images.

TEXT AND REFERENCE BOOKS:

1. R. Kabacoff, R in Action: Data Analysis and Graphics with R, Manning Publications, 2011.
2. T. Rahlf, Data Visualization with R: 100 Examples. Springer, 2017.
3. J. Adler, R in a Nutshell: A Desktop Quick Reference, 2nd Edition, O'Reilly Media, 2012.
4. T. M. Davies, The book of R, 1st Edition, No Starch Press, 2016.

ARTIFICIAL INTELLIGENCE

Course Code: BCA-PC(L)-352

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT-I

Overview of Artificial Intelligence: Introduction to AI, Importance of AI, AI and its related field, AI techniques, Problems, Problem Space and search: Defining the problem as a state space search, Production system and its characteristics, Issue in the design of search problem.

UNIT-II

Knowledge representation: Definition and importance of knowledge, Knowledge representation, various approaches used in knowledge representation, Issues in knowledge representation, Using Predicate Logic: Representing simple facts in logic.

UNIT-III

Heuristic Search Technique: Generate and test, hill climbing, Best first search technique, Problem Reduction, Constraint Satisfaction.

Natural language processing: Introduction syntactic processing, Semantic processing, Discourse and pragmatic processing.

UNIT-IV

Learning: Introduction learning, Rote learning, learning by taking advice, Learning in problem solving, learning from example-induction, Explanation based learning.

Expert system: Introduction, Representing using domain specific knowledge, Expert system shells, LISP and other AI programming languages.

TEXT AND REFERENCE BOOKS:

1. E. Rich and K. Knight, Artificial intelligence, TMH, 2nd Edition, 1999.
2. D. W. Patterson, Introduction to AI and Expert Systems, PHI, 1999.
3. Nils J Nilsson, Artificial intelligence –A new Synthesis, 2nd Edition, Harcourt Asia Ltd., 2000.

INFORMATION AND CYBER SECURITY

Course Code: BCA-PE(L)-361

Course Credit: 3

Maximum Marks: 100

Minimum Pass marks: 40

Time: 3 hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

Unit I

Cryptography: Overview of Information Security, Basic Concepts, Cryptosystems, Cryptanalysis, Ciphers & Cipher modes, Symmetric Key Cryptography DES, AES. Asymmetric Key Cryptography, RSA algorithm, Diffie Hellman Algorithm. Digital Signature-Digital Signatures.

Unit II

System Security: Program Security, Malicious Logic, Protection. Database Security- Access Controls, Security & Integrity Threats, Defence Mechanisms. OS Security-Protection of System Resources.

Unit III

Ethics in Cyber Security: Privacy, Intellectual Property in cyberspace, Professional Ethics, Freedom of Speech, Fair User and Ethical Hacking, Trademarks, Internet Fraud, Electronic Evidence, forensic Technologies, Digital Evidence collections. Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking.

Unit IV

Cybercrimes and Cybersecurity: Cybercrime and Legal Landscape around the world, Cyberlaws, The Indian IT Act, Challenges, Digital Signatures and Indian IT Act, Amendments to the Indian IT Act, Cybercrime and punishment, Cost of Cybercrimes and IPR Issues, Web threats for Organizations, Social Computing and associated Challenges for Organizations.

TEXT AND REFERENCE BOOKS:

1. Cryptography and Network security-Principles and Practices, Pearson Education, 9th Indian Reprint, 2005
2. Charlie Kaufman , Network Security : Private communication in Public World, Prentice-Hall International, Inc. April 2008
3. Nina Godhole and Sunit Belapure, Cyber Security, Wiley India, 2011.
4. James Graham and Ryan Olson, Cyber Security Essentials, Rick Howard CRC Press, Taylor & Francis, 2011.

MULTIMEDIA TECHNOLOGY

Course Code: BCA-PE(L)-362

Course Credit: 3

Maximum Marks: 100

Minimum Pass marks: 40

Time: 3 hours

External: 70

Internal: 30

Note: Examiner will be required to set Nine Questions in all. First Question will be compulsory, consisting of objective type/short-answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each Unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory Question No. 1. All questions will carry equal marks.

UNIT-I

Introduction to Multimedia: Components of Multimedia; Hypermedia and Multimedia; Overview of Multimedia Software Tools; Multimedia Hardware and Software; Basic Software Tools; Making Instant Multimedia; Presentation Tools; Multimedia Authoring; Types of Authoring Tools; Page-Based Authoring Tools; Icon-Based Authoring tools; Time-Based Authoring Tools.

UNIT-II

Graphics and Image Data Representation: Graphics/Image Data Types, Popular File Formats; Color Models in Images and Video; Types of Video Signals Analog and Digital Video: Broadcast Video Standards: NTSC, HDTV; Chroma Subsampling.

UNIT-III

Digital Audio: Digitization of Sound; MIDI Versus Digital Audio; Quantization and Transmission of audio: Coding of Audio; Pulse Code Modulation; Differential Coding of Audio; Lossless Predictive Coding; DPCM.

UNIT-IV

Multimedia Data Compression: Run-Length Coding; Variable-Length Coding; Dictionary-Based Coding; Transform Coding; Image Compression Standards-JPEG standard; Video Compression Technique: MPEG.

TEXT AND REFERENCE BOOKS:

1. Ze-Nian Li and Mark S. Drew, Fundamentals of Multimedia, Pearson Education, 2003.
2. Tay Vaughan, Multimedia Making it Work, Tata McGraw-Hill, 1999.
3. Ramesh Bangia, Multimedia and Web Technology, Firewall Media, 2007.
4. John F. Koegel Buford, Multimedia systems, Addison Wesley, Pearson Education, 1994.
5. Ana Weston Solomon, Introduction to Multimedia, Tata McGraw-Hill

SOFTWARE TESTING AND QUALITY ASSURANCE

Course Code: BCA-PE(L)-363

Course Credit: 3

Maximum Marks: 100

External: 70

Minimum Passing Marks: 40

Internal: 30

Time: 3 Hour

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT I

Introduction: Some Terminologies, Failures, Testing Process, Limitations of Testing and V-Shaped Software Life-Cycle Model.

Functional Testing: Boundary Value Analysis, Equivalence Class Testing, Decision Table Based Testing, and Cause Effect Graphing Technique.

Structural Testing: Control Flow Testing, Data Flow Testing, Slice Based Testing and Mutation Testing.

Software Verification: Verification Methods, Software Requirement Specification Document Verification, Software Design Description Document Verification.

UNIT II

Selection, Minimization and Prioritization of Test Cases for Regression Testing: Regression Testing, regression Test Case Selection, Reducing the Number of Test Cases, Risk Analysis and Code Coverage Prioritization Techniques. Software Testing Activities Levels of Testing, Debugging, Software Testing Tools, Software Test Plan.

Object Oriented Testing: Object Orientation, Object Oriented Testing, Path Testing, State Based Testing and class testing.

Metrics in Software Testing: Software Metrics, Categories of Metrics, Object Oriented Metrics in Testing.

UNIT - III

Software Quality concepts: Meaning and scope, software quality factors, software quality metrics, relationship between quality factors and quality metrics, quality management system, Concepts of Quality Control, Quality Assurance, Quality Management - Total Quality Management; Cost of Quality; QC tools, Business Process Re-engineering - Zero Defect, Six Sigma, Quality Function Deployment, Benchmarking, Statistical process control.

Software measurement: Fundamentals of measurement, Measurements in Software Engineering, Measurement of internal product attributes - size and structure, External product attributes - measurement of quality, Software quality metrics - Software Process, Project and Product Metrics, metrics for software maintenance.

UNIT - IV

Quality assurance models: ISO-9000 Series and SEI-CMM standards of software quality assurance. People Capability Maturity Model, Capability Maturity Model Integration, Malcolm Baldrige Award, FCMM.

Software Quality Assurance related topics

Software Process - Definition and implementation; internal Auditing and Assessments; Software testing - Concepts, Tools, software reviews, formal technical reviews, Inspections & Walkthroughs; correctness proof, statistical quality assurance, clean room software engineering.

TEXT AND REFERENCE BOOKS:

1. Software Testing, Yogesh Singh, Cambridge University Press, 2012.
2. Effective Methods for Software Testing, William E. Perry, John Wiley and Sons, 2002.
3. Software Testing: Principle, Techniques and Tools, M. G. Limaye, Tata McGraw Hill, 2009.
4. Software Engineering, K. K. Aggarwal and Yogesh Singh, New Age International Publishers, Third Edition, 2008.
5. The Art of Software Testing, Glenford J. Myers, Tom Badgett and Corey Sandler, Wiley & Sons, Third Edition, 2012.
6. Metrics and Models in Software Quality Engineering, Stefan H Khan, Addison-Wesley; 2nd edition, 2014.
7. Software Quality: Theory and Management, Alan Gillies, lulu.com; Third Edition, 2011.

DATA ANALYTICS NUSING R LAB

Course Code: BCA-PC(P)-365

Course Credit: 2

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: An internal practical examination is conducted by the course coordinator. The end semester practical examination is conducted jointly by external and internal examiners.

Students are given eight to ten laboratory assignments based on BCA-PC(L)-363. The lab assignments are evenly spread over the semester. Every student is required to prepare a file of laboratory experiments done.

MAJOR PROJECT

Course Code: BCA-PC(P)-366

Course Credit: 5

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hour

External: 70

Internal: 30

Note: An internal practical examination is conducted by the course coordinator. The end semester practical examination is conducted jointly by external and internal examiners.

Project work will be carried out under supervision of official / Engineer / teacher of industry/company/institute/College. Evaluation & viva-voce to be done jointly by internal and external examiners.