Department of Computational Sciences
Bachelor of Computer Application

Semester II						
Sl. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
Theory						
1	BCAN201	Computer Architecture	3	1	0	4
2	BCAN202	Software Engineering	3	1	0	4
3	BCAN203	Data Structure with Python	3	0	0	3
4	BMN201	Advanced Mathematical Computation	3	0	0	3
6	BCAN204	Environmental Science	1	0	0	1
Practical						
1	BCAN291	Computer Architecture Lab	0	0	4	2
2	BCAN293	Data Structure with Python Lab	0	0	4	2
		Total Credit				19

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Course Name: Computer Architecture
Course Code: BCAN201
Contact: 3L
Credits: 4
Allotted Hrs: 36

UNIT I: Data Representation [4L]
Number Systems – decimal, binary, octal, hexadecimal, alphanumeric representation, 2. Complements – 1's complement, 2' complement, 9's complement, 10' complement, [r-1]'s complement, r's complement, 3. Fixed point representation – Integer representation, arithmetic addition, arithmetic subtraction, overflow, decimal fixed point representation, 4. Floating point representation, 5. IEEE 754 floating point representation

UNIT II: Computer arithmetic [5L]
Addition algorithm of sign magnitude numbers, Subtraction algorithm of sign magnitude numbers, Addition algorithm of signed 2's complement data, Subtraction algorithm of signed 2's complement data, Multiplication algorithm, Booth's algorithm, Division algorithm

UNIT III: Register transfer and micro-operations [5L]
Register transfer language, Register transfer, Bus system for registers, Memory transfers – memory read, memory write, Micro operations – register transfer micro operations, arithmetic micro operations, logic micro operations, shift micro operations, Binary adder, binary adder subtractor, binary incrementer, arithmetic circuit for arithmetic micro operations, One stage logic circuit,Selective set, Selective complement, Selective clear, Mask, Insert, Clear

UNIT IV: Basic Computer organization and design [4L]
Instruction codes, Direct address, Indirect address & Effective address, List of basic computer registers, Computer instructions: memory reference, register reference & input – output instructions,Block diagram & brief idea of control unit of basic computer, 6. Instruction cycle

UNIT V: Micro programmed control [2L]
Control memory, Address sequencing,Micro program examples

UNIT VI: Central processing unit [5L]
General register organization,Stack organization, Register stack, Memory stack, Stack operations – push & pop, Evaluation of arithmetic expression using stack, Instruction format,
Types of CPU organization [single accumulator, general register & stack organization] & example of their instructions, 6. Three, two, one & zero address instruction, 7. Definition and example of data transfer, data manipulation & program control instructions, 8. Basic

idea of different types of interrupts [external, internal & software interrupts], 9. Difference between RISC & CISC

UNIT VII: Pipeline and vector processing [3L]

Parallel processing, Flynn's classification, Pipelining, Example of pipeline, space time diagram, speedup, Basic idea of arithmetic pipeline, example of floating point addition/ subtraction using pipeline

UNIT VIII: Input – output organization [4L]

Peripheral devices,Input – output interface, Isolated I/O, Memory mapped I/O, Asynchronous data transfer: strobe & handshaking, Programmed I/O, Interrupt initiated I/O, Basic idea of DMA & DMAC 8. Input – output processor

UNIT IX: Memory organization [4L]

Memory hierarchy, Main memory definition, types of main memory, types of RAM, ROM, difference between SRAM & DRAM, Cache memory, Cache memory mapping – Direct, Associative, Set Associative, CAM, hardware organization of CAM, Virtual memory, mapping using pages, page fault, mapping using segments, TLB, Auxiliary memory, diagrammatic representation of magnetic disk & hard disk drive, Definitions of seek time, rotational delay, access time, transfer time, latency

Suggested Readings:

1. Computer System Architecture, M. Morris Mano, PEARSON
2. Computer Organization & Architecture – Designing For Performance, William
3. Stallings, PEARSON
4. Computer Architecture & Organisation, J.P. Hayes, TATA MCGRAW HILL
5. Computer Organization and Architecture, T. K. Ghosh, TATA MCGRAW-HILL
6. Computer Architecture, Behrooz Parhami, OXFORD UNIVERSITY PRESS

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Course Name: Software Engineering

Course Code: BCAN202

Contact: 3L

Credits: 4

Allotted Hrs: 36

UNIT I: [12L]

Overview of Computer Based Information System- TPS, OAS, MIS, DSS, KBS

Development Life Cycles- SDLC and its phases Models- Waterfall,

Prototype, Spiral, Evolutionary Requirement Analysis and Specification, SRS

System analysis- DFD, Data Modeling with ERD

UNIT II: [7L]

Feasibility Analysis System design tools- data dictionary, structure chart, decision table, decision tree.

Concept of User Interface, Essence of UML. CASE tool.

UNIT III: [7L]

Testing- Test case, Test suit, Types of testing- unit testing, system testing, integration testing,

acceptance testing Design methodologies: top down and bottom up approach, stub, driver, black box and white box testing.

UNIT IV: [10L]

ERP, MRP, CRM, Software maintenance SCM, concept of standards [ISO and CMM]

Suggested Readings:

1. System analysis and design, Igor Hawryszkiewycz, Pearson
2. Analysis and design of Information System, V Rajaraman, PHI
3. Software Engineering, Ian Sommerville, Addison-Wesley

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Course Name: Data Structures with Python
Course Code: BCAN201
Contact: 3L
Credits: 3
Allotted Hrs: 36

UNIT I: Concepts of Abstract data type [4L]
Concept of abstract data types, Structure, union, enum, pointer to structure, Self referential structure, Pointer
to pointer

UNIT II: Dynamic Memory Allocation [4L]
Difference between static and dynamic memory allocation, Using functions such as malloc[], calloc[], realloc[], free[].

UNIT III: File Management [4L]
Application of functions such as fopen[], fclose[], getc[], putc[], fprintf[], fscanf[], getw[], putw[], command line
argument.

UNIT IV: Data Structure using Array [4L]
stack, queue, circular queue, priority queue, dequeue and their operations and applications.

UNIT V: Searching and Sorting [6L]
Searching: linear search, Binary search, their comparison, Sorting: insertion sort, Selection sort. Quick sort, Bubble sort Heap sort, Comparison of sorting methods , Analysis of algorithm, complexity using big 'O' notation

UNIT VI: Linked List [4L]
Linear link lists, doubly linked lists, stack using linked list, queue using linked list, circular linked list and their operations
and applications.

UNIT VII: Trees [5L]
Binary trees, binary search trees, representations and operations, thread representations, sequential representations, B tree , B+ tree,

UNIT VIII: Graphs [5L]
Introduction to graphs, Definition, Terminology, Directed, Undirected & Weighted graph, Representation of graphs, Graph Traversal: Depth first search and Breadth first search. Spanning Trees, minimum spanning Tree, Shortest path algorithm

UNIT IX: Hashing [4L]
Definition, Hashing functions, Load factor and collision, open addressing [linear probing] and chaining method to avoid collision

Suggested Readings:

1. Data Structures in C, Ajay Agarwal, Cyber Tech
2. Data Structures Using C, Radhakrishnan & Shrinivasan, ISTE/EXCEL BOOKS
3. C and Data Structure,Radhaganesan,Scitech
4. Data Structure Using C & C++, Tannenbaum, PHI
5. Mastering Algorithms with C,Loudon,SPD/O'REILLY

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Course Name: Advanced Mathematical Computation

Course Code: BMN201

Contact: 3L

Credits: 3

Allotted Hrs: 36

UNIT I: Algebra [20L]

Abstract Algebra: Sets, Algebra of sets and their applications, Relations, Mapping, Compositions, Groups, Abelian groups, Sub-groups, Cyclic groups, Notion of ring and fields. Complex numbers, Modulus and amplitudes, De Moivre's theorem

Polynomials, Division algorithm, Fundamental theorem of classical algebra [statement only],

Descart's rule of sign, Relation between roots and coefficients, symmetric function of the roots, transformation of polynomial equations, Binomial equations

UNIT II: Differential Equations [14L]

Order, degree, formation of a differential equation, Solutions of ODE, First order and first degree: Variable separation method, Homogeneous equations, Exact equations, Condition of

exactness [statement only], Rules for finding Integrating factors, Linear equation, Bernoulli's

equation. General solution of ODE of first order and higher degree, Clairaut's equation, second order linear ODE with constant coefficients, Solutions using D operator method. Cauchy-Euler equations and their solutions

UNIT III: Sequence and Series [6L]

Bounded and unbounded sequences, convergence or divergence of a sequence, behaviour of monotone sequences, algebra of convergent sequences, Cauchy's sequence, Cauchy's general principle of convergence, infinite series – its convergence and sum, series with positive terms and standard tests of convergence [without proof], alternating series, Leibnitz test, absolute convergence.

Suggested Readings:

1. Higher Algebra, S. K. Mapa, Levant Books
2. Advanced Higher Algebra, Chakravorty and Ghosh, U N Dhar Pvt. Ltd
3. Differential Equations, Sheplay L Ross, Wiley
4. Differential Calculus, Das and Mukherjee, U N Dhar Pvt. Ltd

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Course Name: Environmental Science

Course Code: BCAN204

Contact: 1L

Credits: 1

Allotted Hrs: 12

UNIT I: Introduction [2L]

Introduction to environment and ecology Components of the environment, environmental degradation, natural cycles of environment.

UNIT II: Ecology [2L]

Elements of Ecology, Ecological balance, Effects of Aforestation and deforestation

UNIT III: Air Pollution and Control [2L]

Atmospheric composition, Segments of atmosphere climate, weather, Atmospheric Stability, dispersion of pollutants , Sources and effects of air pollutants, primary and secondary pollutants**,** Criteria Pollutants:PM10, Source, Effect, Control , CO, NO x, **Source, Effect,** Control , SO x, Source, Effect, Control ,Lead, Ozone, Source, Effect, Control ,

Green house effect, Control Measures ,Depletion of ozone layer, Effects of UV exposer, Control Measures

UNIT IV: Water Pollution and Control [2L]

Hydrosphere, natural water resources and reserves, Pollutants: their origin and effects ,COD and BOD test, NBOD and CBOD , River / lake / ground water pollution , Control Measures of water pollution , Drinking water and

waste water treatment

UNIT V: Land Pollution [2L]

Lithosphere, pollutants [municipal, industrial, commercial, agricultural, hazardous solid wastes] their origin and effects , Collection and disposal of solid waste, recycling and treatment methods

UNIT VI: Noise Pollution [2L]

Sources, effects, standards and control

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Course Name: Computer Architecture Lab

Course Code: BCAN291

Contact: 4P

Credits: 2

Basic & Fundamental

Basic gates and Universal gates. Implementation of Half & full adder. Half & full subtractor,

Arithmetic & Logical Units

4 bit logical unit, 4 bit arithmetic unit, BCD adder, 4 bit adder/ subtractor, Carry look ahead adder, Design of ALU for multi bit operation, comparators.

Multiplexer and Decoders

8:1 MUX IC verification, 16:1 MUX using IC 74151, dual 2 to 4 Decoder/ Demultiplexer IC evaluation. Priority encoder.

Memory

Read/ write operation using RAM IC, Cascading RAM ICs

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Course Name: Data Structures with Python Lab

Course Code: BCAN293

Contact: 4P

Credits: 2

1. Implementation of array operations.
2. Stacks and Queues: adding, deleting elements .
3. Circular Queue: Adding & deleting elements
4. Merging Problem : Evaluation of expressions operations on Multiple stacks & queues
5. Implementation of linked lists: inserting, deleting, inverting a linked list.
6. Implementation of stacks & queues using linked lists:
7. Polynomial addition, Polynomial multiplication
8. Sparse Matrices : Multiplication, addition.
9. Recursive and Non Recursive traversal of Trees Threaded binary tree traversal.AVL tree implementation Application of Trees.
10. Application of sorting and searching algorithms Hash tables implementation: searching, inserting and deleting, searching & sorting techniques.