

## **SYLLABUS: III SEMESTER (Computer Technology)**

### **Syllabus for Applied Mathematics- III (CS/CT) Scheme (Theory: 4 hrs, Tutorial: 1hr.)**

#### **UNIT - I: LAPLACE TRANSFORM(12 Hrs)**

Definition, Properties, Laplace Transform of Derivatives and Integrals, Evaluation of integrals by Laplace Transform, Inverse Laplace Transform and its Properties, Convolution theorem(Statement only), Laplace Transform of Periodic Functions(Statement only) and Unit Step Function, Applications of Laplace Transform to solve Ordinary Differential Equations, Simultaneous Differential Equations, Integral Equations &Integro-Differential Equations.

#### **UNIT – II: FOURIER SERIES & FOURIER TRANSFORM(08 Hrs)**

Periodic Functions and their Fourier Expansions, Even and Odd functions, Change of interval, Half Range Expansions.

Fourier Transform: Definition and Properties (excluding FFT), Fourier Integral Theorem, Relation with Laplace Transform, Applications of Fourier Transform to Solve Integral Equation.

#### **UNIT – III: Z-TRANSFORM(08 Hrs)**

Definition , Convergence of Z-transform and Properties, Inverse Z-transform by Partial Fraction Method, Residue Method (Inversion Integral Method) and Power Series Expansion, Convolution of two sequences. Solution of Difference Equation with Constant Coefficients by Z-transform method.

#### **UNIT-IV: FUNCTIONS OF COMPLEX VARIABLE(12 Hrs)**

Analytic Function, Cauchy- Riemann Conditions, Harmonic Functions (excluding orthogonal system), Milne-Thomson Method, Cauchy Integral Theorem & Integral Formula (Statement only), Taylor's & Laurent's series (Statement only), Zeros and Singularities of Analytic Function, Residue Theorem (Statement only), Contour Integration (Evaluation of real definite integral around unit circle and semi-circle).

#### **UNIT –V: MATRICES(12 Hrs)**

Linear and Orthogonal Transformations, Linear dependence of vectors, Characteristics equation, Eigen values and Eigen vectors, Statement and Verification of Cayley-Hamilton Theorem [without proof], Reduction to Diagonal form, Reduction of Quadratic form to Canonical form by Orthogonal Transformation, Sylvester's theorem[without proof], Solution of Second Order

Linear Differential Equations with Constant Coefficients by Matrix method.  
Largest Eigen value and Eigen vector by Iteration method.

### **UNIT - VI: THEORY OF PROBABILITY(08 Hrs)**

Axioms of Probability, Conditional Probability, Baye's Rule, Random variables: Discrete and Continuous random variables, Probability function and Distribution function, Mathematical Expectation, Variance, Standard Deviation, Moments, Moment generating function, Binomial, Poisson and Normal Distributions.

#### Text Books

1. Higher Engineering Mathematics by B.S. Grewal, 40th Edition, Khanna Publication
2. Advanced Engineering Mathematics by Erwin Kreyszig, 8th Edition, Wiley India
3. Applied Mathematics for Engineers & Physicist by L.R. Pipes and Harville
4. Theory & Problems of Probability and Statistics by M.R. Spiegel , Schaum Series, McGraw Hills

#### Reference Books

1. A Text Book of applied Mathematics, Volume II by P.N. Wartikar& J.N. Wartikar, Poona VidyarthiGrihaPrakashan
2. Introductory methods of Numerical Analysis by S.S. Sastry, PHI
3. Mathematics for Engineers by Chandrika Prasad
4. A text book of Engineering Mathematics by N. P. Bali & M. Goyal, Laxmi Publication.

## **BECT202T: Program Logic Design in “C”**

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Practical) 1 hr (Tutorial)	5	100	20	80	100

### **Unit-I**

Arrays: single dimensional arrays, two dimensional arrays, multidimensional arrays, variable length arrays. Array operations. Strings, single dimensional array of string, two dimensional array of string, operations in “string.h”. Structures: array of structures, passing structure to function, structure within structures. Unions, bit-fields, enumerations, sizeof, typedef.

### **Unit II**

Introduction File handling:-File structure, File handling function, File types, Streams, Text, Binary, File system basics, The file pointer, Opening a file, Closing a file, Writing a character, Reading a character, Using fopen(), getc(), putc(), and fclose(), Using feof(). Using fread() and fwrite(), Direct access file, fseek() and random access I/O, fprintf() and fscanf(), getting file name as Command line arguments.

### **Unit III**

Pointers: pointers operators, pointer arithmetic, Pointers and function, Array of pointers, Pointer and Strings, Pointer to structure, Pointers within structure, Introduction of Static and Dynamic memory allocation, The process of Dynamic memory allocation, DMA functions Malloc() function, Sizeof() operator, Function free(), Function realloc()

### **Unit IV**

Graphics: Graphics and Text mode, Video Adapter, Initialize Graphics Mode and resolution, header file graphics.h. Functions used In Graphics – Drawing a Point on Screen, Drawing – lines, rectangle, circles, arcs, polygon. Functions to fill colors. Display Text in Graphics mode, outtext(), outtextxy(), justifying text.

Advanced Graphics: various functions used for moving of graphical objects vizmoverel(), moveto(), putimage(), putpixel().

### **Unit V**

Introduction to problem solving and programming : Basic model of computation, Notion of Algorithms, Principle of Mathematical Induction, Basics of functional programming, notion of types, Iterative versus recursive style, Correctness and efficiency issues in programming, time and space measures

### **Unit VI**

Introduction to problem solving and programming: Basics of imperative style programming, Assertions and loop invariants, Top down design and examples of step-wise refinement, Programming using structures, introduction to encapsulation and object oriented programming.

### **Text Books**

1. The C Programming Language: Dennis Ritchie & Brain Kernighan [Pearson]
2. Practical “C” Programming: Steve Oualline, O’Reilly Publications
3. Programming with C :K.R.Venugopal&S.R.Prasad [TMH]
3. How to solve it by Computer by R. J. Dromey, Prentice-Hall India EEE Series.

### **Reference Books**

1. The Complete Reference C ( 4<sup>th</sup> Edition) : Herbert Schildt [ TMH]
2. Structure and Interpretation of Computer Programs by Harold Abelson and Gerald Sussman with Julie Sussman, MIT Press, 1985.

**BECT202P: Program Logic Design in “C” lab: Practical based on above syllabus**

Load	Credit	Total marks	Sessional marks	University marks	Total
2 hrs (Practical)	1	50	25	25	50

**BECT203T: Digital Circuits & Microprocessor**

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

**Unit I:**

Boolean Algebra, Boolean identities, , Binary, Gray, Octal, Hex and ASCII Codes, Logic Gates & truth Tables, De-Morgan's Law, Sum of Product & Product of Sum, K-Maps, Solution of problems using K-Maps

**Unit II:**

Combinational Circuits: Decoders, Encoders, Multiplexers, De-multiplexers, Code Converters. Introduction to Flip-flops, Latches, Memory organization with Flip Flop as a basic cell, Master Slave Combination & conversion of one type to another type flip flop.

**Unit III:**

Sequential Circuits: Excitation tables, Counters- Synchronous/asynchronous, different modulo counters with reset/clear facility, design of counters of arbitrary modulo with K-maps, Lock Free Counters. Arithmetic Circuits: Adders, Subtractors, BCD adders/Subtractor, Carry Look Ahead Adders

**Unit IV:**

Introduction to Intel's 8085A, Architecture Description, memory and Input/Output, Instruction set.

**Unit V:**

Addressing Modes, Timing Diagrams, Assemblers & Disassemblers (by Hand coding), Flag structure, concept of PSW, Stacks, Subroutines, PUSH & POP instructions & CALL/RETURN instructions, Stack Manipulations. Simple Programs.

**Unit VI:**

Programming Techniques, Looping, Counting, Indexing, Counters & timing delays, interrupt concept & structure in 8085. Interrupt Service routines. Advanced Instructions of 8085.

**TEXT BOOKS:**

1. Digital Circuits & Microprocessors by Herbert Taub
2. Digital circuits by M. Mano
3. Digital Electronics Principles by Malvino.
4. Microprocessors Architecture Programming & Application with 8085 By R. S. Gaonkar  
Microprocessor & Interfacing: D. V. Hall

### **BECT203P: Digital Circuits & Microprocessor lab: Practical based on above syllabus.**

Load	Credit	Total marks	Sessional marks	University marks	Total
2 hrs (Practical)	1	50	25	25	25

### **BECT204T: Social and Ethical aspects of IT**

Load	Credit	Total marks	Sessional marks	University marks	Total
3 hrs (Theory) 1 hr (Tutorial)	4	100	20	80	100

1. An Overview of Ethics.
2. Ethics for IT Professionals and IT Users.
3. Computer and Internet Crime.
4. Privacy.
5. Freedom of Expression.
6. Intellectual Property.
7. Software Development.
8. The Impact of Information Technology on Productivity and Quality of Life.
9. Social Networking.
10. Ethics of IT Organizations.

#### **BOOKS:**

Ethics in Information Technology, 4/e by Reynolds George, Cengage Publisher

### **BECSE205T: Computer Architecture & Organization**

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

#### **Unit I:**

Basic Structure of Computer Hardware and Software: Functional Units, Basic Operational concepts, Bus Structures, Software, Distributed computing, Addressing Methods and Machine Program Sequencing: Memory Locations, Addresses and Encoding of Information, Main Memory Operations, Instructions and Instruction Sequencing, Addressing Modes, Assembly Language, Stacks. Subroutines.

#### **Unit II:**

Instruction Sets: Instruction Formats, Limitations of Shortword- length machines, High Level Language considerations, The IBM -370.

The Processing Unit: Some Fundamental Concepts, Execution of a complete Instruction, Sequencing of Control Signals, Concluding Remarks.

#### **Unit III:**

Microprogrammed Control: Microinstructions, Grouping of control signals, Micro program Sequencing, Micro instructions with next address field, Perfecting Microinstructions, Emulation, Bit Slices, Introduction to Microprogramming.

### **Unit IV:**

Arithmetic: Number Representation, Addition of Positive Numbers, Logic Design for Fast Adders, Addition and Subtraction, Arithmetic and Branching Conditions, Multiplications of positive numbers, Signed -Operand Multiplication, Fast Multiplication, Integer Division, Floating Point Numbers and Operations.

### **Unit V:**

The Main Memory: Some Basic Concepts, Semiconductor RAM Memories, Memory System Considerations, Semiconductor ROM Memories, Multiple module Memories and Interleaving, Cache Memories, Virtual Memories, Memory Management requirements.

### **Unit VI:**

Computer peripherals: I/O Devices, Online Storage, File Services. Processors: Families of Microprocessor chips, Introduction to RISC Processors, Array Processors, Loosely coupled, Tightly coupled Systems. Vector Processing, Array Processor, Literature review of multi-core architecture

### **BOOKS:**

- V.C.Hamacher,Z.G.Vranesic and S.G.Zaky, Computer Organisation, McGraw Hill,5<sup>th</sup>ed,2002.
- Computer Organization, Design and Architecture (IV Ed), Sajjan G. Shiva, CRC Press
- Computer Architecture & Organization III Ed- J.P.Hayes.

### **REFERENCES BOOKS:**

- M Mano,“Computer System and Architecture”, PHI, 1993.
- W. Stallings, “Computer Organization & Architecture”, PHI, 2001.

## **BECSE206P: COMPUTER WORKSHOP LAB**

Load	Credit	Total marks	Sessional marks	University marks	Total
2 hrs (Practical)	1	50	25	25	50

### **Unit I:**

**Basic concepts of HTML:** HTML, Web Pages, World Wide Web, Tags in HTML, HTML As a Markup Language, HTML as a Page Formatting Tool, Structure of an HTML Page, Commands Written In Notepad, the <H> TAG, the basic tags, the <P> TAG, The <PRE>Tag**The text attributes:** The <marquee> tag, Example of Text Styles, the images, the list tag: Ordered List, Unordered List, Nested List **The links:** Links between Two Pages, Links in the Same Page, Images as Links, Attributes of Links, the basic web page, **other formatting tags:** sounds and videos, comments, the <XMP> tag, special characters

**Unit II:**

**The tables:** The Table, The Rows, The Columns, Cellspacing, Cellpadding, Alignment of the Text Present inside the Cells, Alignment of Table, Border Attributes in the Table, Merging Of Rows and Columns, Colspan, Rowspan, Table within a Table, Empty Cells inside the Table, Links in the Table,

**the frames:** Frames with Column Arrangement, Column Size for Frames, Row Size for Frames, Frame Spacing, Margin Width and Height in Frames,

**Unit I:**

**The forms:**The<input> Tag, The <textarea></textarea> Tag, The Dropdown List, The Normal List, HTML 5: New Markup Elements of HTML5, Basic Tags, Images, List and Links, Tables and Forms, Audio and Video, Canvas, XHTML, and CSS, design and deploy a web site

**Unit IV:**

**VB script:** Introduction to vbscript, Printing Text Using vbscript, Alert / msgbox in vbscript, Variables in vbscript, Arrays in vbscript, Conditional Statements, Looping Statements, Procedures , Events

**Unit V:**

**Java script:** Variables , Array, Comments, Operators, Conditional Statements, Looping Statements,

**Unit VI:****Working under UNIX /LINUX Operating Systems:**

- a) Structure: Unix Architecture
- b) Features of UNIX operating system
- c) Layered model of UNIX operating system (study of kernel and Shell)
- d) General file commands and Directory commands
- e) File structure and Directory structure

**Text Book:**

1. **HTML Programming, Freeman and Robson, O'Reilly publications**

## **BECSE207T: Environmental Engineering**

Load	Credit	Total marks	Sessional marks	University marks	Total
2 hrs (Theory)	0				



# **SYLLABUS IV SEMESTER (Computer Science & Engineering)**

PROPOSED SYLLABUS FOR  
SYLLABUS FOR

## **DISCRETE MATHEMATICS AND GRAPH THEORY**

**BE IV Semester (CS/CT/CE/IT)**

Scheme (Theory: 4 hrs. & Tutorial:1 hr.)

### **UNIT-I: Mathematical Logic and Set Theory (08 Hrs)**

Propositions and Logical Operations, Quantifiers, Conditional Statements and Tautologies, Methods of Proof, Principle of Mathematical Induction. Basic concepts of set theory, Operations on Sets, The power set.

### **UNIT-II: Relations and Functions (12 Hrs)**

**Relations:** Ordered pairs and n-tuples, Product Sets and Partitions, Relations and Digraphs, Matrix of Relation, Paths in Relations and Digraphs, Properties of Relations, Equivalence Relations & Partitions, Compatible Relation, Manipulation of Relations, Composition of Relations, Transitive Closure of a relation, Partial order relation, Partially ordered set, Hasse Diagrams. **Functions:** Definition, Composition of functions, Types of Functions, Invertible Function, Permutation Function, Characteristics function of a set with Theorems.

### **UNIT-III: Group Theory (12 Hrs)**

Binary Operations, Properties, Semigroups, Monoids, Subsemigroup, Submonoid, Isomorphism & Homomorphism, Groups (only definitions and examples) Subgroups and Homomorphism, Cosets and Lagrange's Theorem, Normal subgroups.

### **Unit- IV: Rings, Lattices & Boolean Algebra (10 Hrs)**

Rings, Fields, Integral Domain, Ring Homomorphism (definitions & examples), Lattices: Properties, Types of Lattices, Sub lattices, Isomorphic Lattices, Complemented & Modular Lattices (definitions & examples), Boolean Algebra: Definition, Properties, Simplification of Switching Circuits.

### **Unit-V: Graph Theory (12 Hrs)**

Basic concepts of Graph Theory, Digraphs, Basic definitions, Paths and Circuits, Reachability and Connectedness, Matrix representation of graphs, Subgraphs & Quotient Graphs, Isomorphic digraphs & Transitive Closure digraph, Euler's Path & Circuit (only definitions and examples). Trees, Binary Tree, Labeled Trees, Undirected Trees, Spanning Trees of Connected Relations, Prim's Algorithm to

construct Spanning Trees, Weighted Graphs, Minimal Spanning Trees by Prim's Algorithm & Kruskal's Algorithm.

### **Unit-VI: Combinatorics(06 Hrs)**

Generating Functions, Recurrence Relations, Counting: Permutations & Combinations, Pigeonhole Principle with Simple Applications.

#### **Text Books**

1. Discrete Mathematical Structures(3<sup>rd</sup> Edition) by Kolman, Busby & Ross PHI.
2. Discrete Mathematical Structures with Applications to Computer Science by Tremblay & Manohar, Tata McGraw- Hill.
3. Combinatorial Mathematics, C.L. Liu (McGraw Hill)

#### **Reference Books**

1. Discrete Maths for Computer Scientists & Mathematicians by Mott, Kandel, Baker.
2. Elements of Discrete Mathematics by C. L. Liu.
3. Discrete Mathematics by Lipschutz.
4. Discrete Mathematics by R. Johnsonbaugh.
5. Higher Engineering Mathematics by B.S. Grewal, 40<sup>th</sup> Edition, Khanna Publication

### **BECT209T: Data Structures & Program Design**

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

#### **Unit I:**

Introduction to Data Structures: Basic Concepts of Data, How to Create programs.

Arrays: Ordered Lists, Sparse Matrices, Quick Sort, Merge Sort, Heap Sort, selection & Bubble Sort, Linear Search, Binary Search.

#### **Unit II:**

Stacks & Queues: Fundamentals, Evaluation of expressions, Polish expressions & their compilation, Application of stacks, Multiple stacks & Queues, priority queues.

#### **Unit III:**

Linked Lists: Singly Linked List, Linked Stacks & Queues, the polynomial addition, Examples on linked list, circular linked list, doubly linked list & dynamic Storage management, Generalized list.

### **Unit IV:**

Trees: Basic Terminology, Basic trees, Binary tree representations, threaded storage representation, binary tree traversals, binary search trees, Application of trees. Preliminary treatment of AVL Trees, B-Trees.

### **Unit V:**

Graphs: Definition & terminology, Graph representation: matrix representation of Graph, List of structure, other representation of graphs, Breadth First Search, Depth First Search, Spanning trees, Shortest path algorithm, topological sorting, Critical path.

### **Unit VI:**

Files: Storage structures on tapes & disks, sorting with disks & Tapes, sequential files, indexed sequential files, Direct Access files, and Hashing techniques.

#### **Textbooks:**

- Fundamentals of Data Structures: Horowitz and Sahani
- Algorithms in a Nutshell, George H & Garry, O'reilly Publication
- Data Structures using C by Tanenbaum, Pearson Education
- S. Sahani, Data Structures in C,
- Data structures -Robert Kruse

**BECT209P: Data Structures & Program Design Lab: Practical will be based on above syllabus using “C” language and relevant tools of MATLAB.**

Load	Credit	Total marks	Sessional marks	University marks	Total
2 hrs (Practical)	1	50	25	25	50

### **BECT210T: Advance Microprocessor and Interfacing**

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

#### **UNIT I**

Architecture of 8086, Pin configuration of 8086, Physical address formation, addressing modes, Segmentation of memory, Instruction set & programming, 8086 minimum mode and maximum mode, Memory interfacing, static RAM interfacing, dynamic RAM interfacing.

#### **UNIT II**

Different input/output techniques, interfacing with latches, buffers, interfacing of keyboard matrix, Seven-segment display, DAC, ADC 0809 pin diagram, interfacing ADC with 8086, interfacing of 8253.

#### **UNIT III**

Interrupts of 8086, CRT controller 6845 and Hard disk controller. 8255 PPI, pin diagram, modes of operation, strobe modes, interrupt driven mode, BSR mode, Programmable Interrupt Controller 8259, pin diagram, ICWs, OCWs, modes of operation and interfacing details, cascaded mode, SFNM, polled

mode, SMM, USART 8251, pin diagram, internal architecture, modes of operation synchronous and asynchronous modes and interfacing details, DMA controller 8237, pin diagram, transfer modes and interfacing details.

#### **UNIT IV**

Maximum mode of 8086, PDMAC 8237, Interfacing with 8086, 8279A, interfacing with 8086, bus controller 8288, bus arbiter 8289, IOB mode, resident bus mode, co-processor configuration, ESC prefix, system bus mode, semaphores and LOCK prefix, loosely coupled and closely coupled configuration, priority resolution, NDP architecture.

#### **UNIT V**

Introduction to 8 bit microcontroller 8051, architecture, instruction set and programming, using 32 bit addressing in real mode, introduction to protected mode operation, segmentation, segment descriptors, selectors, privilege levels, paging.

#### **UNIT VI**

Pentium super scalar architecture, CPU pin description, bus operation, RISC concepts, pipe lining, branch prediction, instruction and data cache, floating point unit, software programming model, registers, data organization, protection, protecting segmented access, page level protection, multitasking, TSS descriptors, task switching, exceptions and interrupts, IDT descriptors , input/output, IOPL, ALP implementation of data structures : linked list, Queue, stacks.

#### **Reference**

1. Microprocessor and interfacing : Douglas Hall
2. Advanced Microprocessors And Peripherals A.K.Ray ,K.M.Bhuchandi
3. John P Uffenbeck, 8086/8088 Families: Designing, Programming and interfacing Prentice Hall
4. James Antonokos, The Pentium Processor, Pearson Education

#### **BECT210P:Advance Microprocessor and Interfacing**

Load	Credit	Total marks	Sessional marks	University marks	Total
2 hrs (Practical)	1	50	25	25	50

## **BECSE211T: Theory of Computation**

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

### **UNIT 1**

Mathematical preliminaries – Sets, operations, relations, strings, closure of relation, countability and diagonalization, induction and proof methods- pigeon-hole principle, concept of language, formal grammars, Chomsky hierarchy.

### **UNIT 2**

Finite Automaton, regular languages, deterministic & non deterministic finite automata, E-closures, minimization of automata, equivalence, Moore and Mealy machine.

### **UNIT 3**

Regular expression, identities, Regular grammar, right linear, left linear, Arden theorem, Pumping lemma for regular sets, closure & decision properties for regular sets, Context free languages, parse trees and ambiguity, reduction of CFGS, Normal forms for CFG .

### **UNIT 4**

Push down Automata (PDA), non-determinism, acceptance by two methods and their equivalence, conversion of PDA to CFG, CFG to PDAs, closure and decision properties of CFLs, pumping lemma for CFL

### **UNIT 5**

Turing machines, TM as acceptor, TM as transducers, Variations of TM, linear bounded automata, TM as computer of function.

### **UNIT 6**

Recursively enumerable (r.e.) set, recursive sets, Decidability and solvability, Post correspondence Problem (PCP), Introduction to recursive function theory, primitive recursive functions, Ackerman function

#### **Text Books:**

- Introduction Of Automata Theory, Languages and computation- Hopcroft, Motwani&Ulman
- Introduction to formal languages and automata – Peter Linz.
- Introduction to Theory of Computation –Michael Sipser.

#### **Reference Books:**

- Theory Of Computer Science –Mishra and Chandrashekharan,
- Theory Of Computation –John C. Martin

## **BECT212T: Introduction to Main-Frame Languages**

Load	Credit	Total marks	Sessional marks	University marks	Total
3 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

### **Unit I: Evolution of Mainframe hardware**

- Overview of Computer Architecture -Classification of Computers - micro, mini, mainframes and super computer - Mainframe computer - key features - benefits - Evolution of Mainframes - Different hardware systems
- Operating systems on mainframes, Batch processing vs. online processing - mainframe operating system. - evolution - concepts of Address space, Buffer management - Virtual storage - paging - swapping - Dataset management in mainframes

### **Unit II: z/OS and its features**

- Z-operating system (Z/OS) - Virtual storage - Paging process - storage Managers - Program execution modes - Address space - Multiple virtual system(MVS) , MVS address space, Z/OS address space - Dataset - sequential and partial dataset - Direct access storage device(DASD) -Access methods - Record formats - Introduction to virtual storage access methods(VSAM) - Catalog - VTOC

### **Unit III: Introduction to JCL**

- Introduction to Job Control language - Job processing - structure of JCL statements - Various statements in JCL - JOB statement - EXEC statement - DD statement - JCL procedures and IBM utility programs.

### **Unit IV: COBOL Programming 1**

- Introduction – History, evolution and Features, COBOL program Structure, steps in executing COBOL
- Language Fundamentals – Divisions, sections, paragraphs, sections, sentences and statements, character set, literals, words, figurative constants, rules for forming user defined words, COBOL coding sheet.
- Data division – Data names, level numbers, PIC and VALUE clause, REDEIFNES, RENAMES and USAGE clause
- Procedure Division – Input / Output verbs, INITIALIZE verb, data movement verbs, arithmetic verbs, sequence control verbs.

### **Unit V: COBOL Programming 2**

- File processing – Field, physical / logical records, file, file organization (sequential, indexed and relative) and access mode, FILE-CONTROL paragraph, FILE SECTION, file operations.
- File handling verbs – OPEN, READ, WRITE, REWRITE, CLOSE.
- Table processing – Definition, declaration, accessing elements, subscript and index, SET statement, SEARCH verb, SEARCH ALL verb, comparison.
- Miscellaneous verbs – COPY, CALL, SORT, MERGE, STRING, UNSTRING verbs.

## Unit VI: Mainframe Application Development guidelines

- COBOL coding standards, relation between a COBOL file handling program and JCL, Different types of ABEND codes, COBOL-DB2 program pre-compilation, DBRM (Database Request Module), Application plan/packages, program execution methods (EDIT JCL, foreground and background modes).

### Books and Reference Text:

- 1. MVS JCL, Doug Lowe, Mike Murach and Associates
- 2. Gary DeWard Brown, JCL Programming Bible (with z/OS) fifth edition, Wiley India Dream Tech, 2002.
- 3. z/OS V1R4.0 MVS JCL Reference found online at <http://www-1.ibm.com/support/docview.wss?uid=pub1sa22759706>
- 4. COBOL - Language Reference, Ver 3, Release 2, IBM Redbook.
- 5. COBOL - Programming Guide, Ver 3, Release 2, IBM Redbook.
- 6. Nancy Stern & Robert A Stern, “Structured Cobol Programming”, John Wiley & Sons, New York, 1973.
- 7. M.K. Roy and D. GhoshDastidar, “Cobol Programming”, Tata McGraw Hill, New York, 1973.
- 8. Newcomer and Lawrence, Programming with Structured COBOL, McGraw Hill Books, New York, 1973.
- Study material from INFOSYS-PUNE

### BECT213P: COMPUTER WORKSHOP – 2 LAB

Load	Credit	Total marks	Sessional marks	University marks	Total
2 hrs (Practical)	1	50	25	25	50

**The contents may be based on LINUX and LINUX Administration. The contents can be revised as per the current trends in Software Industry.**