Babu Banarasi Das University, Lucknow
School of Computer Applications
Bachelor of Computer Applications
Evaluation Scheme (w. e. f. Academic Session 2019-20)

SEMESTER I									
Course Category	**Course Code**	**Course Title**	**Contact Hours**			**Evaluation Scheme**			**Credits**
			L	**T**	**P**	**CIA**	**ESE**	**Course Total**	
Theory									
F	BCA3101	Computer Fundamental	3	1	0	40	60	100	4
C	BCA3102	Digital Electronics	3	1	0	40	60	100	4
C	BCA3103	Programming Concept Using 'C'	3	1	0	40	60	100	4
C	BCA3104	Mathematics	3	1	0	40	60	100	4
C	BHS3101	Technical Communication	3	1	0	40	60	100	4
Practical									
C	BCA3151	Digital Electronics Lab	0	0	4	40	60	100	2
C	BCA3152	'C' Programming Lab	0	0	4	40	60	100	2
	GP3101	General Proficiency	-	-	-	100	-	100	1
		Total	15	5	8	-		800	25

SEMESTER II									
Course Category	**Course Code**	**Course Title**	**Contact Hours**			**Evaluation Scheme**			**Credits**
			L	**T**	**P**	**CIA**	**ESE**	**Course Total**	
Theory									
C	BCA3201	Data Structure Using 'C' I	3	1	0	40	60	100	4
C	BCA3202	Operating System I	3	1	0	40	60	100	4
C	BCA3203	System Analysis & Design I	3	1	0	40	60	100	4
C	BCA3204	Data Communication & Computer Network	3	1	0	40	60	100	4
C	BCA3205	Computer Organization & Architecture I	3	1	0	40	60	100	4
Practical									
C	BCA3251	Data Structure Using 'C' I Lab	0	0	4	40	60	100	2
C	BCA3252	Computer Organization I Lab	0	0	4	40	60	100	2
	GP3201	General Proficiency	-	-	-	100	-	100	1
		Total	15	5	8	-		800	25

SEMESTER III									
Course Category	**Course Code**	**Course Title**	**Contact Hours**			**Evaluation Scheme**			**Credits**
			L	**T**	**P**	**CIA**	**ESE**	**Course Total**	
Theory									
C	BCA3301	Design & Analysis of Algorithm	3	1	0	40	60	100	4
C	BCA3302	Data Base Management System	3	1	0	40	60	100	4
C	BCA3303	Object Oriented Programming Using Java	3	1	0	40	60	100	4
C	BAS3304	Environmental Studies	2	0	0	40	60	100	2
C	BCA3305	Discrete Mathematics & Graph Theory	3	1	0	40	60	100	4
Practical									
C	BCA3351	Data Base Management System Lab	0	0	4	40	60	100	2
C	BCA3352	Object Oriented Programming Using Java Lab	0	0	4	40	60	100	2
	GP3301	General Proficiency	-	-	-	100	-	100	1
		Total	13	4	8	-		800	23

SEMESTER IV									
Course Category	**Course Code**	**Course Title**	**Contact Hours**			**Evaluation Scheme**			**Credits**
			L	**T**	**P**	**CIA**	**ESE**	**Course Total**	
Theory									
C	BCA3401	Python Programming I	3	1	0	40	60	100	4
C	BCA3402	Numerical & Statistical Techniques	3	1	0	40	60	100	4
C	BCA3403	.NET Framework & C# I	3	1	0	40	60	100	4
C	BCA3404	Data Warehousing & Data Mining	3	1	0	40	60	100	4
C	BCA3405	Computer Graphics	3	1	0	40	60	100	4
Practical									
C	BCA3451	Python Programming I Lab	0	0	4	40	60	100	2
C	BCA3452	.NET Framework & C# I Lab	0	0	4	40	60	100	2
	GP3401	General Proficiency	-	-	-	100	-	100	1
		Total	15	5	8	-		800	25

SEMESTER V									
Course Category	**Course Code**	**Course Title**	**Contact Hours**			**Evaluation Scheme**			**Credits**
			L	**T**	**P**	**CIA**	**ESE**	**Course Total**	
Theory									
C	BCA3501	Web Application Development Using OSS	3	1	0	40	60	100	4
C	BCA3502	Mobile Application Development	3	1	0	40	60	100	4
GE		Generic Elective	3	1	0	40	60	100	4
C	BCA3504	Software Engineering	3	1	0	40	60	100	4
OE		Open Elective	3	1	0	40	60	100	4
Practical									
C	BCA3551	Web Application Development Using OSS Lab	0	0	4	40	60	100	2
C	BCA3552	Mobile Application Development Lab	0	0	4	40	60	100	2
	GP3501	General Proficiency	-	-	-	100	-	100	1
		Total	15	5	8	-		800	25

SEMESTER VI									
Course Category	**Course Code**	**Course Title**	**Contact Hours**			**Evaluation Scheme**			**Credits**
			L	**T**	**P**	**CIA**	**ESE**	**Course Total**	
Theory									
C	BCA3601	Management Information System	3	1	0	40	60	100	4
C	BCA3602	Advance Computer Technologies	3	1	0	40	60	100	4
Practical									
C	BCA3651	Project Training	-	-	-	220	280	500	16
	GP3601	General Proficiency	-	-	-	100	-	100	1
					Total			800	25

Legends:

L Number of Lecture Hours per week
T Number of Tutorial Hours per week
P Number of Practical Hours per week
CIA Continuous Internal Assessment
ESE End Semester Examination

Credit Summary Chart

Course Category	Semester						Total Credits	%age
	I	II	III	IV	V	VI		
Basic Sciences	4		4	4			12	8.17
Humanities	4		2				6	4.06
Social Sciences								
Professional Subject - Core	16	24	16	20	16	8	100	67.5
Professional Subject – Generic Elective					4		4	2.70
Professional Subject – Open Elective					4		4	2.70
GP	1	1	1	1	1	1	6	4.06
Project Work, Seminar and/or Internship in Industry or elsewhere						16	16	10.81
Total	25	25	23	25	25	25	148	100

Discipline wise Credit Summary Chart

Course Category	Semester						Total Credits	%age
	I	II	III	IV	V	VI		
F	4						4	2.7
C	20	24	22	24	16	24	130	87.48
GE					4		4	2.7
OE					4		4	2.7
GP	1	1	1	1	1	1	6	4.06
Total	25	25	23	25	25	25	148	100

Category of Courses:

F Foundation Course
C Core Course
GE Generic Elective
OE Open Elective

Generic Elective Subjects List

1. BCA3511 Fundamental of E Commerce
2. BCA3512 Software Project management I
3. BCA3513 Green Computing
4. BCA3514 E- Governance I

Open Elective Subjects List

1. OE31101: Environmental Issues of IT & e-Waste Management
2. OE31102: Digital Governance

I Semester

BCA3101: Computer Fundamental

Course Objective:

1. The subject provides the fundamental concepts of computer science and information technology.
2. Subject introduces computer hardware, computer networks, DBMS and operating system.

Learning Outcome: Upon successful completion of the course the student will be able to:

1. Understand the basics of computer science and information technology.
2. Learn History of computers, Computer Peripherals, Storage Devices, Computer Security Systems, Computer Viruses and Computer Networking etc.
3. Understand how to use Internet technology and their various applications.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Introduction to Computers** Introduction to computer, Basics of computers and its operation, History of computer, Capabilities and limitations of computers, Types of computers; **Hardware:** CPU(Architecture & Related Technology) and Microprocessors; **Storage Devices:** Primary & Secondary; Auxiliary Storage Devices; Cache Memory; Memory Hierarchy; Buffering and Spooling; **Software:** Types of software; **System Software**: Control, Development, Management; **Input devices:** Keyboard, Mouse, Joystick, Stylus, Tablet, Touchpad, Touch Screen, Data Gloves, Camera Scanner, Microphones, Barcode reader, OCR, OMR, MICR; **Output Devices:** Display; CRT Plasma, LCD, LED, Printers and Plotters, projectors, Speaker, VR Head; Booting and POST.	8 Hours	1
II	**Operating System** Operating System: Types of Operating System, Function of Operating System, MS-DOS,MS-Windows and Unix; Process Management(Job Scheduling), Memory Management, File Management, I/O Management, Security; Introduction to Programming Languages, Language Processing: Translator, Assembler, Compiler, Interpreter, Cross Compiler; Introduction to data storage; Virus & Anti-Virus.	8 Hours	1

III	**Computer Networks & Internet** Data communication: Signaling & Transmission; Network Devices: HUB, Switch, Router, Gateways; Types of network; Topology; Transmission Mode & Media; Switching Techniques, Internet and protocol, Internet services, OSI reference model; TCP/IP Reference Model.	8 Hours	1
IV	**Introduction to Modern Technologies** Open source Software; Mobile Application Development, Data Science & Analysis; Artificial Intelligence; Soft Computing; Cloud Computing; IOT; Digital Marketing.	8 Hours	1

Suggested Readings:

1. E. Balagurusamy, "Fundamentals of Computers", McGraw Hill Education.
2. Peter Norton's., "Introduction to Computers", McGraw Hill Education.
3. Raja Raman .V, "Fundamentals of Computers", PHI Publications, 3rd Edition, 2004.

BCA3102: Digital Electronics

Course Objective:

1. Provide a better understanding of Computer Organization, its designing & implementation.
2. Provide the understanding and uses of flip flops.
3. To enable student to implement synchronous state machine using flip flops.

Learning Outcome: On completion of this course students will be able to:

1. Understand the concept of logic family in order to build digital circuits and the obsolescence curve associated to a given logic family.
2. Simplify or minimize logic functions with up to 5 input variables by means of Karnaugh maps.
3. Use digital timing diagrams to specify a combinational circuits' behavior or to verify its operation.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Number System & Boolean Algebra** Number System: Binary, Octal, Decimal, Hexadecimal; Conversion of Number System; Binary Arithmetic & Complement, Binary Codes: Weighted & Non Weighted, Gray Code, Excess-3 Code. Error Detection Codes: Hamming Code; Boolean Function; Boolean Postulates; De-Morgan's Theorem; Boolean Expressions: Sum of Product, Product of Sum, Minimization of Boolean Expressions using K-Map; Logic Gates: AND, OR, NOT, NAND, NOR, XOR, XNOR; Implementations of Logic Functions using Gates; NAND- NOR Implementations; Multilevel gate Implementations.	8 Hours	1
II	**Combinational Circuits** Adders & Subtractors: Half Adder, Full Adder, Binary Adder, Half Subtractor, Full Subtractor, Adder Subtractor; Magnitude Comparator: Two Bit Magnitude Comparator, Three Bit Magnitude Comparator; Multiplexer & De-Multiplexer: 4*1 Multiplexer, 8*1 Multiplexer; Decoder & Encoder; Parity Checker & Generator; Code Converter.	8 Hours	1

III	**Sequential Circuit:** Introduction to Flip Flops: SR, JK, T, D, Master Slave Flip Flops; Conversion of Flip Flops; Characteristic Table & Equation; Edge Triggering & Level Triggering; Excitation Table; State Diagram; State Table; State Reduction; Design of Sequential Circuits.	8 Hours	1
IV	**Registers** Introduction of Registers; Classification of Registers; Register with Parallel Load; Shift Registers; Bidirectional Shift Register with Parallel Load. **Counters** Introduction of Counter; Asynchronous/Ripple Counters; Synchronous Counters; BCD Counter; 4-bit Binary Counter with Parallel Load; Design of Synchronous Counters; Ring Counter; Johnson Counter.	8 Hours	1

Suggested Readings:

1. V. Rajaraman, "Fundamental of Computers", PHI Publications, 3rd Edition, 2004.
2. P. K. Sinha , "Fundamental of Computers",BPB Publications
3. M. Mano, "Digital Logic and Computer Design", 2nd Edition, PHI.
4. R. P. Jain, "Modern Digital Electronics", Tata Mc Graw Hill, 2003.
5. P. Raja, "Switching Theory", Fourth Edition, Umesh Publication.

BCA3103: Programming Concepts Using 'C'

Course Objective:

1. To provide the basic fundamental knowledge about various concepts of programming.
2. Clear understanding of the basic terminology required for programming.

Learning Outcome: On completion of this course students will be able to:

1. Understand various constructs of the C Language along with proper syntax.
2. Understand various header Files.
3. Develop programs on various topics.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Introduction:** Evolution of Programming Languages; Programming Approaches: Top-down Approach, Bottom-up Approach; Algorithm; Flowchart; Source Code; Object Code; Executable File; **Introduction to C:** Data Types: Primitive Data types, Derived Data types, User-Defined Data Types; **Operators:** Different Types of Operators, Precedence of Operators, Expression and Statements; **Token:** Variables, Constants, Literals, Identifiers, Keyword, Escape Sequence; **Types of Conversion:** Typecasting, Conversion; **Decision Control Statements:** IF, IF-ELSE, Nested IF, IF-ELSE ladder, Switch-case; **Iterative statements:** FOR loop, WHILE loop, DO-WHILE loop; **Jump Statements:** Break, Continue.	8 Hours	1
II	**Array:** Declaration of an Array, Initialization of Array, Types of Array: Single Dimension Array, Two-Dimensional Array; Address Calculation of an Element in Array; Insertion and Deletion in an Array; **Searching**: Linear Search, Binary Search; **Sorting**: Bubble Sort, Selection Sort, Insertion Sort; **Character Array and Strings:** Reading, writing, String Handling Functions: strcat(), strcmp(), strcpy(), strlen().	8 Hours	1
III	**Functions & Pointers:** User-Defined Functions; Function Declaration; Types of Arguments: Actual Arguments, Formal Arguments; Function Definition; Methods to Call a Function: Call by Value, Call by Reference; Passing Arrays as Parameters; Storage Classes; **Pointers:** Declaration of Pointer Variables; Pointer Arithmetic; Pointers and Arrays, Pointer and Character Strings, Array of Pointers, Pointers as Function Arguments; Structures; Unions; Array of Structures; Array of Union; Pointers and Structures; Enumerations.	8 Hours	1

IV	**File Handling:** Opening a File, Closing a File, File-Opening Modes, Reading from and Writing to a File, Copying Content of an Existing File to another, File Handling Library Functions; Command Line Arguments; Preprocessor Directives; **Header Files:** stdio.h, conio.h, math.h, stdlib.h, setjmp.h, signal.h, time.h, stdarg.h, graphics.h.	8 Hours	1

Suggested Readings:

1. E.Balagurusamy, "Programming in ANSI C", TMH Publications.
2. Reema Thareja, "Programming in C", OXFORD University Press.
3. Peter Norton's, "Introduction to Computers", TMH Publications
4. Kernighan, Ritchie, "The C Programming Language", PHI Publications
5. Yashwant Kanitakar, "Let us C", BPB Publications

BCA3104: Mathematics I
Course Objective:

1. To understand the basic concepts of mathematics.
2. To get the knowledge about the matrices, determinants and limits.
3. To study the basics of differential and integral calculus.

Learning Outcome: On completion of this course students will be able to:

1. Evaluate derivatives for complexly constructed elementary functions.
2. Evaluate definite and indefinite integrals.
3. Evaluate limits using algebraic, geometric, analytic techniques.
4. Demonstrate proficiency in calculus.
5. Evaluate matrices and Determinants.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Determinants:** Definition, Minors, Cofactors, Properties of Determinants. **Matrices:** Definition, Types of Matrices, Addition, Subtraction, Scalar Multiplication and Multiplication of Matrices, Adjoint, Inverse, Cramer's Rule, Rank of Matrix Dependence of Vectors, Eigen Vectors of a Matrix, Caley-Hamilton Theorem.	8 Hours	1
II	**Differntial Calculas:** Successive Differentaition, Leibnitz's theorem, Taylor's Series, Maclaurin's series, Rolle's theorem, Mean value theorem, Maxima and Minima, Point of Inflexion; Tangent and Normals of simple curve Partial Differentiation, Definition and examples of Curvature, Asymptotes, Tracing of Curves.	8 Hours	1
III	**Integral Calculas**: Integral as Limit of Sum, Definite Integrals, Multiple Integrals, Quadrature, Rectification, Volume and Surface of Revolution.	8 Hours	1
IV	Differential Equations, Solutions with separation variable, homogenous equation, Linear equation, reducible to variable separable, reducible to homogenous and first order linear differential equation with constant coefficient.	8 Hours	1

Suggested Readings:

1. H.K. Dass, "Advanced Engineering Mathematics", S. Chand & Company, 9th Revised Edition, 2001
2. Shanti Narayan, "Integral Calculus", S. Chand & Company
3. Shanti Narayan, "Differential Calculus", S.Chand & Company

BCA3151: Digital Electronics Lab

Module	Course Topics	Credits
I	1. Implementation of Gates. 2. State & Prove De Morgan's Law. 3. Verification of Expressions using Gates. 4. Verification of various gates (NOT, OR, AND, Ex-OR, Ex-NOR) using universal gates. (NAND & NOR). 5. Implementation of Adders & Subtractors. 6. Implementation of Code Converters. 7. Implementation of Parity Checker & Generators. 8. Implementation of Parity Magnitude Comparator. 9. Design and Implementation of Combinational Circuits.	1
II	1. Proving of Characteristic table of different Flip Flops. 2. Prove the Conversion Logic of various Flip Flops. 3. Design & Prove the State Table and State Diagram of various flip flop input functions. 4. Design of sequential Circuit using different Flip Flops. 5. Design of various counters using various Flip Flops. 6. Design the sequential circuit using a 2-bit register and combinational gates. 7. Design and Implementation of BCD Counters. 8. Design and Implementation of Ripple Counter. 9. Construct the Johnson Counter.	1

BCA3152: 'C' Programming Lab

Module	Course Topics	Credits
I	1. Implementation of Fundamental Data Types. 2. Implementation of Fundamental Operators. 3. Implementation of Conditional Program such as if, switch etc. 4. Implementation of Basic Control Constructs such as for loop, while loop, do while loop. 5. Implementation of Functions.	1
II	1. Implementation of Advance Control Constructs such as Arrays & structures etc. 2. Implementation of Pointers. 3. Implementation of Pointers as Function Arguments. 4. Implementation of File. 5. Implementation of Command Line arguments.	1

II Semester

BCA3201: Data Structure Using 'C' I

Course Objective:

1. The objective of this course is to make the student learn fundamental data structures algorithms.
2. The course describes and implements algorithms such as stacks, queues, linked lists, trees, searching techniques, sorting techniques, hashing techniques and graphs.
3. Comprehend alternative implementations using the differing logical relationships and appreciate the significance of choosing a particular logical relationship for implementation within real-world setting.
4. Demonstrate the ability to plan, design, execute and document sophisticated technical programs to handle various sorts of data structures.
5. Be familiar with the use of data structures as the foundational base for computer solutions to problems.
6. Become introduced to and investigate the differing logical relationships among various data items.

Learning Outcome: Having successfully completed this course, the student will be able to:

1. Apply advance C programming techniques such as pointers, dynamic memory allocation, structures to developing solutions for particular problems.
2. Design and implement abstract data types such as linked list, stack, queue and tree by using C as the programming language using static or dynamic implementations.
3. Analyse, evaluate and choose appropriate abstract data types and algorithms to solve particular problems.
4. Design and implement C programs that apply abstract data types.

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Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Introduction to Data Structures**. Classification of Data Structure, Operations on Data Structure, Dynamic Memory Allocation, Types of Case Analysis Arrays: Address Calculation, Application of arrays, Limitation of Array, Application of Arrays, Array as Parameters, Sparse Matrices	8 Hours	1
II	**Continuous Implementation (Stack):** Array Representation, Operations on Stacks: Push & Pop, Applications of stack, Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using stack **Recurssion**: Recursive Definition and Processes, Principles of Recursion, Tower of Hanoi Problem, Recursion Vs. Iteration Continuous Implementation(Queue): Array representation and implementation of Queues, Operations on Queue: Create, Add, Delete, Full and Empty Queue , Circular Queue, Dequeue and Priority Queue	8 Hours	

III	**Non Continuous Implementation:** Link Lists: Linear List concept, List v/s Array, Linked List Terminology, Representation of Linked List in Memory, Types of Linked List, Single Linked List, Doubly Linked List, Single Circular Linked list, Circular Doubly Linked List, Operations on Link List: Create List Insert node (empty list, beginning, middle, end), Delete node(first, general case), Traversing node, Searching node, Print list, Count Nodes, Sort Lists	8 Hours	1
IV	**Trees**: Introduction to Tree & its Terminology, Binary trees, Types of Binary trees, Representation of Binary Tree, Traversals (Inorder, Preorder, Postorder), Tree Expression, Binary Search Tree, Insertion and Deletion in BST Graph Terminology Sorting & Searching Techniques: Bubble Sort, Selection Sort, Insertion Sort, Shell Sort, Quick Sort, Merge Sort, Sequential Search, Binary Search	8 Hours	1

Suggested Readings:

1. Y. Langsam, M. Augenstin and A. Tannenbaum, "Data Structures using C and C++", Pearson Education Asia, 2nd Edition, 2002.
2. Ellis Horowitz, S. Sahni, D. Mehta, "Fundamentals of Data Structures in C++", Galgotia Book Source, New Delhi.
3. S. Lipschutz, "Data structures", Mc-Graw-Hill International Editions, 1986.
4. Jean-Paul Tremblay, Paul. G. Soresan, "An Introduction to Data Structures with Applications", Tata Mc-Graw-Hill International Editions, 2nd edition 1984.
5. A. Michael Berman, "Data Structures via C++", Oxford University Press, 2002.
6. M. Weiss, "Data Structures and Algorithm Analysis in C++", Pearson Education, 2nd Edition, 2002.

BCA3202: Operating System I

Course Objective:

1. To provide a good understanding of the underlying concepts of operating systems.

Learning Outcome: Upon successful completion of the course the student will:

1. Understand the principles and techniques used to implement processes and threads as well as the different algorithms for process scheduling.
2. Understand the mechanisms used for process synchronization & handling deadlock.
3. Understand the concept of memory management and virtual memory.
4. Understand the file system structure and storage management.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Introduction and Process Management:** Operating System: System Components, System Calls and its types, System Programs; Types of Operating System; Operating System Structure: Simple Structure, Layered Approach, Microkernels, Exokernels; Virtual machine; Introduction to Process: Process States, Process Control Block; Process Scheduling: Scheduling Queues, Schedulers, Context Switch, Scheduling Objectives, Scheduling Criteria; Scheduling Algorithms: First Come First Serve, Shortest Job First, Round Robin, Priority; Multiple-Processor Scheduling; Real-Time Scheduling; Multilevel Feedback Queue Scheduling; Threads.	8 Hours	1
II	**Process Synchronization and Deadlocks**: Critical-Section Problem; Peterson's Solution; Semaphore: Usage of Semaphore; Classical Problems of Synchronization: Producer Consumer, Readers-Writer, Dining Philosophers; Deadlock System Model; Deadlock Characterization: Necessary Condition, Resource-Allocation graph; Deadlock Handling Methods: Deadlock Prevention, Deadlock Avoidance Mechanisms: Resource Allocation graph Algorithm, Banker's Algorithm, Deadlock Detection and Recovery.	8 Hours	1

III	**Memory Management**: Memory Management Strategies: Address Binding, Logical and Physical Address Space, Dynamic Linking; Swapping; Contiguous and Non-Contiguous Memory Allocation; Paging; Segmentation; Virtual Memory Management Concept; Demand Paging; Page Replacement Policies: Basic Page Replacement, FIFO Page Replacement, LRU Page Replacement, Optimal Page Replacement, Counting Based Page Replacement; Allocation of Frames: Minimum Number of Frames, Allocation Algorithm, Global Versus Local Allocation; Thrashing: Cause of Thrashing, Working Set Model.	8 Hours	1
IV	**Storage Management:** File Concept: File Attribute, File Operations, File Types**,** File Structure; File Access Method: Sequential Method, Direct Access Method; Directory Structure; File System Implementation: File System Structure, Allocation Methods**,** Free space Management; Secondary Storage Structure: Disk Structure**,** Disk Scheduling Algorithms**,** Disk Management.	8 Hours	1

Suggested Readings:

1. Abraham Silberschatz and Peter Baer Galvin, "Operating SystemConcepts", Addison-Wesley.
2. Andrew S. Tanenbaum, "Modern Operating Systems", PrenticeHall.
3. Milan Milankovic, "Operating Systems, Concepts and Design",TMH.
4. William Stallings, "Operating Systems: Internal and Design Principles",PHI.
5. D M Dhamdhere, "Operating System- a Concept based Approach", McGraw Hill Education.

BCA3203: System Analysis & Design I

Course Objective:

1. To presents a comprehensive introduction to the system analysis and design skill in information management.
2. To provide the students with the skills to identify business problems which may be solved by technology based solutions and develop design which form the basis for implementing systems as well as a strong foundation in systems analysis and design concepts, methodologies, techniques and tools.
3. This also include waterfall model (system development life cycle), system analysis and Design Technique (Process Modeling (DFDs), Logical Modeling (decision tree, decision table, structured English).

Learning Outcomes: On completion of this course students will be able to:

1. Describe the different phases of systems development life cycle.
2. Describe the different fact-finding techniques in system analysis and design.
3. Explain different methodologies of analysis and design of information systems.
4. Describe the concepts and theories of systems approach.
5. Design appropriate information systems.
6. Manage the development of systems based on system specifications.
7. Manage implementation and maintenance of information systems.

Course Contents:

Module	Course Topics	Total Hours	Credit
I	**Overview of Systems Concepts** Introduction to System Concept: Characteristics of the system, Elements of a System, Types of Systems, Physical and Abstract System, Open and Closed System, Formal and Informal System; Types of Information System, Needs of Information Systems, Qualities of Information System; Software Development Life Cycle (SDLC); Role and Attributes of System Analyst.	8 Hours	1
II	**System Analysis** Fact Finding Technique (Information gathering tools): Review of Literature, On-Site observation, Interviews and Questionnaires; **The Tools of Structured Analysis:** Data Flow Diagram, Components of a DFD, Zero Level DFD, DFD Transformation and Decomposition, Context Diagram, Leveling a DFD; Data Dictionary, Structured English, Decision Tree, Decision Table, Feasibility Study: Economic Feasibility (Cost & Benefit Analysis), Organizational Feasibility, Technical Feasibility, Behavioral Feasibility study, Steps in Feasibility study.	8 Hours	1

III	**System Design** **Process of Design**: Logical and Physical Design, Structured Design, Functional Decomposition. Form Design, Classification of Forms, Requirement of Form Design, Input Design, Output Design.	8 Hours	1
IV	**System Testing And Quality Assurance** System Testing, Types of System Tests, Quality Assurance, Quality factors specifications, Levels of Quality Assurance. Audit Trail; Software Maintenance. Hardware and Software Selection Procedure	8 Hours	1

Suggested Readings:

1. Elias Awad, "Systems Analysis and Design", Galgotia Publications.
2. V. Rajaraman, "Analysis & Design of Information System", PHI.
3. Hussain & Hussain, "Information Systems Analysis, Design and Implementation", McGraw Hill

BCA2304: Data Communication & Computer Networks
Course Objective:

1. To introduce basic elements of communication system.
2. Techniques, channels and devices used to transmit data between distant locations.
3. To introduce the functions of different layers.
4. Understand different protocols and network components.

Learning Outcome: Upon successful completion of the course the student will be able to:

1. Describe and analyze the hardware, software, components of a network.
2. Explain networking protocols and their hierarchical relationship hardware and software. Compare protocol models and select appropriate protocols for a particular design.
3. Explain concepts and theories of networking and apply them to various situations, classifying networks, analyzing performance and implementing new technologies.
4. Identify infrastructure components and the roles they serve, and design infrastructure including devices, topologies, protocols, systems software, management and security.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Introduction to Data Communications** Basic Data Communication System: Data, Signaling and Transmission System; Synchronous and Asynchronous Transmission; Transmission modes: Serial and Parallel; Simplex, Half Duplex and Full Duplex Transmission; Transmission media: Guided and Unguided , Wired and Wireless; Transmission Impairment and issues in wired and wireless communication; Bandwidth Band and Channel Capacity: Nyquist Capacity Formula, Shannon Capacity Formula; Modulation; Multiplexing: SDM, FDM, TDM, WDM; Switching; PSTN & ISDN: Narrowband and Broadband; Frequency Spectrum and Type of Data Communication System: Satellite and Terrestrial; Infrared and Optical Communication.	8 Hours	1
II	**Introduction to Computer Network** Definition; Goals and Application of Computer Network; Types of Network: Based on Architecture (Point to point, Multipoint), Based on Topology (Bus, Star, Ring, Mesh, Tree, Hybrid), Based on Size Technology and Ownership (PAN, LAN, MAN, WAN), Based on Computing (Centralized, Distributed and Collaborative), Based on Connection Management (Connection-Oriented and Connectionless Communication); Introduction to Internet, Intranet, Extranet, VPNS. **Network Architecture** Network Architecture: Monolithic v/s Layered Approach; Design Issues of Layered approach; Services, Interfaces, Standards and Protocols; Protocol Hierarchies; ISO-OSI Reference Model and TCP/IP Model ; Concept of Subnet & Host-to-Host Communication; Intermediate Devices: Repeaters	8 Hours	1

	and Regenerators, Hub, Switch, Router, Gateway. **Subnet Communication: Physical Layer:** Design Issues, Services provided to the Upper Layer, Physical Layer Protocols: Analog (RS232) & Digital(X.21); **Data Link Layer:** Design Issues; Services Provided to Upper Layer: Framing, Error Control, Flow Control, Link Management, Acknowledgement; Logical Link Control(LLC) Sub-layer and Protocols (BISYNC , HDLC); MAC Sub-layer: Static and Dynamic Channel Allocation; MAC Protocols: Unrestricted Simplex Protocol, Stop-and-wait Protocol, Sliding Window Protocols, Pure and Slotted ALOHA, CSMA, CSMA/CD, CSMA/CA		
III	**Subnet Communication:** LAN Protocols: IEEE 802.3, 802.11, 802.15, 802.16; Frame Relay; Cell Relay and ATM **Network Layer:** Design Issues; Services provided to the Upper Layer: Routing, Congestion Control, Quality of Service, Internetworking; Routing Algorithms: Centralized and Distributed Routings; IP Addressing: IPV4 & IPV6, ICMP, IPSec, Firewalls. **Host-to-Host Communication: Transport Layer:** Design Issues , Services provided to the Upper Layer; Connection Management, Multiplexing, Segmentation and Reassembly Host-to-Host Flow Control, Acknowledge and Error Control; Transport Protocol: Connection-oriented TCP and Connection-less UDP, Secure Transport layer through SSL	8 Hours	1
IV	**Host-to-Host Communication** **(Contd. …..): Session Layer:** Design Issues, Services provided to the Upper Layer; Logical Session Management, Quality of Service, Token Management; Synchronization; Event Management; Exception Handling. **Presentation Layer:** Design Issues, Services provided to the Upper Layer; Data Presentation, Compression and Encryption; Data Compression: Text, Image, Audio and Video; Cryptography; Symmetric and Asymmetric Encryption; Private Key and Public Key Encryption; DES, AES and RSA Algorithms; Digital Signature; Message Digest; **Application Layer Protocols:** Design Issues, Services provided to the Upper Layer: HTTP, HTTPS, Internet Browser, FTP, Telnet, DNS, Email System (POP, IMAP, SMTP, MIME), SNMP	8 Hours	1

Suggested Readings:

1. W. Stallings, “Data and Computer Communication”, Pearson Education.
2. A. S. Tanenbaum, “Computer Network”, 4th, Edition, Pearson Education.
3. Forouzan, “Data Communication and Networking”, 2nd Edition, Tata McGraw Hill.
4. W. Stallings,” Computer Network with Internet Protocols”, Pearson Education.
5. Eugene Blanchard “Introduction to Networking and Data Communications”.
6. J. Martin “Computer Network and Distributed Data Processing”, PHI.

BCA3205: Computer Organization and Architecture I

Course Objective:

1. To provide a good understanding of the underlying concepts of Computer organization.
2. Explain Computer performance measurement methods.
3. Student should learn how to quantitatively evaluate different designs and organizations.
4. Student should be able to articulate design issues in the development of processor or other components that satisfy design requirements.

Learning Outcome: Upon successful completion of the course the student will:

1. Describe software and hardware interaction layers in computer architecture.
2. Describe various machine language instructions.
3. Be familiar with the terminology and basic principles of Computer organization systems.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Register Transfer and Micro-operation** Register Transfer Language: Register Transfer, Bus and Memory Transfer; Micro operations: Arithmetic, Logical, Shift Micro-operations; Arithmetic logic shift unit; Timing and control; Instruction codes; Computer instructions; Machine language instructions. **Basic Computer Organizations and Design** Instruction Cycle; Memory Reference Instructions; Register Reference Instructions; Input-Output Instructions; Design of Accumulator Logic Shift Unit; Instructions Format.	8 Hours	1
II	**Central Processing Unit** Accumulator based organization; General register organization; Stack organization; Addressing modes; RISC vs. CISC; Hard wired & micro programmed control Unit. **I/O Organizations** Introduction to system buses; Input/ output interface; Interrupt and Interrupt handling: S/W Interrupt, Daisy Chaining, Priority Interrupt; Device Polling; Serial Vs Parallel communications; Synchronous Data Transfer; Synchronous Data Transfer methods: Strobe Control, handshaking; Modes of Data Transfer: Programmed I/O, Interrupt initiated I/O; DMA: DMA Controller, DMA Transfer.	8 Hours	1
III	**Memory organization** Memory hierarchy, Main Memory: RAM Chips, ROM Chips; Concept of address space & Memory Space; Address Mapping; Auxiliary Memory; Cache memory: Mapping Techniques: Direct mapping, Associative mapping, Set associative mapping; Associative memory.	8 Hours	1

IV	**Microprocessor & Concept of Parallel Processing** Introduction to 8085 microprocessor with instruction set and programming concepts; Uniprocessor System; Multiprocessor System; Pipelining Vs Parallelism; Flynn's and Fang's Classification; Introduction to multithreading; multi-core processors and shared memory microprocessor.	8 Hours	1

Suggested Readings:

1. M. Morris Mano, "Digital Logic & Computer Design", PHI
2. R. P. Jain, "Modern Digital Electronics", TMH
3. M. Morris Mano, "Computer System Architecture", PHI
4. B. Ram, "Computer Fundamental Architecture & Organization", NewAge
5. William Stalling, "Computer Organization & Architecture", Pearson Education Asia
6. V. Carl Hamacher, "Computer Organization", TMH
7. B. Ram, "Fundamentals of Microprocessor & Microcomputers", NewAge

BCA3251: Data Structure Using 'C' I Lab

Module	Course Topics	Credits
I	1. Implementation of Arrays (Single & Double Dimension). 2. Implementation of String. 3. Implementation of Recursive Procedures. 4. Array implementation of Stack. 5. Array implementation of Queue. 6. Array implementation of Circular Queue. 7. Array implementation of Linked List. 8. Implementation of Stack using dynamic memory allocation. 9. Implementation of Queue using dynamic memory allocation. 10. Implementation of Circular Queue using dynamic memory allocation. 11. Implementation of Linked List using dynamic memory allocation.	1
II	1. Implementation of Binary tree. 2. Implementation of Linear Search. 3. Implementation of Binary Search. 4. Implementation of Bubble sort. 5. Implementation of Merge sort. 6. Implementation of Insertion sort 7. Implementation of Selection sort. 8. Implementation of Quick sort.	1

BCA3252: Computer Organization I Lab

Module	Course Topics	Credits
I	1. Study Architecture of 8085and familiarization with its Software mnemonics of Microprocessor 8085. 2. Write a program using 8085 & verify for : A. Addition of two 8-bit numbers. B. Addition of two 16-bit numbers(with carry). 3. Write a program using 8085 & verify for : A. Subtraction of two 8-bit numbers. (display of barrow) B. Subtraction of two 16-bit numbers. (display of barrow) 4. Write a program using 8085 for arranging an array of numbers in descending order & verify. 5. Write a program using 8085 for finding First and second 6. Compliment of an 8-bit number. 7. Write a program using 8085 for finding first and second Compliment of an 16-bit number. 8. Write a program using 8085 for left shift 8-bit number by 2. 9. Write a program using 8085 for left shift 16-bit number by 2.	1
II	1. Write a Program using 8085 for masking 8-bit number. 2. Write a program using 8085 for. Largest and Smallest number in an array. 3. Write a program using 8085 to find table of any number. 4. Write a program using 8085 to Sum of elements in an array. 5. Write a program using 8085 for Sorting in Ascending and Descending Order of 8-bit number.	1