

B.Sc. Computer Science (Honours)

About the Course

Technology is defined as the the application of scientific knowledge for practical purposes. The radical changes in technologies and their ever increasing adaptation to newer areas of application, demand frequent updation of the academic curriculum so that the students can rise to the expectation of the Industry.

The revised and restructured curriculum provides a strong foundation to pursue post graduation programme in computer science / applications. The knowledge acquired by the students will also equip them to meet the industrial need, and get suitable employment.

Course Objectives

The B.Sc. Computer Science (Honours) course is designed with the following objectives.

- a) To attract young minds to the potentially rich & employable field of computer Science.
- b) To be a foundation graduate programme which will act as the base for higher studies in the area of Computer Science/Applications.
- c) To develop skills in software and hardware so as to enable the graduates to take up self-employment in Indian & global market.
- d) To Train & Equip the students to meet the requirement of the Industrial standards.

Student Learning Outcomes

The Computer Science Curriculum is designed so that each student will have demonstrated the following competencies upon graduating with a Bachelor of Science in Computer Science:

- a) Ability to apply knowledge of computing appropriate to the discipline.
- b) Ability to analyze a problem and identify and define the computing requirements to solution.
- c) Ability to design, implement and evaluate a computer-based system, process, component or program to meet desired needs.
- d) Ability to function effectively on teams to accomplish a common goal.
- e) Understanding of professional, ethical, security, and social issues and responsibilities.
- f) Ability to analyze the local and global impact of computing on individuals, organizations and society.
- g) Ability to use current techniques, skills, and tools necessary for computing practice.
- h) Ability to apply design and development principles in the construction of software systems of varying complexity.

COMPUTER SCIENCE-HONOURS
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SEM	PAPER CODE	SECTION	MARK	TOPIC
1	CS31011	A	30	Computer Fundamentals
		B	30	Introduction to Programming
		C	40	Digital System Design
	CS31511	A	50	Hardware Lab - I
		B	50	Programming in 'C'
2	CS32021	A	50	Computer Organization
		B	50	Data Structures
	CS32521	A	50	Hardware Lab - II
		B	50	Data Structure Lab (using 'C')
3	CS33031	A	50	DBMS
		B	50	Operating Systems
	CS33531	A	50	Linux and shell Programming
		B	50	DBMS Lab
4	CS34041	A	40	Formal Languages & Automata Theory
		B	60	Systems Software
	CS34051	A	50	Data Communications and Comp Networks
		B	50	Object Oriented Programming Concepts using C++
	CS34061	A	50	Computational Mathematics I
		B	50	Discrete Mathematical Structures
CS34541	A	50	Advanced Computing Lab	
	B	50	OOPS Lab	
5	CS35071	A	50	Computer Graphics
		B	50	Microprocessor
	CS35081	A	50	Software Engineering
		B	50	Design and Analysis of Algorithms
	CS35551	A	50	Programming in 'Java'
		B	50	Computer Graphics Lab
CS35561	A	50	Microprocessor Lab	
	B	50	GUI Design Lab	
6	CS36091	A	50	Computer Architecture
		B	50	Computational Mathematics-II
	CS36101		50	Web Technologies and Multimedia
	CS36111	Elective	50	Elective: Either E-commerce
	CS36112	Elective	50	Data Security
	CS36571	A	50	Web Page Design Lab
		B	50	Simulation Lab
CS36581	-	100	Project	

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CS31011	Section A: Computer Fundamentals	Marks: 30
Sl. No.	Topic	No. of Periods
1.	Introduction to Computer: Different Generations, Functional Units, Basic I/O devices, Storage devices, Bus Structure	2
2.	Number Systems and Codes: Weighted and Non-Weighted Codes, Positional Number Systems like Binary, Octal, Decimal and Hexadecimal, Conversion of one number system to another, BCD, EBCDIC, Gray, Excess-3, Concept of r's and (r-1)'s Complement.	6
3.	Binary Arithmetic: Addition and Subtraction using Complement Operation. Representation of Numbers: Fixed Point and Floating Point (IEEE representation). Representation of Characters: ASCII and Unicode	6
4.	Introduction to Problem Solving: Concept of Data and Information, Basic problem solving using Flow Chart and Algorithm	5
5.	Software: Types and Brief Ideas about Each of the Types.	2
	Total:	21

Books and References:

1. Computer Fundamental- P.K Singha.
2. Digital Electronics – M.Moris Mano.
3. Introduction to Computer Science-ITL Edution solutions Limited,Pearson Edution
4. Computer Organization-William Stalling.
5. Fundamentals of Computers, V. Rajaraman, PHI
6. Introduction to Computers, Sinha & Sinha
7. Fundamentals of Computers, E Balaguruswamy, TMH

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CS31011	Section B: Introduction to Programming	Marks: 30
Sl. No.	Topic	No. of Periods
1.	Generations of Programming Languages: Machine Language, Assembly Language, Procedural Language, Object Oriented Language.	1
2.	Introduction to C Programming Language: Features and Structure of a C Program, Character Set, Identifiers and Keywords, Variables and Constants, Brief Idea about C Library.	1
3.	Data Types in C: Primitive, User-Defined, Enumerated, Type Casting, Declaration.	1
4.	Operators in C: Different Types, Precedence and Associativity, Expressions using Operators.	1
5.	Input-Output Operations: Standard Functions with Escape Sequences and Format Specifiers.	1
6.	Decision Making Statement: if-else, switch-case, Ternary Operator.	2
7.	Iterative Statements: for, while and do-while with control statements like break and continue.	2
8.	Functions: Declaration, Calling and Definition, Idea about Recursive Function.	2
9.	Scope of Variables: Local and Global.	1
10.	Storage Classes: auto, extern, register, static.	1
11.	Array: Declaration and Use-Both 1-D and 2-D, Idea about String, Passing Array to a Function.	2
12.	Pointer: A Brief Idea about Declaration and Use, Passing Pointer to a Function-Idea of Call-By-Value and Call-By-Address.	2
13.	Structure and Union: Declaration and Use.	1
14.	Macro: Different Types, Declaration and Use.	1
15.	File Handling: Basic input and output operations on a disk file, sequential and random file access.	2
	Total:	21

Books:

1. Dey and Ghosh – Programming in C, Oxford Publications
2. Gottfried – Programming with C, TMH Publications
3. Kernighan and Ritchie – The C Programming Language – PHI Publications
4. C Programming Essentials, K. N. dey and S. K. Bandopadhyay, Pearson Education
5. Programming in ANSI C, Balaguruswamy

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CS31011	Section C: Digital System Design		Marks: 40
Sl. No.	Topics		No. of Periods
1	Introduction to Computers, Binary Number System, Basic Logic Gates, Truth Tables		2
2	Design of simple logic circuits, Boolean expression, SOP, POS		2
3	Combinational circuits – Half Adder, Full Adder, Half Subtractor, Full Subtractor, Binary Adder, Laws of Boolean Algebra, Simplification		2
4	Other logic gates – NAND, NOR, XOR, XNOR, Applications, Comparator circuit		3
5	Simplification using Karnaugh Map, Applications		2
6	Other Combinational Circuits – Multiplexer, Decoder, Encoder, Demultiplexer Signed number representation, 2's complement adder subtractor		4
7	Simple Arithmetic and Logic Circuits, PLA, ROM Design		2
8	Introduction to Sequential Circuits, Flip-flops – RS, Clocked, D, JK, Master Slave, T.		2
9	Register – Shift, Parallel		2
10	Counter – Synchronous, Asynchronous		2
11	Counter – Excitation Table, ring, ripple, etc. Design of generalized Sequential Circuits		3
12	ADC, DAC, Ramp Counter, Successive Approximation		2
13	Logic Circuit design using TTL, MOS and CMOS circuits, Relative comparison. Integrated Circuits : SSI, MSI, LSI, VLSI classification.		2
	Total:		30
<p>Books & References:</p> <p>1. Digital Computer Electronics, Malvino and Brown, Tata McGraw-Hill</p> <p>2. Digital Logic and Computer Design, M Morris Mano, Pearson education India</p>			

CS31511	Section: A	Marks: 50	Hardware Lab I	LAB
Lab experiments will be related to topics covered in the theory paper CS31011, Section C.				

CS31511	Section: B	Marks: 50	Programming in 'C'	LAB
Lab experiments will be related to topics covered in the theory paper CS31011, Section B.				

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Paper Code: CS32021

CS32021	Section A: Computer Organisation	Marks: 50
Sl. No.	Topics	No. of Periods
1	Instruction: Operation Code and Operand. Zero, One, Two and Three address instruction. Instruction types, Addressing modes. Stack Organisation.	5
2	Memory: Memory Organisation - Interfacing with system bus using multiplexers/tri-state devices, Types of Memory. Memory Hierarchy, Associative Memory, Cache Memory, Virtual Memory.	9
3	von Neumann vs Harvard Architecture	2
4	Control Unit: Control Structure and Behavior, Hardwired Control and Micro programmed Control: Parallelism in Microinstruction	7
5	I/O Organisation: Polling, Interrupts, DMA, I/O Bus Interfacing and Protocols - Strobe Control, Handshaking, Bus Arbitration.	6
6	Fixed and Floating Point Arithmetic: Addition, Subtraction, Multiplication (Booth's Algorithm) & Division.	4
7	ALU - Combinational ALU Design	3
	Total:	36
Reference Books: 1. Computer System Architecture, M. Morris Mano, Pearson Education 2. Computer Architecture and Organisation, Hayes, McGraw-Hill		

COMPUTER SCIENCE-HONOURS
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CS32021	Section B: Data Structures	Marks: 50
Sl. No.	Topic	No. of Periods
1.	Introduction: Concept of different data types, ADT.	1
2.	Complexity Analysis: Basic ideas about Big-Oh, Big-Omega and Big-Theta notations.	3
3.	Recursion: Definition, Advantages and Disadvantages over Iteration, Examples.	2
4.	Array: Different Representation and Applications.	2
5.	Linked List: Representation, Types-Singly, Doubly and Circular, Different Operations on Each of Types.	4
6.	Stack: Definition, Array and Linked Representation, Applications on Infix, Prefix and Postfix.	3
7.	Queue: Definition, Array and Linked Representation, Different Types-Priority Queue and Deque.	2
8.	Tree: Definition and concepts.	1
9.	Binary Tree: Definition, Quantitative Properties, Types, Array and Linked Representation, Different Traversals, Threaded Binary Tree.	4
10.	Binary Search Tree: Property, Different Operations, AVL Tree-Properties only.	3
11.	Searching: Linear and Binary-Advantages and Disadvantages.	2
12.	Sorting: Internal and External, In-Place, Different Sorting Algorithms-Bubble, Selection, Insertion, Shell, Merge, Quick and Heap.	6
13.	Hashing: Definition, Advantages, Different Hash Functions, Collision Resolution Techniques, Applications.	3
	Total:	36

Books:

1. Horowitz and Sahni – Fundamentals of Data Structures in C – Orient Longman Pvt. Ltd.
2. Reema Thareja – Data Structures using C – Oxford Publications
3. Srivastava and Srivastava – Data Structures Through C in Depth – BPB Publications
4. Data Structure in "C", Horowitz & Sahni, Silicon Press
5. Data Structures & Program Design in "C", R. Kruse, Pearson Education
6. Data Structures using "C", A. M. Tenenbaum, Pearson Education
7. Data Structures with "C", Lipschutz, TMH

CS32521	Section: A	Marks: 50	Hardware Lab II	LAB
Lab experiments will be related to topics covered in the theory paper CS31011, Section C.				
CS32521	Section: B	Marks: 50	Data Structure Lab (using 'C')	LAB
Lab experiments will be related to topics covered in the theory paper CS32021, Section B.				

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Paper Code: CS33031

CS33031	Section A: DBMS	Marks: 50
Sl. No.	Topics	No. of Periods
6.	Fundamental concepts of DBMS; Purpose of Database Systems; Data Abstraction: Physical, Conceptual and External Levels; Data Models; Database Languages; Database Users; Database Manager; Database Administrator; DBMS Structure.	8
7.	Entity Relationship Model: Entity Sets; Relationship Sets; Mapping Constraints; Keys; E R Diagrams; Strong and Weak Entity Sets; Extended ER Features: Specialization/Generalization, Aggregation.	6
8.	Relational Model: Structure of Relational Databases; Database Schema; Query Languages: Relational Algebra: Fundamental Operations, Additional Operations; Tuple and Domain Relational Calculus; Structured Query Languages	6
9.	Integrity Constraints: Domain Constraints; Referential Integrity; Functional Dependencies: Concepts, Closure, Canonical Cover; Normalization: 1NF, 2NF, 3NF and BCNF	4
10.	File Organisation: Fixed length, Variable Length; Sequential File Organisation.	2
11.	Indexing and Hashing: Primary Index, Clustered Index, Secondary Indices; Dense and Sparse Indices; B Trees and B+ Trees; Hashing: Hash functions; Static and Dynamic Hashing.	4
12.	Distributed Databases: Introduction; Comparison with traditional databases; Reference Architecture; DDBMS Components; Access Methods; Fragmentation, Replication, Allocation.	6
	Total:	36
Books & References:		
<ol style="list-style-type: none"> 1. Database System Concepts- Abraham Silberschatz, Henry Korth, S. Sudarshan McGraw-Hill. 2. An introduction to Database Systems by, C.J.Date, Narosa Publications 3. Fundamentals of database systems by Elmasri.Navathe, Addison Wesley 4. Distributed Databases: Principles and Systems; Stefano Ceri, Giuseppe Pelagatti, Tata McGraw Hills 		

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CS33031	Section B: Operating System	Marks: 50
Sl. No.	Topic	No. of Periods
14.	Operating system and its functions, Operating System Structure-Layered, Shell Kernel Classification of Operating systems-Centralized vs Distributed, Monolithic vs. Micro Kernel	2
15.	Classification of Operating systems- Batch, Interactive, Distributive, Interrupt driven, Time sharing, Real Time System, Multiprocessor Systems, Multiprogramming Systems, Multitasking Systems, Multithreaded Systems,	3
16.	Process Concept, OS as a concurrent program, Process creation, Process States, PCB, Schedulers.	3
17.	Process Scheduling, Inter process Communication, Thread and their management	4
18.	Process Synchronization, Mutual Exclusion	2
19.	Critical Section Problem, Dekker's solution, Peterson's solution, Semaphores, Test and Set operation; Classical Problem in Concurrency.	6
20.	System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.	4
21.	Introduction to memory hierarchy, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation,	4
22.	Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference.	4
23.	I/O devices, I/O buffering, Spooling, Disk storage and disk scheduling.	2
24.	File System: File concept, File organization and access mechanism, File directories, and File sharing, File system implementation issues, File system protection and security.	2
Total:		36

Books and References:

1. Silberschatz, Galvin and Gagne, "Operating Systems Concepts", Wiley
2. Harvey M Deitel, " An Introduction to Operating System", Pearson Education
3. Modern Operating Systems; Andrew S. Tanenbaum, Prentice Hall of India
4. William Stallings, "Operating Systems: Internals and Design Principles ", 6th Edition, Pearson Education
5. Operating Systems: Principles and Design; Pabitra Pal Choudhury, PHI Learning

CS33531	Section: A	Marks: 50	Linux and shell Programming	LAB
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CS33531	Section: B	Marks: 50	DBMS Lab	LAB
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Paper Code: CS34041

CS34041	Section A: Formal Language and Automata Theory	Marks: 40
Sl. No.	Topics	No. of Periods
1	Fundamentals: Introduction to Finite State Automaton, definitions, acceptance of strings, and languages, deterministic finite automaton and non deterministic finite automaton, transition diagrams and Language recognizers.	4
2	Conversions and Equivalence: Equivalence between NFA with and without ϵ -transitions, NFA to DFA conversion, minimisation of FSM, equivalence between two FSM's.	5
3	Finite Automata with output, Moore and Mealy machines.	4
4	Regular Languages: Regular sets, regular expressions, identity rules, Constructing finite Automata for a given regular expressions, Conversion of Finite Automata to Regular expressions. Pumping lemma of regular sets, closure properties of regular sets	5
5	Grammar Formalism: Regular grammars-right linear and left linear grammars, equivalence between regular linear grammar and FA, inter conversion, Context free grammar, derivation trees, sentential forms. Right most and leftmost derivation of strings. Context Free Grammars: Ambiguity in context free grammars. Chomsky normal form, Greibach normal form.	5
6	Push Down Automata: Push down automata, definition, model, acceptance of CFL, Equivalence of CFL and PDA, interconversion.	5
7	Turing Machine: Turing Machine, definition, model, design of TM, types of Turing machines.	4
8	Computability Theory: Chomsky hierarchy of languages, linear bounded automata and context sensitive language, Universal Turing Machine.	4
Total:		36
<p>Books & References:</p> <ol style="list-style-type: none"> 1. "Introduction to Automata Theory Languages and Computation". Hopcroft H.E. and Ullman J. D.Pearson Education. 2. "Introduction to Formal languages and Automata", Peter Linz, Narosa Publishing House 3. Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley. 4. "Elements of Theory of Computation", Lewis H.P. & Papadimition C.H. Pearson /PHI. 5. Theory of Computer Science – Automata languages and computation -Mishra and Chandrashekar, 2nd edition, PHI. 		

COMPUTER SCIENCE-HONOURS
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CS34041	Section B: System Software	Marks: 60
Sl. No.	Topic	No. of Periods
1	Introduction: Concepts and Types of Translators: Assembler, Cross-Assembler, Pre-Processor, Interpreter, Simulator, Compiler, Cross-Compiler; Loader; Linker	4
2	Assembler: One pass assembler, two pass assembler, macro assembler, conditional assembly	8
3	Loader: Absolute Loader, Relocatable Loader, Translate-and-go scheme	3
4	Linker: Direct Linking scheme, Linkage editors	3
5	Compiler: Different phases of compilation	4
	Table management with reference to Symbol Table, Error Handling.	
	Lexical analyzer concepts.	2
	Parser: Top down (Recursive descent and Predictive Parsing), Bottom up (Shift Reduce and Operator Precedence)	6
	Intermediate Code Generation: Three Address Code and representation using quadruples, Triples and Indirect Triples	2
	Code Optimization: Different techniques	2
	Code generation.	2
	Total:	36
<p>Reference Books:</p> <ol style="list-style-type: none"> 1. Systems Programming and Operating System, D. M. Dhamdhare, Tata McGraw Hills 2. Systems Programming, John J Donovan, Tata McGraw Hills 3. Alfred V. Aho and Jeffrey D. Ullman, Principles of Compiler Design, Narossa Publication 4. Aho, Sethi and Ullman, Compilers – Principles, Techniques and Tools, Narossa Publication 		

COMPUTER SCIENCE-HONOURS
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Paper Code: CS34051

CS34051	Section A: Data Communications and Computer Networks	Marks: 50
Sl. No.	Topics	No. of Periods
13.	Data Communications , Analog & Digital Signals, Periodic and Non Periodic Signals, Time and frequency Domain Analysis. Transmission Impairments: Nyquist and Shanon's Theorem.	6
14.	Network Architecture: Layered architecture and protocol hierarchy. OSI and TCP/IP Reference Model. Services and important functions of each layer.	6
15.	Physical Layer: Transmission Media. Multiplexing: FDM, TDM and Applications. Switching Techniques: Circuit, Message and Packet Switching. Encoding Techniques.	8
16.	Data Link Layer: Flow Control: Stop-and-wait, Go Back N and Selective Repeat ARQ. Errors: different types of Errors and their detection and correction.	6
17.	Local Area Networks: IEEE 802.X – Introduction, architecture, protocol and management of Ethernet and token ring LANs.	6
18.	IP addressing: Concepts, classification, subnetting in IPv4; Introduction to IPv6	4
	Total:	36
<p>Books and References:</p> <ol style="list-style-type: none"> 1. B.Forouzan – Data Communication and Networking.TMH 2. A Tanenbaum – Computer Networks, PHI 3. Data and Computer Communications; William Stallings, PHI 		

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CS34051	Section B: Object Oriented Programming Concepts using C++	Marks: 50
Sl. No.	Topic	No. of Periods
1	Concepts and Characteristics of OOPS, Differences with Procedural Programming	3
2	Encapsulation, Abstraction, Polymorphism, Classes, Messages Association, Interfaces. Implementation of class in C++	4
3	Constructor, Destructor, Copy constructor, Structures and classes. Classes objects and memory static class data.	4
4	Friend function, friend class, this pointer.	3
5	Function overloading, constructor overloading,	4
6	Overloading unary operators, Overloading binary operators, data conversion.	4
7	Concept of inheritance. Derived class and based class, Types of Inheritance, Derived class constructors, public and private inheritance, aggregation : Classes within classes, inheritance and program development.	6
8	Virtual Function	2
9	Function templates, Class templates, Exception Handling (Try, Throw and Catch), Discussion on Standard Template Library	6
	Total:	36

Books and References:

1. Object Oriented Programming in C++ by Robert Lafore Techmedia Publication.
2. The complete reference C – by Herbert shieldt Tata McGraw Hill Publication.
3. Object Oriented Programming in C++ Saurav Sahay Oxford University Press.
4. Object Oriented Programming in C++ R Rajaram New Age International Publishers 2nd.
5. Object Oriented Programming in C++ Balaguruswamy, TMH

COMPUTER SCIENCE-HONOURS
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Paper Code: CS34061

CS34061	Section A: Computational Mathematics I	Marks: 50
Sl. No.	Topics	No. of Periods
1.	Solutions of Linear Simultaneous Equations:: Gaussian Elimination method, Matrix Factorization method, Gauss-Jordan Matrix Inversion method, Gauss_Seidal Iterative method.	6
2.	Solutions of Nonlinear Equation: Bisection method, Newton-Raphson method.	3
3.	Numerical Integration Method: Trapezoidal Rule, Simpson's 1/3 rd Rule, Simpson's 3/8-th Rule, Romberg Integration method.	4
4.	Interpolation Method: Newton forward and backward interpolation method, Lagrange Interpolation method.	3
5.	Curve Fitting method: Least square Fit Method	2
6.	Solution of Differential Ordinary Differential Equations:: Euler and Modified Euler method, Taylor series expansion method, Picard method, Runge Kutta 2 nd order and Runge Kutta 4-th order method	6
7.	Linear Programming Problem(LPP): Basics of linear programming, Simplex method, artificial variable, objective function, Maximization and minimization problem Transportation problem: North West Corner Method, Matrix Minima method, Vogel Approximation method, Optimization methods : MODI method, Stepping stone method	6 6
Total:		36
Books & References:		
<ol style="list-style-type: none"> 1. Introductory methods of Numerical analysis : S.S.Sastry : Publ: PHI 2. Numerical Methods for Science and Engineering: Sen and Krishnamurthy 3. Numerical Algorithms : Dr. S.Mollah 4. Numerical Methods : Dorn and McCracken 5. Linear Programming Problem : Ghosh and Chakraborty 6. Operations Research : V.K.Kapoor : Publ: Sultan Chand & Sons 7. Operations Research : Harvey M. Wagner : Publ: PHI 8. Operations Research : Kanti Swarup,P.K.Gupta, Man Mohan : Publ: Sultan Chand & Sons 		

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CS34061	Section B: Discrete Mathematical Structures	Marks: 50
Sl. No.	Topic	No. of Periods
1.	Logic and Proof, Sets and Functions: Propositional Equivalences, Predicates and Quantifiers, Methods of Proof, Sets,	2
2.	Counting Theory: Basics of Counting, Permutations and Combinations, Pigeon Hole Principle, Recurrence Relation, Generating Function, Inclusion and Exclusion Principle. Principle of mathematical induction.	5
3.	Set Operations : Superset, subsets, union, Intersection, difference, symmetric difference, Venn diagrams, Cartesian product. Relations as a subset of a product. Binary relations. Functions , growth of functions	5
4.	Relations on a set. Reflexive, symmetric and transitive properties of a relation on a set. Closure relations, Equivalence relations, partial orderings. Examples.	4
5.	Introduction to Probability Theory: Introduction to discrete probability, sample space, Finite probability space, Conditional probability, Independence, Independent repeated trials, Bernoulli Trials and Binomial distribution, probability distribution of Random variable, Expectation of random variable, Variance	6
6.	Graph Theory: Definition of Graph, Graph Terminology, Finite and Infinite graphs. Directed and undirected graphs, Degree, Isolated vertex, Pendant vertex. Null graphs. Walks: Paths and circuits. Connected and disconnected graphs, Euler's graphs, Hamiltonian paths and circuits. Planer Graph, Isomorphic graph, coloring graphs	4
7.	Graph algorithms : Adjacency Matrix, Warshall algorithm, Floyd's shortest Path algorithm, Trees, Shortest spanning tree using Kruskal Algorithm and Prim's Algorithm, Dijkstra's Algorithm to find shortest path from a given vertex.	8
8.	Graph Search: Breadth First Search Algorithm(BFS), Depth First Search Algorithm Problems(DFS).	2
Total:		36
Books and References:		
<ol style="list-style-type: none"> 1. Discrete Mathematics and its Applications : Kenneth H.Rosen : Publ: Tata McGraw-Hill Publishing Company Limited. 2. Elements of Discrete Mathematics : C.L.Liu: Publ: Tata McGraw-Hill Publishing Company Limited. 3. Discrete Mathematical Structures : Kolman, Busby, Ross : Publ: Pearson Education. 4. Engineering Mathematics : B.K.pal, K.Das : U.N.Dhar & Sons Pvt. Ltd, Kolkata. 5. Graph Theory : Narshing Deo . 6. Introduction to Graph Theory : Douglas B.West : Publ: PHI 		

CS34541	Section: A	Marks: 50	Advanced Computing Lab based on CS34061 Section A	LAB
CS34541	Section: B	Marks: 50	OOPS using C++ Lab	LAB

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SEM	PAPER CODE	SECTION	MARKS	TOPIC
5	CS35071	A	50	Computer Graphics
		B	50	Microprocessor
	CS35081	A	50	Software Engineering
		B	50	Design and Analysis of Algorithms
	CS35551	A	50	Programming with 'Java' Lab
		B	50	Computer Graphics Lab
	CS35561	A	50	Microprocessor Lab
		B	50	GUI Design Lab
6	CS36091	A	50	Computer Architecture
		B	50	Computational Mathematics-II
	CS36101		50	Web Technologies and Multimedia
	CS36111	Elective	50	Elective: Either E-commerce
	CS36112	Elective	50	Data Security
	CS36571	A	50	Web Page Design Lab
		B	50	Simulation Lab
	CS36581	-	100	Project

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CS35071	Section A: Computer Graphics	Marks: 50
Sl. No.	Topics	No. of Periods
8.	Introduction to Computer Graphics: Application of Computer Graphics, Devices for Graphics output, Graphics input devices	2
9.	Two Dimensional Transformations: Homogeneous coordinate system, Translation, Rotation, reflection along x-axis, reflection along y-axis, reflection along y=x axis, reflection along y=-x, scaling along x-axis, scaling along y-axis, composite transformations, reflection along a general axis.	5
10.	Two Dimensional Clipping Algorithms: Point Clipping, Two dimensional clipping, Sutherland-Cohen Algorithm, Midpoint Subdivision Line Clipping Algorithm, Midpoint Subdivision Algorithm.	4
11.	Three Dimensional Transformations: Translation along x, y, z axes, Rotation along x-axis,y-axis and z-axis , reflection along xy-plane, reflection along yz-plane, reflection along zx-plane, scaling along x-axis, scaling along y-axis, scaling along z-axis , composite transformations, rotation along a general line.	5
12.	Three Dimensional Perspective Geometry: Geometric Projection, Oblique Projections, Perspective Transformations, Single-Point Perspective Transformation, Two-Point Perspective Transformation, Three-Point Perspective Transformation.	6
13.	Line-Drawing and Circle Drawing Algorithms: Digital Differential Algorithm(DDA), Bresenham's Line Draw Algorithm, Integer Bresenham's Line Draw Algorithm, Generalized Bresenham's Line Draw Algorithm, Midpoint Circle Algorithm, properties of Circle.	5
14.	Curves and Surfaces: Parametric Functions, Bezier methods, Bezier curves, Bezier surfaces.	3
15.	Edge Fill Algorithm: Edge Fill Algorithm, Seed Fill Algorithm	4
16.	Application of Computer Graphics: Animation, Morphing, Tweening	2
Total:		36

Books & References:

1. Computer Graphics, Donald Hearn and M.Pauline Baker, Pearson Education
2. Fundamentals of Interactive Computer Graphics, J.D.Foley and A. Van Dam, Addison Wesley.
3. Introduction to Computer Graphics and Multimedia, Anirban Mukhopadhyay, Arup Chattopadhyay, Vikas Publishing House Pvt Ltd.
4. Schaum's Outline of Computer Graphics 2/E, Zhigang Xiang, Roy A. Plastock

COMPUTER SCIENCE-HONOURS
Session - 2013-14 onwards.....

CS35071	Section B: Microprocessor	Marks: 50
Sl. No.	Topics	No. of Periods
1.	Introduction of Microprocessor: Evolution of microprocessor and its type, Microprocessor Bus organization- Data Bus, Address Bus and Control Bus. Microprocessor architecture.	4
2.	Pin diagram and block diagram of 8085, Internal register organization of 8085, Limitations of 8085.	4
3.	Instruction Cycle and Timing Diagram: 8085 machine cycles and bus timings to fetch decode and execute instruction from memory, Memory read and write cycle, Input/Output read and write cycle with timing diagram.	6
4.	Operations of microprocessor: internal data manipulation, microprocessor initiated and peripheral or external initiated, Addressing modes, 8085 Instruction set.	7
5.	Developing simple programs with 8085 instruction: using control structures- Looping, Counting and indexing, Counter and Timing delays. Implementing subroutines, procedures, Stack and subroutine basic concepts, Procedure and macro.	7
6.	8085 Interrupts: Interrupts and its need, classification of interrupts, 8085 interrupts: software, hard ware, and priorities of interrupts, 8085 vectored interrupts: TRAP, INTR, RST 7.5, RST 6.5, RST 5.5.	4
7.	Introduction to Advanced microprocessor architecture: 80x86, i-core architecture	4
Total:		36

Books & References:

1. Introduction to Microprocessor by Gaonkar – PHI
2. The Intel Microprocessors by Barry B. Brey – PHI
3. Microprocessors and digital systems, Douglas V. Hall, McGraw Hill

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CS CS35081	Section A: Software Engineering	Marks: 50
Sl. No.	Topics	No. of Periods
1.	Introduction to Software: Software as product and service, Software Crisis, Important qualities of software product.	3
2.	Introduction to Software Engineering: Software Engineering concept, Software Development Life Cycle (SDLC), Software Development process models - Waterfall, Prototype, RAID and Spiral models	4
3.	Software Project Management: Phases in Software Project Management; Function Point Method; Cost Estimation – COCOMO, Introduction to Risk Management.	4
4.	Software Requirements and Specifications: SRS concept, Need for SRS, SRS Problems, Characteristics of SRS, Components of SRS, SRS Validation	4
5.	Software Design: Design principles, Top-down and Bottom-up Strategies, Module level concepts, Coupling, Cohesion, Structured design methodology, Structure charts, Design verification and reviews	6
6.	Software Testing : Software Testing Fundamentals, Test Cases; Types of testing: Unit Testing, Integration Testing, System Testing; Levels of Testing	6
7.	Software Maintenance and Software Quality assurance	2
8.	Software Metrics: Role of software metrics, Size-oriented metrics, Function-oriented metrics, Metrics for software quality	3
9.	Case Tools and Introduction to UML	4
	Total:	36

Reference Books:

1. Software Engineering: A Practitioner's Approach Paperback – 1 Apr 2009, by Roger S Pressman, McGraw Hills
2. Software Engineering, Ian Sommerville - Pearson Education
3. An Integrated Approach to Software Engineering, Pankaj Jalote – NAROSA
4. Object-Oriented Analysis and Design with Applications, Grady Booch, Robert A. Maksimchuk, Addison Wesley
5. Fundamentals of Software Engineering, Rajib Mall, PHI

COMPUTER SCIENCE-HONOURS
Session - 2013-14 onwards.....

CS35081	Section B: Design and Analysis of Algorithms	Marks: 50
Sl. No.	Topics	No. of Periods
1.	Mathematical Foundations: Introduction, Growth of functions, Summations, Induction, Recurrences.	4
2.	Sorting and order statistics: Heap sort, Merge Sort, Quick sort, sorting in linear time, Median and order statistics.	7
3.	Design and analysis Techniques: Divide and conquer - Strassen's Method; Dynamic programming – Bellman-Ford algorithm; Greedy concepts; Back tracking – 8 Queens problem.	7
4.	Generalised Tree Algorithms: Threaded Binary Tree, Binary Search Tree, AVL Tree and B Tree.	6
5.	Graph Algorithms: Graph Representation, Breadth First Search, Depth First Search, Connected Components, Minimal spanning Tree using Prim's and Kruskal's algorithms, Dijkstra's Shortest path algorithm.	7
6.	Computational Geometry Algorithms: Convex Hulls, Closest pair of points	3
7.	Notion of NP-completeness P class, NP-hard class, NP-complete class, Circuit Satisfiability problem.	2
	Total:	36
<p>Books & References:</p> <ol style="list-style-type: none"> 1. Fundamentals of Computer Algorithms, Horowitz Ellis, Sahani Sartaz, R Sanguthevar 2. Introduction to Algorithms, Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, PHI 3. Fundamentals of Algorithmics Paperback – August 20, 1995, Gilles Brassard and Paul Bratley, PHI 4. Data Structures and Algorithms Paperback – January 11, 1983, by Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft, Addison-Wesley 		

COMPUTER SCIENCE-HONOURS
Session - 2013-14 onwards.....

CS35551	Section A: Programming with Java Lab	Marks: 50	Lab
Object-Oriented Program implementation using Java.			

CS35551	Section B: Computer Graphics Lab	Marks: 50	Lab
Lab experiments will be related to topics covered in the theory paper CS365071, Section A.			

CS35561	Section A: Microprocessor Lab	Marks: 50	Lab
Lab experiments will be related to topics covered in the theory paper CS365071, Section B.			

CS35561	Section B: GUI Design Lab	Marks: 50	Lab
GUI design and implementation.			

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CS36091	Section A: Computer Architecture	Marks: 50
Sl. No.	Topics	No. of Periods
1.	Introduction to Computer Architecture, Parallel Processing: Parallel Computer Structures, Architectural Classification schemes, Parallel Processing Applications	4
2.	Principles of Pipelining: Classification of Pipeline processors, Instruction and Arithmetic Pipelines, Principles of designing pipelined processors	8
3.	SIMD Computers: SIMD Array Processors, SIMD Interconnection Networks (Static vs. Dynamic Networks), Different structures - mesh, cube, barrel shifter, shuffle exchange, Parallel Algorithm – Matrix Multiplication using SIMD computer	8
4.	Multiprocessor Architecture: Functional Structure - Loosely Coupled and Tightly Coupled, Interconnection Networks (Time shared/ common buses, crossbar switch and multiport memories, multistage networks), Message passing and Routing, Parallel memory organization and protocols	8
5.	Memory and I/O sub systems: Hierarchical Memory structure, virtual memory system, cache memory and management, I/O sub-systems	8
Total:		36
<p>5.</p> <p>6. Books & References:</p> <p>7.</p> <p>8. Computer Architecture and Parallel Processing: Kai Hwang, Faye A. Briggs; Tata McGraw Hills</p> <p>9. Advanced Computer Architecture: Kai Hwang; Tata McGraw Hills</p> <p>10. Computer Architecture, A quantitative Approach: Hennessy Patterson; Elsevier.</p> <p>11. Source Book of parallel Computing: Dongarra, Foster, Fox & others; Elsevier.</p> <p>12. Designing Efficient Algorithms for Parallel Computers: M.J Quinn; Mc Graw Hill</p> <p>13. Digital Design and Computer Architecture Paperback – Import, 24 Aug 2012, David Harris, Sarah Harris, Morgan Kaufmann; 2 edition</p> <p>14. Parallel Computation: Models and Methods Textbook Binding – November 6, 1996, Selim G. Akl, Prentice Hall</p>		

COMPUTER SCIENCE-HONOURS
Session - 2013-14 onwards.....

CS36091	Section B: Computational Mathematics – II	Marks: 50
Sl. No.	Topics	No. of Periods
1.	Introduction to Dynamic Programming: Decision Tree and Bell Man's Principle of Optimality, Characteristics of Dynamic programming problem, Solution of Linear programming Problem by Dynamic Programming.	6
2.	Network Scheduling by PERT/CPM : Rules for Network Construction, Construction of Network, Time analysis, Forward Pass Computations, Backward pass Computations, calculation of Floats and Slack Times, Critical Path Method(CPM), Programme Evaluation and Review Technique(PERT), PERT Procedure, Cost Consideration in PERT/CPM, Project Cost, Cost Slope, Time-Cost Optimization Algorithm.	8
3.	Queueing Theory: The Input(Arrival Pattern), The Service Mechanism, The Queue Discipline, Customer's Behaviour, Kendall's Notation for Representing Queueing Models, M/M/I(∞ /FCFS), M/M/I(N/FCFS), M/M/S(∞ /FCFS).	6
4.	Game Theory: Definition, Payoff, Types of Games, The Maxmin-Minimax principle, Games without Saddle Point(mixed Strategies), 2x2 Games without saddle point, Graphical method for 2xn or mx2 Games, Introduction to Discrete Dynamical System	6
5.	Eigen values and Eigen vectors of a Matrix: Eigen values and Eigen vectors: Definitions, Jacobi method, Householder method.	6
6.	Fourier Transform: Introduction of Fourier series, Fourier series for Discontinuous functions, Fourier series for even and odd function, Half range series, Properties of Fourier transform	4
Total:		36

Books & References:

1. Operations Research : Harvey M. Warner, PHI.
2. Operations Research : Kanti Swarup, P.K.Gupta, Man Mohan, Sultan Chand and Sons
3. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley India
4. Higher Engineering Mathematics by BS Grewal, Khanna Publication
5. Operations Research: An Introduction (9th Edition) Hardcover– September 8, 2010, Hamdy A. Taha, Prentice Hall

COMPUTER SCIENCE-HONOURS
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CS36101	Section A: Web Technologies and Multimedia	Marks: 50
Sl. No.	Topics	No. of Periods
1	History and evolution of web - Web 1.0 to Web 4.0	2
2	OSI Reference Model, TCP/IP Model	2
3	Concept of Client Server Architecture, 3-tier Web Architecture, Hyper Text Transfer Protocol (HTTP), File Transfer Protocol (FTP)	4
4	Web Pages, Domain Names, URL, Internet Protocol Address, Website, Web browser, Web Servers, Web Hosting, Cookies.	2
5	Exploring Web Technologies: HTML, XHTML, DHTML, DOM, XML	6
6	Client Side Scripting: JavaScript, VBScript	4
7	Server Side Programming: CGI, ASP, JSP, PHP, AJAX	4
8	Concept of Multimedia: Picture/Graphics, Audio, Video	2
9	Basic concepts of Images: Digital Images and Representation, Image Formats: TIFF, BMP, JPG/JPEG, GIF, PIC, PDF, PSD; Colour Formats: RGB, CMYK	4
10	Animations – Tweening, Morphing, Virtual Reality	2
11	Sound: recording, editing, noise correction, effect enhancement; Voice Recognition; Sound File Format: AIFF, MIDI, WAV, MP3, ASF	4
Total:		36
<ol style="list-style-type: none"> 1. Books & References: 2. Web Technologies Black Book, Kogent Learning Solutions Inc, Dreamtech Press 3. Web Design in a Nutshell- J. Niederst, SPD 4. Multimedia making it wok, Tay Vaughan, TMI 5. Multimedia systems design, K. Andleigh and K. Thakkarar, PHI 6. Internet and World Wide Web How To Program (5th Edition)Paperback – November 19, 2011, by Harvey & Paul Deitel & Associates, Harvey Deitel, Abbey Deitel, Prentice Hall 		

COMPUTER SCIENCE-HONOURS
Session - 2013-14 onwards.....

CS36101	Section B (Elective): E – Commerce	Marks: 50
Sl. No.	Topics	No. of Periods
1	An overview of E- Commerce :Traditional Commerce & E-commerce, Types of E Commerce Solutions- Direct Marketing and Selling, Supply Chain Integration, EDI, Bricks & Mortar vs Clicks & Mortar	2
2	Business Models for E-Commerce- Brokerage Model, Aggregator Model, Info-mediary model, Community Model, Value chain model, Manufacturer model, Advertising Model, Subscription model. E-Commerce Applications: Business-to-Consumer (B2C), Consumer-to-Consumer (C2C), Business-to-Business (B2B), B2G.	4
3	Applications of Electronic Commerce: Application of E Commerce in Direct Marketing and Selling, Value Chain Integration, Supply Chain Management, Corporate Purchasing, Financial and Information Services, Obstacles in adopting E-Commerce Applications, Future of E Commerce.	4
4	E-Strategy: Information and Strategy, The virtual value chain, seven dimensions of ecommerce strategy, E- commerce strategy and knowledge management, E-Business Strategy and Data Warehousing and Data Mining.	2
5	Customer effective Web design: Requirements of Intelligent Websites, Website Goals and Objectives, planning the budget, analyzing website structure, fixed versus flexible webpage design, outsourcing web design, testing and maintaining websites.	2
6	E-Commerce Marketing Concepts: Basic marketing concepts for internet marketing, Ecommerce marketing and branding strategies, Strengthening the customer relationship. Customer Service and quality Evolution (SERVQUAL).	2
7	Electronic Data Interchange: Evolution, uses, Benefits, Working of EDI,EDI Standards, Cost Benefit Analysis of EDI, Electronic Trading Networks, EDI Components, File Types, EDI Services,EDI Software,	4
8	Security Issues in E-Commerce: Introduction to Security, Passwords, Viruses, Firewalls, Encryption (PGP, SHTTP, SSL),Public Key and Private Key, Digital Certificate and Digital Signature. Protocols for Transactions: SSL Secure Socket Layer, SET-Secure Electronic Transaction.	6

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9	Electronic Payment Systems -Overview of Electronic Payment Systems, Cyber cash, Smart Card, Digi cash, Digital Wallet, Electronic Banking, Electronic Fund Transfers and VeriSign.	4
10	Growth of E-commerce: Concerns for E-commerce Growth, Internet bandwidth, Technical issues, India and E-commerce Readiness, Legal, Ethical and Social Issues in E-Commerce, Shopping Carts.	2
11	Enterprise Resource Planning: Evolution of ERP, Characteristics, Features, Components, Need, ERP Vendors, Business Process Reengineering, Advantages of ERP Packages, Implementation of ERP Packages, Future of ERP Systems.	4
	Total:	36
Books & References:		
<ol style="list-style-type: none"> 1. E-Commerce An Indian Perspective, P.T.Joseph, S.J., PHI. 2. Doing Business on the Internet E-COMMERCE (Electronic Commerce for Business): S. Jaiswal, Galgotia Publications. 3. E-Commerce Business.Technology. Society, Kenneth C. Laudon, Carol Guerico Traver,Pearson Education. 4. E-Commerce: Schneider, Thomson Publication 5. Electronic Commerce: Greenstein, Merylin, Tata Mc.Graw Hill 		

COMPUTER SCIENCE-HONOURS
Session - 2013-14 onwards.....

CS36101	Section B (Elective): Data Security	Marks: 50
Sl. No.	Topics	No. of Periods
1	Basic Concepts: Threats, Vulnerabilities, Confidentiality, Integrity, Availability, Security Policies and Mechanisms	3
2	Malicious Codes: Virus, Worms and Trojan Horse	2
3	Basic Concepts on Cryptography: Objectives, Block Ciphers and Stream Ciphers, Private Key and Public Key Cryptography: Diffie-Hellman, RSA Algorithms, Cryptanalysis	8
4	Cryptographic Hash Functions	3
5	Digital Signatures: NIST's Algorithm, Message Digest Scheme: MD5	6
6	Introduction to Digital Watermarking and Steganography	4
7	Entity Authentication: Introduction, Password Technique, Challenge Response Technique and Biometric Authentication Process, Digital Certificate	7
8	Introduction to Network Security: SSL and SSH	3
	Total:	36

Reference Books:

16. Cryptography and Network Security by B.A.Forouzan, McGraw-Hill Publication
17. Cryptography and Network Security – Principals and Practice by William Stallings, PHI Publication
18. Computer Security and Cryptography by Alan G. Konheim, John Wiley and Sons Publications
19. Cryptography and Network Security by Atul Kahate, McGraw-Hill Publication
20. Cryptography: Theory and Practice, Third Edition (Discrete Mathematics and Its Applications) Hardcover – Import, 1 Nov 2005, Douglas R. Stinson, Chapman and Hall/CRC

CS36571	Section A: Web Page Design Lab	Marks: 50	Lab
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Lab experiments will be related to topics covered in the theory paper CS36101, Section A.

CS36571	Section B: Simulation Lab	Marks: 50	Lab
Simulation using MATLAB.			

CS36581	Section B: Project	Marks: 100	Lab
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