

"MINUTES"
of
The Meeting of Board of Studies in Computer Science, Dated 09.04.2011

Today, i.e., on the 09th day of April, 2011, a meeting of the Board of Studies (BOS) in Computer Science was held at 11:30 AM in the conference room of the university. The following were present:

1. Prof. Durgesh Pant

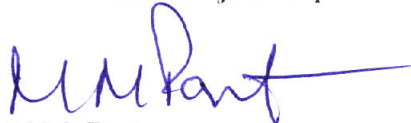
Convener

Director,

School of Computer Science & IT,

Uttarakhand Open University

External Member/Subject Expert



1. Prof. M.M. Pant

External Member/Subject Expert

Ex Director,

School of Computer Science,

Pro- VC, IGNOU,

New Delhi



4. Prof. Manoj Mishra

External Member/Subject Expert

Dept. Of Computer Science & Engineering

IIT Roorkee



5. Prof. Samant Ray

External Member/Subject Expert

Dept. Of Computer Science & Engineering

GB Pant University of Agriculture & Technology

Pant Nagar

INVITED MEMBERS

- Rajeev Tandon
 Research Scientist
 Uttarakhand Open University

INVITED MEMBERS

- Rajeev Tandon
Research Scientist
Uttarakhand Open University
- Abhishek Nagar
Junior Research Scientist
Uttarakhand Open University
-  Rajender Goswami
Lecturer School Of Computer Science & IT
Uttarakhand Open University

MINUTES
of
The Meeting of Board of Studies in
School of Computer Science & IT,
Dated 09.04.2011

A meeting of the Board of Studies (BOS) in Computer Science & IT was held on 9.4.2011 at 11:30 am in the conference room of the Uttarakhand Open University, Haldwani.

At the outset, the Director of the School of Computer Science & IT welcomed all the learned members and apprised them about the activities of the School. The following points were taken up and discussed in the meeting:

1. The School expressed its intent to activate the programmes BCA, MCA, PGDCA and CCA from the coming session. The Director informed the board about the University's intent of adopting and procuring the desired Self Learning Material (SLM) from Krishna Kant Handique State Open University, Guwahati.
2. The programme structure and syllabi were approved. With regard to the fee structure the learned members expressed their opinion that it should be decided by the university as per the requirement, mandate and norms. On the suggestion of incorporating list of suggested books, the list of suggested books has been incorporated. Enclosures are enclosed as annexure 1, 2, 3 & 4.
3. The board also expressed the need to simultaneously develop indigenous course material at the University level as per the need of time and upcoming trend for all the proposed programmes in the time to come. The proposal was thereon proved.
4. It was resolved that the minimum eligibility for admission to MCA programme, whose duration shall be minimum three years and maximum six spanning over six semesters, shall be BCA/ B.Sc. / B.Com./ B.A. degree with mathematics as one of the subject at 10+2 level or at graduation from a recognized University. Though with regard to admission through lateral entry, BCA/M.Sc.(IT)/B.Sc.(CS)/A-level from DOEACC, After graduation/PGDCA equivalent shall be entitled to admission to second year of MCA. M.Sc.(CS)/M.Sc.(IT) from a recognized University shall be entitled to admission to third year of MCA.

Also resolved that the BCA Programme shall be of minimum three years and maximum six years duration spanning over six semesters. It was resolved further, that the eligibility for admission to BCA Programme shall be 10+2 pass. Learners having qualified Bachelor of Computer Applications Preparatory Programme shall also be eligible. However, learners having 10+2 without mathematics shall have to clear a paper on mathematics of BCAPP along with the BCA curriculum.

It was resolved that the Post Graduate Diploma in Computer Application i.e. PGDCA Programme shall be of minimum one year and maximum 3 years duration spanning over two semesters. It was resolved further, that the eligibility for admission to PGDCA Programme shall be Graduation.

It was resolved that the Certificate in Computer Application i.e. CCA Programme shall be of minimum Six month and maximum 2 years duration. It was resolved further, that the eligibility for admission to CCA Programme shall be 10th.

5. It was resolved that the learners shall have to abide by the assignment submission rules of the University.

6. It was resolved that there shall be four foundation courses in the curriculum of BCA programme. These are the following :

S. No.	Foundation Course Title
1	Functional English and Digital Literacy
2	Himalayan Heritage
3	Human Values and Ethics
4	Environmental Studies

It was resolved further, that the learners enrolled with the BCA programme shall be required to pass the above four papers during the course of the BCA programme.

7. A six-month certificate programme 'Certificate in Computer Course' whose course-content in Hindi is being developed by the school has been proposed for activation. The members welcomed this proposal and approved it with some re-structuring. The modifications have been dealt with accordingly. Enclosure is enclosed as annexure 6.

It was resolved that the duration of the proposed programme shall be minimum Six month and maximum 2 years. It was resolved further, that the eligibility for admission to CCC Programme shall be 10th.

8. A programme, Certificate in Linux Awareness (CLA) has also been approved. The members expressed the need to incorporate a module in fundamentals of operating system in the syllabus and subsequently it has been incorporated. Enclosure is enclosed as annexure 11.
9. Keeping in view the growing applicability of Informatics in the domain of geo-informatics the School expressed its intent to activate Masters in Geo Informatics, Post Graduate Diploma in Geo Informatics and Certificate in Geo Informatics programmes. The Self Learning Material of these programmes is being indigenously developed by the School.

The learned members suggested that it curriculum should include the objective of the programme which has been incorporated subsequently.

The programme structure and syllabi were approved. It was resolved that the Masters in Geo Informatics Programme shall be of minimum 2 years and maximum 4 years' duration. It was resolved further, that the eligibility for admission to Masters in Geo Informatics Programme shall be graduation.

It was resolved that the Post Graduate Diploma in Geo Informatics shall be of minimum 1 year and maximum 3 years' duration. It was resolved further, that the eligibility for admission to Post Graduate Diploma in Geo Informatics Programme shall be graduation.

RESOLVED that the Certificate in Geo Informatics programme shall be of minimum 6 months and maximum 2 years duration. It was resolved further, that the eligibility for admission to Certificate in Geo Informatics Programme shall be graduation.

Enclosures are enclosed as annexure 8, 9 & 10.

10. The school expressed its intent to activate a Certificate in e-governance. The syllabus was discussed whose Self Learning Material is been indigenously developed by School.

One of the experts Prof. S.D. Samantray suggested that the programme should also include two units of 4 credits each on Cyber Security. The learned expert gave his

consent to develop the Self Learning material for it. The board accorded its consent for the same. Enclosures are enclosed as annexure 7.

11. The School expressed its intent to activate B.Lib programme. The course material is likely to be procured from some open university.
12. It was brought to the knowledge of the board that IL & FS an education and Technology enterprise intends to activate Certificate Programme in Hardware & Networking (CPHN), Certificate Program for IT Teachers (TechTeach) and Certificate Program for DTP and Web Developers (ACPCA) in association with the Uttarakhand Open University. The course material shall be provided by the IL & FS Education & Technology Services Ltd. A live presentation was also given by IL & FS.

It was suggested by the learned experts that the IL&FS must provide content in the ODL format and subsequently it may be decided upon.

13. It was intended by the school to activate the Doctoral programme. The hon'ble Vice Chancellor informed that the programme across all disciplines would be as per the guidelines and norms of the regulatory and statutory bodies.
14. RESOLVED that the programmes of School of Computer Science shall be offered at those study centers of Uttarakhand Open University which are equipped adequately as per norms. Also, the school would be running its programmes as per the needs and requirement through its approved study centers across the state.
15. RESOLVED that the evaluation criteria, grace marks and all such related matters to be applied to computer science & IT courses shall be as per the University norms decided by the Examination Committee.
16. The enclosed panel of experts for the various activities of school (Course Writers for development of SLM, Course Editors and Paper Setters, examiners etc.) was approved. Enclosures are enclosed as annexure 12.

The meeting ended with thanks to all the members.

Prof. Durgesh Pant
Director
School of Computer Science & Information Technology
Uttarakhand Open University, Haldwani

Agenda
for
The meeting of Board of Studies
of
School of Computer Science & Information Technology,
Scheduled on 9th April, 2011,
at
Uttarakhand Open University

School of Computer Science & Information Technology, Uttarakhand Open University proposes to start various Programmes in Computer Science & Information Technology from the session 2011-12. For the same, meeting of the Board of Studies has been called to discuss and take decision on various issues proposed and consequent decisions regarding programmes to be offered through School of Computer Science & Information Technology.

Issues on the agenda are following:-

Proposal 1:

For the kind approval and sanction by the honourable members of the Board of Studies, the Fee Structure, Programme structure and Syllabus for Bachelor of Computer Application (BCA) is being proposed (attached as Annexure No. 1).

Proposal 2:

For the kind approval and sanction by the honourable members of the Board of Studies, the Fee Structure, Programme structure and Syllabus for Master of Computer Application (MCA) is being proposed (attached as Annexure No. 2).

Proposal 3:

For the kind approval and sanction by the honourable members of the Board of Studies, the Fee Structure, Programme structure and Syllabus for Certificate in Computer Application (CCA) is being proposed are attached as Annexure No. 3.

Proposal 4:

For the kind approval and sanction by the honourable members of the Board of Studies, the Fee Structure, Programme structure and Syllabus for Post Graduate Diploma in Computer Application (PGDCA) is being proposed (attached as Annexure No. 4).

Proposal 5:

The self-instructional material for BCA, MCA, PGDCA and CCA has been proposed to be adopted from Krishna Kant Handique State Open University, Guwahati. The Board is requested to accord approval for the same.

Proposal 5:

For the kind approval and sanction by the honourable members of the Board of Studies, the Fee Structure, Programme structure and Syllabus for Certificate Programme in Hardware & Networking (CPHN), Certificate Programme for IT Teachers (TechTeach) and Certificate Programme for DTP and Web Developers (ACPCA) is being proposed (attached as Annexure No. 5).

Proposal 6:

The self-instructional material for Certificate Programme in Hardware & Networking (CPHN), Certificate Program for IT Teachers (TechTeach) and Certificate Programme for DTP and Web Developers (ACPCA) shall be provided by IL&FS Education & Technology Services Ltd. The Board is requested to accord approval for the same.

Proposal 7:

For the kind approval and sanction by the honourable members of the Board of Studies, the Fee Structure, Programme structure and Syllabus for Certificate in Computer Course (CCC) is being proposed (attached as Annexure No. 6).

Proposal 8:

For the kind approval and sanction by the honourable members of the Board of Studies, the Fee Structure, Programme structure and Syllabus for Certificate in e-governance (CEG) being proposed (attached as Annexure No. 7).

Proposal 9:

For the kind approval and sanction by the honourable members of the Board of Studies, the Fee Structure, Programme structure and Syllabus for Certificate in Geo-Informatics (CGIS) is being proposed (attached as Annexure No. 8).

Proposal 10:

For the kind approval and sanction by the honourable members of the Board of Studies, the Fee Structure, Programme structure and Syllabus for Post Graduate Diploma in Geo Informatics (PGDGIS) is being proposed (attached as Annexure No. 9).

Proposal 11:

For the kind approval and sanction by the honourable members of the Board of Studies, the Fee Structure, Programme structure and Syllabus for Masters in Geo Informatics is being proposed (attached as Annexure No. 10).

Proposal 12:

For the kind approval and sanction by the honourable members of the Board of Studies, the Fee Structure, Programme structure and Syllabus for Certificate in Linux Awareness (CLA) is being proposed (attached as Annexure No. 11).

The Certificate in Linux Awareness will start at the University Computer Centre (s) with a student limit of 25 students per batch and subsequently the programme shall be extended to other study centres as well. The programme would also help in testing the e-learning systems.

Proposal 13:

The school proposes to start Ph.D. in Computer Science and Information technology programme. The Board is requested to provide necessary approval for the same.

Proposal 14:

14 a) The minimum duration of BCA programme shall be of three years and would be conducted on the semester pattern.

14 b) The minimum eligibility criteria to admission in BCA programme shall be 10+2 in Science stream/10+2 in other stream will have to successfully complete the course of Mathematics of the BCAPP/BCAPP

14 c) The maximum duration of BCA programme shall be 6 years.

Proposal 15:

15 a) The minimum duration of MCA programme shall be of three years and would be conducted on the semester pattern.

15 b) The minimum eligibility criteria to admission in MCA programme shall be B.C.A./B.Sc./ B.Com/B.A. degree with Mathematics as one of the subjects at 10+2 level or at graduation.

15 c) The maximum duration of MCA programme is of 6 years.

15 d) Lateral Entry:

(for MCA second year) BCA/B.Sc(IT)/B.Sc.(CS)/A-level from DOEACC, After Graduation/ PGDCA and Graduation from a recognized University.

(for MCA third year) M.Sc.(CS)/ M.Sc.(IT) from a recognized university.

Proposal 16:

16 a) The minimum duration of Masters in Geo Informatics programme shall be two years .

16 b) The minimum eligibility criteria to admission in Geo Informatics programme shall be Graduates of any discipline.

16 c) The maximum duration of Masters in Geo Informatics programme shall be 4 years.

16 d) The Certificate programme in Geo Informatics is a minimum 6 months and maximum duration shall be 2 years.

16 e) The minimum duration of Post Graduate Diploma in Geo Informatics programme shall be one year and maximum 3 years.

Proposal 17:

The minimum eligibility criteria to admission in certificate in e-governance programme shall be Graduates of any discipline.

Proposal 18:

18 a) The duration of Post Graduate Diploma in Computer Application programme shall be one year and would be conducted on the semester pattern.

18 b) The minimum eligibility criteria to admission in PGDCA is Graduation.

18 c) The maximum duration of the PGDCA programme shall be 3 years.

Proposal 19:

For the kind approval of the Board of Studies, the Programme structure and Syllabus for B.Lib.(I.Sc.) is being proposed (attached as Annexure No. 1.2).

Proposal 20:

The board is requested to suggest and approve the Course Writers, Course Editors and panel of Paper Setters, examiners for the development of Self Learning Material and conducting examination related assignments .

Proposal 21:

It is proposed that the following foundation courses shall be included in the curriculum of BCA programme.

S.No.	Foundation Course Title
1	Foundation English and Digital Literacy(examination with second semester)
2	Himalayan Heritage (examination with second semester)
3	Human Values and Ethics(exam with fourth semester)
4	Environmental Studies(exam with fourth semester)

It is also proposed that while pursuing the BCA programme the student has to appear and qualify the four foundation courses distributed over the first and second year of study. The board is requested to accord approval for the same.

Proposal 22:

It is hereby proposed that the learner is required to submit one assignment per course as per norms. The board is requested to accord approval for the same.

Proposal 23:

It is proposed to run the programmes of the school of Computer Science & IT at the study centers of Uttarakhand Open University. The board is requested to accord approval for the same.

Proposal 24:

It is proposed that the learners admitted in programmes being offered by the school be provided with certification on the basis of the credits obtained by them.

Proposal 25:

It is proposed that the school shall carry the rights to continue/defer any programme proposed as above and as approved by the board.

Proposal 26:

Any other item with the permission of the chair.

Director

Prof. Durgesh Pant

School of Computer Science & Information Technology

Uttarakhand Open University

Haldwani, Nainital

Annexure – 1

Bachelor of Computer Application

Objective :

The basic objective of this programme to open up windows of opportunities to the learners who are interested to take up Computer applications as their career.

The curriculum of BCA includes foundation courses along with the trend-setters for the advanced learning. The objective is to create a workforce of qualified and knowledgeable of Computing & IT professional who could pursue the programme taking leverage of the open and distance learning paradigm.

Programme Structure:

BCA Syllabus	
Semester 1	Credits
BCA-01 Computer Fundamentals and Introduction to Digital Logic	5
BCA-02 Introduction to Computer Programming using C	5
BCA-03 Basic of OS and PC Software	5
BCA-P1 Practical	1
Semester 2	
BCA-04 Computer Based Accounting and Financial Management	5
BCA-05 Discrete Mathematics	5
BCA-06 Data Structure through C Language	5
BCA-P2 Practical	1
Semester 3	
BCA-07 Object-Oriented Programming through C++	5
BCA-08 Database Management System	5
BCA-09 Operating System	5
BCA-P3 Practical	2
Semester 4	
BCA-10 Computer Organization	5
BCA-11 System Analysis and Design	5
BCA-12 Programming in JAVA	5
BCA-P3 Practical	1
Semester 5	
BCA-13 Data Communication and Computer Networks	5
BCA-14 Software Engineering	5
Optional-1 (Any one course of the following to be chosen)	5
BCA-15 Advanced Computer Architecture	}
BCA-16 Interactive Computer Graphics	
BCA-17 e-Commerce	
Project (to be submitted at the end of 6 th Semester)	
Semester 6	
BCA-18 Web Technology	5
Optional -2 (Any one course of the following to be chosen)	5
BCA-19 System Programming	}
BCA-20 Artificial Intelligence	
BCA-21 Data Warehousing and Data Mining	
BCA-22 Microprocessor and Assembly Language Programming	
BCA-23 Project	8

Syllabus Content:

Semester 1
Computer Fundamentals and Introduction to Digital Logic
BCA-01

Unit 1: Introduction of Computer

Block diagram, Evolution, Generations, Classification and its Application.

Unit 2: Number Systems

Decimal, Binary, Hexadecimal and Octal. It's Conversion: Decimal to Binary/Hexadecimal/Octal and vice versa. Addition/ Subtraction on Binary Numbers, Complement: r 's and $(r-1)$'s complement. Fixed Point representation and Floating point representation, BCD, ASCII, EBCDIC, Gray code.

Unit 3: Logic Gates

Logic Gates, Truth Tables, De-Morgan's theorem, Conversion of the logic gates.

Unit 4: Combinational and Sequential Circuit

Boolean operators, Rules (postulates and basic theorems) of Boolean algebra, dual and complement of Boolean expression, representation of Boolean expression in Canonical form, Boolean expression and their simplification by algebraic method and Karnaugh Map. Don't care condition. Multiplexer, Demultiplexer, Encoder, Decoder, Half-Adder, Full-Adder, Sequential circuit, Flip-Flop and its different types like RS, JK; Registers: Shift register, parallel/serial in, parallel/serial out; Different types counter like Asynchronous and Synchronous. Multiplexer, Demultiplexer, Encoder, Decoder, Half-Adder, Full-Adder.

Unit 5: Basic Computer Organization

Central Processing Unit (CPU), CU, ALU, Instruction format, instruction execution, Primary Memory- RAM and its types, ROM and its types, Secondary Memory, Secondary Storage Device : Magnetic Tape, Magnetic Disk, Optical disk, Magneto-Optical Disk, Various input and output devices, Buses(Address, Data, Control)

Suggested Readings:

1. Rajaraman, V." Fundamentals of Computers" Prentice Hall of India, New Delhi.
2. M. Motris Mamo, "Digital Logic and Computer Design".

Semester-1**Introduction to Computer Programming using C****BCA-02****Unit 1: Introduction to Programming**

Basic definition of Pseudo Code, algorithm, flowchart, program, Elementary data types, variables, constants and identifiers. Integer, character floating point and string constants. Variable declarations. Syntax and semantics. Reserved word Initialization of variable during declarations, Symbolic Constants.

Unit 2: Operators and Expressions

Expression in C, Different types of operators: Arithmetic, Relational and Logical, Assignment, Conditional, Increment and decrement, Bitwise, Comma and other operator (sizeof, period etc). Precedence and associativity of operators, type casting.

Unit 3: Decision and Control Structures

Various input /output functions like scanf, getch, getchar, printf, putchar. Conditional Statement- if, if- else, nested if-else switch, Other Statement –break, continue, goto, Concept of Loops: while, do-while, for, nested loops.

Unit 4: Storage Class

Automatic, External, Static, Register, Scope and lifetime of variables, Macro, Preprocessor directive.

Unit 5: Functions

Function: function declaration, function definition, function call (Call by value, Call by reference), Formal and Actual parameter, Recursive function.

Unit 6: Structures and Unions

Structure declarations, definitions, array of structure, pointers to structures, Union definition, declaration, use; Enumerated data types, defining your own types (typedef)

Unit 7: Arrays and Pointers

Array, 1-Dimensional array, 2-Dimensional array and its declaration, String, Pointers - Declaration, Passing pointer to a Function, Pointer and One-dimensional Arrays, Dynamic Memory Allocation.

Unit 8: File Handling

Opening, closing, reading and writing of files. Seeking forward and backward. Examples of file handling programs.

Suggested Readings:

1. Balagurusamy, E: Programming in ANSI C, Tata McGraw-Hill publication
2. Gottfried Byron S: Programming with C, Tata McGraw-Hill publication

Semester 1
Basic of OS and PC Software
BCA-03

UNIT 1: Introduction to OS

Definition and functions of an Operating System, Types of OS (Single User, Multi user, Single tasking, Multitasking, Real time, Network OS, Distributed OS)

UNIT 2: MS DOS Operating System

Introduction to DOS, System files of DOS, concept of Booting, Files and Directory Structure, Concept of Paths, Internal and External commands, Batch File.

UNIT 3: MS Windows Operating System

Introduction to Windows, Components of Windows, Customizing the Desktop, Files and Folders

UNIT 4: LINUX Operating System

Introduction to LINUX, login into LINUX, Structure of File System, Concepts of Path

UNIT 5: LINUX Commands

Directory handling Commands (mkdir, cd, rmdir, ls, pwd), File handling commands (cat, cp, rm, mv, more, lp), Utility commands (date, cal, echo, time, who, passwd), file permissions

Text editor vi, three modes of vi editor, adding and replacing text, saving text and quitting.

UNITS 1-5: Microsoft Word

Starting Word, different Bars, Document View, Text Area, Exiting Word.

Creating new Document, Editing text, Saving a Document, Closing a Document, Opening an Existing Document.

Working with Paragraph, Copy & Paste and Cut & Paste methods, Spell Check, Find & Replace.

Bullets and Numbering, Undo and Redo, Header & Footer, Page-Setup.

Creating Table, Modifying a Table, Merging of Cells, Split Cells.

UNITS 6-8: Microsoft Excel

Starting MS-Excel, different Bars. Row, Column and Cel. Exiting MS-Excel.

Creating a New Workbook, Working with Cells. Working with Fonts. Merging of Cells. Inserting a Row and Column, Deleting a Row and Column. Saving a Workbook, Closing a Workbook.

Different Operators used in Excel, Working with Calculation and Functions. 5
Working with Chart.

UNITS 9-10: Microsoft PowerPoint

Starting MS-PowerPoint, different Bars, Different Types of Views and Exiting MS-PowerPoint

Creating a New Presentation, Working with Slides, Applying Design emplates, Applying Custom Animations, Applying Slide Transitions. Saving a Presentation, Running a Presentation, Closing a Presentation and Opening an Existing Presentation.

Suggested Readings:

1. Anderw S Tanenbaum, Albert S. Woodhull, " Operating System Design and Impletation", prentice-Hall India Publication.
2. Word 2002 from A to Z-by Stephen L. Nelson, FireWall Media
3. Microsoft XP Plain & Simple-by Brown & resources Online

Semester 2
Computer Based Accounting and Financial Management
BCA-04

Unit 1 : Fundamentals of Accounting

Meaning of Accounting, its scope; Objects and limitations; Meaning and application of double entry system, Books of Accounts, Ledgers - Debtors ledger, Creditors ledgers and General ledger; Cash Book and Bank Reconciliation Statement.

Unit 2 : Financial Statements

Meaning and Components of Financial statements, Preparation of Financial Statements, Trading Account, Profit and loss Account, Meaning and Purpose of Balance Sheet, Steps for preparation of Balance Sheet, Marshalling of Balance Sheet, Format of Balance Sheet

Unit 3 : Accounting Ratio and Cash Flow Statement

Ratio Analysis, Objectives of Ratio Analysis, Classification of Accounting Ratios, Advantages of Ratio Analysis, Analysis of Financial Statement through Ratios, Cash Flow Statement, Meaning of Cash Flow Statement, Importance of Cash Flow Statement, Cash Flow Statement as per as 3, Illustration Preparation of Cash Flow Statement

Unit 4 : Cost Concepts and Cost Sheet

Meaning of Cost, Classification of Cost, Various Cost Concepts, Cost Centre, Types of Cost Centres, Cost Unit, Elements of Costs, Cost Sheet

Unit 5 : Budgetary Control and Marginal Costing

Meaning of Budget, Purpose of Budget, Budgetary Control: Meaning and Essentials, Merits OF budgetary Control system, Steps in preparation of budgets, Classification of budgets, Standard cost and standard costing, Variance analysis, Marginal cost and marginal costing, Advantages of marginal costing, Managerial Application of marginal costing, Break Even Analysis

Unit 6 : Capital and Working Capital

Meaning of capital, cost of capital, shares, debentures, capitalisation and capital structure; Meaning of working capital, its components and estimation.

Suggested Readings:

1. Financial Accounting, Ashis Bhattacharya, prentice-Hall India Publication.
2. Financial Accounting, S.N. Maheshwari, Vikas Publication House Pvt. Ltd., New Delhi
3. Theory and Practice of Accountancy By B. B. Dam, R. A. Maheswari, R. Barman and B Kalita

Semester 2
BCA-05
Discrete Mathematics

Unit-1 : Sets

Sets – the Empty Set, Finite and Infinite Set, Equal and Equivalent set, Subsets, Power set, Universal set, Venn Diagram, Complement of a set, set operations.

Unit-2 : Relations

Cartesian products, Relation - equivalence relation - partition - partial order relation

Unit-3 : Functions

Definition, Inverse functions - Composition of functions - Properties of functions – Binary operation

Unit-4 : Mathematical Logic-1

Statements, logical connectives, truth tables

Unit-5 : Mathematical Logic-2

Tautologies, contradictions, logical equivalence, Applications to everyday reasoning

Unit-6 : Counting Principles

The Pigeonhole principle - counting

Unit-7 : Permutation and Combination

Definition of Permutation and combination, Simple application of permutation and combination

Unit-8 : Basic Algebraic Structure

Definition and basic properties of semi groups and groups.

Unit-9 : Ring

Definition and basic properties of rings.

Unit-10 : Integral Domains and Fields

Definition and basic properties of integral domains and fields.

Unit-11 : Linear Algebra-1

Types of matrices - Matrix operations - canonical forms.

Unit-12 : Linear Algebra-2

Inverse of a matrix - Rank and nullity.

Unit-13 : Linear Algebra-3

Methods of solution to Linear systems (Cramer's Rule, Gaussian Elimination Scheme).

Suggested Readings:

1. Elements of Discrete mathematics: C.L Lieu Mc Graw Hill
2. Discrete Mathematical Structure with Application to Computer Science: Trembly J.P Mc Graw Hill

Semester 2
Course : BCA-06
Data Structure Through C Language

Unit 1 : Introduction to Data Structure

Basic concept of data, data type, Elementary structure, Arrays: Types, memory representation, address translation functions for one & two dimensional arrays and different examples.

Unit 2 : Algorithms

(Complexity, time-Space, Algorithmic Notation.

Unit 3 : Linked List

Introduction to Linked List , representation of single linked list.

Unit 4 : Operations on Linked List

Insertion into a linked list, deletion into a linked list, searching and traversal of elements and their comparative studies with implementations using array structure.

Unit 5 : Stacks

Definitions, representation using array and linked list structure, applications of stack.

Unit 6 : Queues

Definitions, representation using array, linked representation of queues, application of queue.

Unit 7 : Searching

Linear and binary search algorithms, performance and complexity using big 'O' notation

Unit 8 : Sorting

Sorting algorithms (Complexity, advantages and disadvantage, implementation), bubble sort, insertion sort, selection sort, quick sort.

Unit 9 : Trees

Definition and implementation : Binary Tree, Tree traversal algorithms (inorder, preorder, postorder), postfix, prefix notations

Unit 10 : Binary Search Tree

Searching in Binary Search Tree, insertion and deletion in Binary Search Trees

Unit 11 : B-Tree

Searching, Insertion and Deletion in a B-Tree.

Unit 12 : Graph

Introduction to Graphs, depth first search and breadth first search technique.

Suggested Readings:

1. Rajni Jindal, Data structure using C, Umesh Publication
2. HorowitzE, Fundamental of data structure, Galgotia Publications

Semester 3
Course BCA-07
Object-Oriented Programming through C++

Unit 1 : Introduction to Object Oriented Programming

Basic concept of OOP, Comparison of Procedural Programming and OOP, Benefits of OOP, C++ compilation, Abstraction, Encapsulation, Inheritance, Polymorphism, Difference between C and C++.

Unit 2 : Elements of C++ Language

Tokens and identifiers: Character set and symbols, Keywords, C++ identifiers; Variables and Constants: Integer, character and symbolic constants; Dynamic initialization of variables, Reference variables, Basic data types in C++, Streams in C++.

Unit 3 : Operators and Manipulators

Operators, Types of operators in C++, Precedence and associativity of operators, Manipulators.

Unit 4 : Decision and Control Structures

if statement, if-else statement, switch statement, Loop: while, do-while, for; Jump statements: break, continue, go to.

Unit 5 : Array, Pointer and Structure

Arrays, pointers, structures, unions;

Unit 6 : Functions

main() function, components of function: prototype, function call, definition, parameter; passing arguments; types of function, inline function, function overloading.

Unit 7: Introduction to Classes and Objects

Classes in C++, class declaration, declaring objects, Defining Member functions, Inline member function, Array of objects, Objects as function argument, Static data member and member function, Friend function and friend class.

Unit 8: Constructors and Destructors

Constructors, Instantiation of objects, Default constructor, Parameterized constructor, Copy constructor and its use, Destructors, Constraints on constructors and destructors, Dynamic initialization of objects.

Unit 9: Operator Overloading

Overloading unary operators: Operator keyword, arguments and return value; overloading unary and binary operators: arithmetic operators, manipulation of strings using operators; Type conversions.

Unit 10: Inheritance

Derived class and base class: Defining a derived class, Accessing the base class member, Inheritance: multilevel, multiple, hierarchical, hybrid; Virtual base class, Abstract class

Unit 11: Virtual Functions and Polymorphism

Virtual functions, pure virtual functions; Polymorphism, Categorization of polymorphism techniques: Compile time polymorphism, Run time polymorphism

Unit 12: File Handling

File classes, Opening and Closing a file, File modes, Manipulation of file pointers, Functions for I/O operations.

Suggested readings:

1. E.Balagurusamy: Object oriented programming with C++
2. K.R.Venugopal: Mastering C++
3. Bjarne Stroustrup: The C++ programming language.

Semester 3
Course BCA-08
Database Management Systems

Unit 1: File Structure

What is data and information, Concept of field, key field; Records and its types, fixed length records and variable length records; Files, operation on files, Primary file organization.

Unit 2: Database System

Traditional file approach vs. Database approach, Database Management System (DBMS), merits and demerits of DBMS, Database architecture, Data independence, Types of DBMS, Database Administrator

Unit 3: Data Models

Conceptual model, logical model, physical model, ER model as a tool for conceptual design: entities, attributes and relationships, weak and strong entities, conversion of ER model into relational schema, ER modeling symbols.

Unit 4: The Relational Model

Relational data model concepts, Integrity constraints: Entity integrity, Referential integrity, Domain Constraints.

Unit 5: Keys

Concept of keys, Composite key, Candidate key, Primary key, Alternate key, Foreign key, Defining primary and Foreign keys in database.

Unit 6: Relational Database Design

Database design, Decomposition, Universal Relation, Functional dependencies, Prime and Non-prime attribute

Unit 7: Normalization

Normalization, First Normal form(1NF), Second Normal form(2NF), Third Normal form(3NF), Boyce-Codd Normal form(BCNF), Fourth Normal Form(4NF), Fifth Normal form(5NF)

Unit 8: Introduction to SQL

Structured Query Language(SQL), Characteristics of SQL, Advantages of SQL, SQL data types, Types of SQL commands DDL, DML, SQL commands : Select .. From... Where... Group by Having... Order by..., Tables, Views and Indexes, Queries, Sub Queries, Insert, Update and Delete operations, Constraints considers (NOT NULL , UNIQUE, Check Primary key, Foreign key)

Unit 9: Database recovery and Security

Concept of database recovery, Backup of database, Types of database failure, Types of database recovery, Goals of database security.

Suggested readings:

1. "Database Systems: Concepts, Design and Applications", by S.k. Singh, Pearson Edition
2. "Introduction to Database Management Systems", by Atul Kahate, Pearson Edition
3. "Fundamentals of Database System", by Elmasri Navathe, Somayajulu & Gupta, Pearson Education publication.

Semester 3
Course code BCA-09
Operating System

Unit 1: Introduction to Operating System

What is an operating system, batch system, multi-programmed system, time-sharing system, personal computer operating system, parallel systems, distributed systems, real-time systems.

Unit 2: Processes

Process (process models, process hierarchies, process states), Threads (what is thread and its use, design issues of thread).

Unit 3: Interprocess Communication

What is interprocess communication, race conditions, critical-sections, mutual exclusion, solution to race condition, disabling interrupt, peterson's solution, sleep & wake up (The Producer Consumer Problem) and Semaphores.

Unit 4: Scheduling

Basic concepts, primitive and non-primitive scheduling, scheduling algorithms, types of scheduling - batch, interactive and real-time, goals of scheduling algorithms, first come first serve, shortest job first and round robin scheduling.

Unit 5: Deadlocks

What is deadlock, principles of deadlock (deadlock conditions & modeling), deadlock detection, recovery & prevention, deadlock avoidance (Banker's algorithm)

Unit 6: Memory Management

Multiprogramming(with fixed partitions, relocation and protection).What is swapping and its basic concepts. Virtual Memory – Basic Concepts, Paging, Page Tables. Page replacement algorithms: - Optimal, Not Recently Used, First In First Out, Least Recently Used.

Unit 7: File System

What is file, file naming, file types(directory, regular, device), sequential access and random access files, file attributes, operations on file, hierarchical directory structure, path name(relative and absolute), operation on directories. File System Implementation Techniques.

Unit 8: I/O Management

Basic principles I/O Hardware, I/O Devices, Device controllers, DMA. Principles of I/O Software, its goals, Interrupt Handlers, Device Drivers, Device Independent I/O Software(its functions)

Unit 9: Security and Protection

Security threats and goals, Authentication, Protection and Access control, Formal model of protection, Cryptography.

Unit 10: Multiprocessor Systems

Multiprocessor Interconnections, types of Multiprocessor Operating Systems, Multiprocessor OS Functions and Requirements, Multiprocessor Synchronization.

Unit 11: Distributed Operating Systems

Algorithms and Distributed Processing, Coping with Failures Models of Distributed systems, Remote procedure calls, distributed Shared Memory, Distributed File Systems.

Suggested Readings:

1. Operating System Concepts, S. Galvin, AWL
2. Modern Operating System, A.S. Tanenbaum, PHI

Semester-4
Course BCA-10
COMPUTER ORGANIZATION

Unit 1: Digital Components

Flip-Flops, Counter, Register, Half adder-Full Adder, Half subtractor-Full subtractor, Coder-Decoder, Multiplexer, De-multiplexer, Magnitude Comparator

Unit 2: Instruction Sets and Addressing modes

Different Instruction Formats, Instruction Types, Instruction Execution, Assembly language notation, Different Addressing Modes(8085)

Unit 3: Input-Output Organization

Different I/O techniques (Programmed I/O, Interrupt-Driven I/O, Direct Memory Access), I/O Processors.

Unit 4: Internal Memory

Memory Hierarchy, Semiconductor RAM memories, Internal organization of Memory Chips, Read Only Memories

Unit 5: Cache and Virtual Memory

Locality of reference, Cache Memory, Mapping functions, Virtual Memory, Paging.

Unit 6: External Memory

Magnetic Disk, RAID, Optical memory, Magnetic tape

Unit 7: Pipelining

Introduction to Pipelining and Basics of Parallel Processing

Unit 8: CISC and RISC

CISC (Complex Instruction Set Computers), RISC(Reduced Instruction Set Computers)

Suggested Readings:

1. Computer System Architecture- M.Moris Mano (PHI publication)
2. Computer Organisation and architecture- Pal Chaudhary
3. Structured computer organization- Tanenbaum

Semester 4
Course code: BCA-11
System Analysis and Design

Unit 1: Basic Concept of Systems

The System: Definition and Concepts; Elements of a System: Input, Output Processor, Control, Feedback, Environment, Boundaries and Interface; Characteristics of a System; Types of systems -Physical and Abstract System, Open and Closed Systems, Man-made Systems; Information and its categories

Unit 2: Information System and System Analyst

Information systems : TPS, OAS, MIS, DSS, ESS; System Analyst: Role and need of system analyst, System Analyst as an agent of change.

Unit 3: System Development Life Cycle

Introduction to SDLC, Various phases: study, analysis, design, development, testing, implementation, maintenance; System documentation: Types of documentation and their importance.

Unit 4: System Planning and Information Gathering

Initial Investigations, Identification of user needs, Project Identification and Selection; Needs of Information Gathering, Determination of requirements, Information gathering tools: interviews, group communication, questionnaires, presentations and site visits.

Unit 5: Feasibility Study

Definition, Importance of feasibility study, Types of feasibility study, System selection plan and proposal, Prototyping, Cost-Benefit Analysis: Tools and Techniques.

Unit 6: Tools for System Analysis

Data Flow Diagram (DFD), Logical and Physical DFDs, Developing DFD; System Flowcharts and Structured charts, Structured English, Decision trees and Decision tables.

Unit 7: System Design

Module specifications, Module Coupling and cohesion, Top-down and bottom-up design; Logical and Physical design, Structured design.

Unit 8: Input and Output

Input design: Input data, Input media and devices; Output design; Form Design: Classification of forms, Requirements of Form design.

Unit 9: System Implementation and Maintenance

Need of System Testing, Types of System Testing, Quality Assurance; System Conversion, Conversion methods, procedures and controls, System evaluation and performance, Maintenance activities and issues.

Unit 10: System Security and Audit

System Security, Security Threats, Risk Analysis, Control measures, System Audit, Disaster Recovery Planning

Suggested Readings:

1. Elias m. Awad: System Analysis and Design
2. Perry Edwards: System Analysis & design Mc Graw Hill

Semester 4
BCA-12
Programming in JAVA

Unit - 1 Introduction to JAVA

An overview of JAVA, Object-oriented programming features, JAVA Applets and Applications. Difference between Java Script and JAVA.

Unit - 2 Programming Basic

Java Token & Keywords, Constants, Data types; The JAVA class libraries, Declaring a variable, The scope and lifetime of variable, Various Operators, Decision Making and Control Statements : if statement, If-else, else-if, switch statement; the for, while, do-while statements

Unit - 3 OOP in Java

Class fundamentals : Defining class, Accessing class members, Declaring objects, Passing Arguments to Methods, Returning Multiple Values from methods, Modifiers, Constructors, copy constructor; Recursive class; Inheritance : the super class, Multilevel Inheritance, Final and abstract keyword, Static Members

Unit - 4 Arrays, Strings and Vectors

Declaring Arrays, Creating Arrays, Initializing Arrays, System Arraycopy(), Multi-Dimensional Arrays, Strings: string arrays, string methods, stringbuffer class, Vectors

Unit - 5 Packages and Interfaces

Packages: Defining a package, Understanding classpath, Importing Packages.

Interfaces: Defining an Interface, Implementing interfaces, Applying Interfaces, Variable in interfaces.

Unit - 6 Exception Handling

Exception handling fundamentals, Exception types, Uncaught exceptions. Using *try* and *catch* JAVA's build-in exceptions, User defined exception subclasses

Unit - 7 File Handling

I/O Basics: Streams, The stream classes, The predefined streams, Reading console input, Writing console output, Reading and writing files

Unit – 8 Introduction to Applets

Applets and the World Wide Web, The Applet Class, Applets and HTML , The Life Cycle of an Applet, Responding to Events, Using Window Components, Adding Audio and Animation

Unit – 9 AWT and Swings

AWT Basics, AWT Components, Containers, Event Handling, Application and Menus; *Swings*: Introduction, Swing Components, Event Handling, Display text and image in a window, Layout manager.

Unit – 10 Introduction to JDBC

JDBC: Basic steps to JDBC, API, JDBC Drivers, Connection Management, JDBC Design considerations, Two Tier and Three Tier client server model, ResultSet, Prepared statement and callable statement. Creating and executing SQL statements (SELECT, INSERT, UPDATE, DELETE) and ResultSet MetaData Object.

Suggested Readings:

1. Margaret Levine Young, "The Complete Reference Internet", TMH
2. Naughton, Schildt, "The Complete Reference JAVA2", TMH
3. Balagurusamy E, "Programming in JAVA", TMH
4. Dustin R. Callway, "Inside Servlets", Addison Wesley
5. Mark Wutica, "Java Enterprise Edition", QUE
6. Steven Holzner, "Java2 Black book", dreamtech

BCA-16
INTERACTIVE COMPUTER GRAPHICS

Unit 1 : Introduction to Computer Graphics

Definition, Application areas of Computer graphics, Graphical user interface, Cathod ray tubes, Random scan displays, Raster scan displays, Color CRT monitors, Flat panel displays (Plasma Panels, Liquid crystal displays, Electroluminescent displays), Graphics software (GKS, PHIGS), Color Models (RGB, CMYK, HSV, Lookup tables etc.)

Unit 2 : Raster Graphics Algorithms

Points and Lines, Line drawing algorithms (DDA, Bresenham's algo), Circle and Ellipse drawing algorithms, Filling (Scan-converting Polygon filling, Inside outside tests boundary fill and area fill algo).

Unit 3 : Transformations and Projections

2-D transformations (Rotation, Reflection, shearing, scaling), Homogeneous coordinate representation, Translation, 3-D transformations, Projection classification, Parallel projections, Perspective projections (One point, Two point)

Unit 4 : Two Dimensional Clipping

Point Clipping, Line Clipping, Text Clipping

Unit 5 : Animation

Animation Basic, Computer Animation, Principles of Animation, Types of Animation, Animation Software and Hardware, Common Terms in Animation, Design of Animation sequence, Morphing, Application of Computer Animation, Future of Animation

Suggested Readings:

1. Donald Hearn and M. Pauline Baker, "Computer Graphics", PHI
2. Steven Harrington, "Computer Graphics: A Programming Approach", TMH
3. Prajapati A. K, "Computer Graphics", PPM Ed 2
4. Foley James D, "Computer Graphics", AW Ed 2
5. Newman and Sproul, "Principle of Interactive Computer Graphics", McGraw Hill
6. Rogers, "Procedural Elements of Computer Graphics", McGraw Hill
7. Rogers and Adams, "Mathematical Elements of Computer Graphics", McGraw Hill

BCA-14
SOFTWARE ENGINEERING

Unit 1 : Introduction to Software Engineering

Definition of Software Engineering, Need for Software Engineering, Software Characteristics, Software Qualities

Unit 2 : Requirement Analysis

Definition of System Analysis, Requirement Analysis, System Analyst, Knowledge and Qualities of System Analyst, Role of a System Analyst, Feasibility Study and Types, Fact Gathering, User Transaction Requirement, User Design Requirements, SRS (System Requirement Specification)

Unit 3 : System Development Methodologies

System Development Phases, Need for a Software Life Cycle Model, Software Development Models: Waterfall Model, Spiral Model, Prototyping Model

Unit 4 : Analysis and Design Tools

Entity-Relationship Diagrams, Decision Tree and Decision Table, Data Flow Diagrams (DFD), Data Dictionary :Elements of DD, Advantage of DD; Pseudo code, Input And Output Design

Unit 5 : Structured System Design

Modules Concepts and Types of Modules, Structured Chart, Qualities of Good Design: Coupling, Types of Coupling, Cohesion, Types of Cohesion

Unit 6 : Software Testing

Definition, Testing Strategies, Types of Testing, Black-Box Testing, White-Box Testing, Stress Testing, Storage Testing, Performance Testing

Suggested Readings:

1. Pressman, Roger S., "Software Engineering: A Practitioner's Approach Ed. Boston: McGraw Hill, 2001
2. Jalote, Pankaj, "Software Engineering Ed.2", New Delhi: Narosa 2002
3. Schaum's Series, "Software Engineering", TMH
4. Ghezzi, Carlo and Others, "Fundamentals of Software Engineering", PHI
5. Alexis, Leon and Mathews Leon, "Fundamental of Software Engineering", Vikas
6. Sommerville, Ian, "Software Engineering", AWL, 2000

BCA-13**DATA COMMUNICATION AND COMPUTER NETWORKS****Unit 1 : Basics of Computer Network**

Computer Network: Definition, Goals, Structure; Broadcast and Point-To-Point Networks; Network Topology and their various Types; Types of Network: LAN, MAN, WAN; Server Based LANs & Peer-to-Peer LANs; Communications Types: Synchronous, Asynchronous; Modes of Communication: Simplex, Half Duplex, Full Duplex; Protocols and Standards

Unit 2 : Network Models

Design Issues of the Layer, Protocol Hierarchy, ISO-OSI Reference Model : Functions of each Layer, Various Terminology used in Computer Network, Connection-Oriented & Connectionless Services, Internet (TCP/IP) Reference Model, Comparison of ISO-OSI and TCP/IP Model

Unit 3 : Transmission Media

Transmission Media, Guided Media (Wired) : Coaxial Cable: Physical Structure, Standards, BNC Connector, Applications, Twisted Pair : Physical Structure, UTP vs STP, Connectors, Applications, Fiber Optics Cable: Physical Structure, Propagation Modes (Single Mode & Multimode), Fiber Sizes, Connectors , Applications , Advantages & Disadvantages; Unguided Media(Wireless): Electromagnetic Spectrum for Wireless Communication, Propagation Methods, (Ground, Sky, Line-of-Sight); Wireless Transmission: Radio Waves, Infrared, Micro-wave; Wireless LANs (IEEE 802.11), Architecture, MAC Sub Layer, Frame Format, Frame Types; Bluetooth, Architecture (Piconet, Scatternet, Bluetooth, Layers), Applications

Unit 4 : Network Connectivity Devices

Categories of Connectivity Devices, Passive and Active Hubs, Repeaters, Bridges, Switches (2-Layer Switch, 3-Layer, Switch(Router), Gateways, Network Security Devices (Firewalls, Proxy Servers)

Unit 5 : Components of LAN

Network Interface Card (NIC), Network Adapters, Components of NIC, Functions of NIC, Types of NIC; Ethernet : Basic Features, Types of Ethernet, Different Framing Format: IEEE 802.3, IEEE 802.4, IEEE 802.5

Unit 6 : Internet Basics

Internet: Growth, Architecture, Accessing, Internet Service Providers (ISP), Internet Addressing System: IP Address, DNS, URL; World Wide Web (WWW): Web Servers, Web Browsers, Search Engine; Concept of Intranet & Extranet.

Suggested Readings:

1. Tanenbaum, Andrew, Computer Networks, PHI
2. Forouzan Behrouz A., Tata McGraw Hill
3. Norton Peter, Complete Guide To Networking

Semester 6

BCA-18 : Web Technology

Unit 1: Basics of Internet and Web

The basics of Internet, World Wide Web, Web page, Home page, Web site, Static, Dynamic and Active web page, Overview of Protocols – Simple Mail Transfer Protocol, Gopher, Telnet, Emails, TFTP, Simple Network Management Protocol, Hyper Text Transfer Protocol, Client server computing concepts.

Unit 2: Web Client and Web Sever

Web Browser, Browsers e.g., Netscape navigator, Internet Explorer, Mozilla Firefox, Client-Side Scripting Languages- VB Script and Java Script, Active X control and Plug-ins; Web Server Architecture, Image maps, CGI, API web database connectivity-DBC, ODBC

Unit 3 : Introduction to HTML

Introduction to HTML, Essential Tags, Tags and Attributes, Text Styles and Text Arrangements, Text, Effects, Exposure to Various Tags (DIV, MARQUEE, NOBR, DFN, HR, LISTING, Comment, IMG), Color and Background of Web Pages, Lists and their Types, Attributes of Image Tag, Hypertext, Hyperlink and Hypermedia, Links, Anchors and URLs, Links to External Documents, Different Section of a Page and Graphics, Footnote and e-Mailing, Creating Table, Frame, Form and Style Sheet.

Unit 4 : DHTML

Dynamic HTML, Document Object Model, Features of DHTML, CSSP (Cascading Style Sheet Positioning) and JSSS (JavaScript assisted Style Sheet), Layers of Netscape, The ID Attribute, DHTML Events.

Unit 5 : Java Script

Objects, Methods, Events and Functions, Tags, Operators, Data Types, Literals and Type Casting in JavaScript, Programming Construct, Array and Dialog Boxes, Relating JavaScript to DHTML, Dynamically Changing Text, Style, Content.

Unit 6: Introduction to PHP

Server Side Programming , Introduction to PHP, Basic Programming Concepts of PHP: Variables, Data-types, Constants, Scope of Variables, Type of Variables, Type Casting, Operators, Operators Precedence, References, Arrays; Control Structures: Branching, If statement, Switch statement; Looping: for Loop, while Loop, do while Loop, for each Loop; Functions: User Defined Functions, Built-in Function, Functions for Variables; Script Controlling Functions, Array Functions, Date and Time Functions, Mathematical Functions, String Functions, PHP Server Variables; Working with form, Uploading files to Web Server using PHP

Suggested Readings:

1. Burdman, "Collaborative Web Development", Addison Wesley.
2. Sharma & Sharma, "Developing E-Commerce Sites", Addison Wesley
3. Ivan Bayross, "Web Technologies Part II", BPB Publications.

BCA-19 System Programming

Unit I : Language Processors

Introduction to language processor, Interpreters, language processing activities, Program execution, Fundamentals of language processing, phase and passes of language processor, Compiler: Front end, Lexical analysis, Syntax analysis, semantic analysis, memory allocation, code generation, symbol table, Fundamentals of Language Specification : Programming language grammar, Terminal symbols, alphabet and strings, production, derivations, reduction and parse tree, classification of grammar : Type 0, Type 1, Type 2 & Type 3 Grammar, Ambiguity in Grammatic specification, Eliminating ambiguity, Language processor development tools : LEX, YACC

Unit II : Scanning & Parsing

Introduction to Scanning, Finite state automaton, Regular expression, Parsing, parse tree, Top Down parsing, predications and backtracking, Top Down parsing without backtracking, Recursive descent parser, LL(1) parser, Bottom up Parsing, Simple precedence grammar, Operator precedence grammars, LALR parsing,

Unit III: Assemblers

Elements of Assembly language programming, statement format, Assembly Language statements, Advantage of Assembly Language, Design specification of an assembler, Pass structure of Assembler, Design of A two pass assembler, Pass I of the Assembler, Intermediate code forms, Mnemonic field, Pass II of the Assembler, Architecture of Intel 8088, Design of Assembler

Unit IV : Compilers and Interpreters

Aspects of Compilation, Data type, Memory allocation, static and dynamic memory allocation, Accessing nonlocal variables, symbol table requirements, recursion, Compilation of expressions, Intermediate code for expression : Postfix strings, Triples and quadruples, expression tree, compilation of control structure, function and procedure call, Parameter passing mechanisms, code optimization, elimination of common subexpressions, Frequency reduction, Local and global optimization, Interpreters.

Unit V : Linkers

Translated, linked and load address, Relocation and linking concept, Object module, Design of linker, Linking for Overlays,

Suggested Readings:

1. Robert Britton: *MIPS Assembly Language Programming*. Prentice Hall, 2003.
2. Compilers principles, techniques & Tools, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman