Indian Institute of Information Technology Bhagalpur

Computer Science and Engineering (CSE)

B.Tech. Course Curricula and Syllabus

Semester-III

Curricula:

Course Code	Course name	L	T	P	C
MA201	**Engineering Mathematics III**	**3**	**1**	**0**	**4**
CS203	**Object Oriented Programming**	**3**	**0**	**0**	**3**
CS202	Discrete Mathematics	3	1	0	4
CS201	Design and Analysis of Algorithms	3	1	0	4
CS207	Computer Organization and Architecture	3	1	0	4
HS201	**Management Concepts and Technology**	**2**	**0**	**0**	**2**
CS211	Object Oriented Programming LAB	0	0	3	2
SAI	**Society Internship Program**	**0**	**0**	**0**	**1**

Syllabus:

Course Code	**Course name**	**L**	**T**	**P**	**C**	**Year**	**Semester**
MA201	Engineering Mathematics III	3	1	0	4	2nd	3rd
Topic	**Contents**						**No. of Lectures**
Module-I	Complex numbers and elementary properties. Complex functions - limits, continuity and differentiation. Cauchy-Riemann equations. Analytic and harmonic functions.						**08**
Module-II	Elementary functions. Anti-derivatives and path (contour) integrals. Cauchy-Goursat Theorem. Cauchy's integral formula, Morera's Theorem. Liouville's Theorem, Fundamental Theorem of Algebra and Maximum Modulus Principle. Taylor series. Power series. Singularities and Laurent series.						**09**
Module-III	Cauchy's Residue Theorem and applications. Mobius transformations; Partial Differential Equations: First order PDEs; solutions of linear and nonlinear first order PDEs; classification of second-order PDEs.						**08**
Module-IV	Method of characteristics Iin PDE; boundary and initial value problems (Dirichlet and Neumann type) involving wave equation, heat conduction equation, Laplace's equations and solutions by method of separation of variables; initial boundary value problems.						**08**

Module-V	Solution of PDE by Laplace transform; Fourier series, Fourier integrals; Fourier transforms, sine and cosine transforms; solution of PDE by Fourier transform.	**10**
	Total	**43**
Text	1. B S Grewal, J S Grewal, J K Dhanoa, *Higher Engineering Mathematics*, Khanna Publishers, 44th edition, 2017. 2. E. Kreyszig, H. Kreyszig, E. J. Norminton*, Advanced Engineering Mathematics,* 10th*,* Wiley India Pvt. Ltd., 2017	
Reference	1. Ian N Sneddon, *Elements of Partial Differential Equations*, Dover Publications; 2006. 2. John H Mathews, Russell W Howell, *Complex Ananlysis for Mathematics and Engineering*, Jones and Bartlett India Pvt.Ltd, 6th edition, 2011. 3. James Ward Brown, Ruel V Churchill, *Complex Variables and Applications,* Tata McGraw Hill Education*, 8th edition, 2016.*	

Course Code	**Course Name**	**L**	**T**	**P**	**C**	**Year**	**Semester**
CS203	Object oriented Programming	3	0	0	3	2nd	3rd

Course Objective: The course is designed to provide students with complete knowledge of Object Oriented. Programming through C++ and to enhance the programming skills of the students by giving practical assignments to be done in labs. The course also aims to provide students with requisite knowledge about Object Oriented Programming through C++ so that they make their own Applications/Projects using C++.

Topic		Hour
Module I	Principles of OOPs, Basics of C++, Functions in c++ : Basic Concepts of OOP, Benefits of OOP, OOP Languages, Applications of OOP. C++ program basics, data types, operators in c++, scope resolution, type cast operators, operator overloading, operator precedence. Main function, function prototyping, call by reference, inline functions, default arguments, constant arguments, function overloading, friend and virtual functions, maths library functions.	6
Module II	Classes, objects, constructors and destructors – C structures revisited, specifying a class, defining a member function, private member functions, memory allocation for objects, static data members and member functions, array of objects, objects as function arguments, friendly functions, returning objects, pointers to members, constructors, Parametrized constructors, Multiple constructors, Copy constructor, Destructors.	6
Module III	Operator overloading, inheritance, virtual functions and polymorphism – Overloading unary operators, overloading binary operators, rules for overloading operators, type conversions. Derived classes, single inheritance, multilevel inheritance, multiple inheritance, hierarchical inheritance, hybrid inheritance, virtual base classes, abstract classes, nesting of classes. Pointers, pointer to objects, this pointer, pointer to derived classes, virtual functions, pure virtual functions.	8
Module IV	Console I/O operations, working with files and templates – C++ streams and stream classes, unformatted I/O operations, formatted console I/O operations, managing output with manipulators. Classes for file stream	8

	operations, opening/closing of file, file pointers and their manipulation, error handling during file operation, command line arguments. Class templates, class template with multiple parameters, function templates, overloading template functions, member function templates, non-type template arguments.	
Module V	Exception handling and Standard template library – Basics of exception handling, exception handling mechanism, throwing mechanism, catching mechanism, rethrowing exception, specifying exception. Components of STL, Containers, Algorithms, Iterators, Application of Container classes, Functions objects.	6
	Total	34
Text	1. Object Oriented Programming with C; E Balagurusamy, ; 7th, McGraw Hill Education (India) Pvt. Limited; 2018. 2. The Complete Reference C++ (Indian Edition); Herbert Schildt, ; 4th, McGraw Hill Education (India) Pvt. Limited; 2017.	
Reference	1. The C++ Programming Language; Bjarne Stroustrup, ; 3rd, Pearson India Education Services Pvt.Ltd; 2017.	

Course Code	**Course Name**	**L**	**T**	**P**	**C**	**Year**	**Semester**
CS202	Discrete Mathematics	3	1	0	4	2nd	3rd

Course Objective: A course designed to prepare computer science and engineering students for a background in abstraction, notation and critical thinking for the mathematics most directly related to computer science. Topics include: logic, relations, functions, basic set theory, countability and counting arguments, proof techniques, mathematical induction, graph theory, combinatorics, recursion, recurrence relations, elementary number theory and graph theory.

Topic		Hour
Module I	Set Notations, Basic Operations on a Set, Subset, Power Set, Product of Sets, Partition on a set. Relation: equivalence relation, Closures. Functions: composition, injective-bijective functions. Poset, Lattice, Boolean Algebra, and Groups as Algebraic Structures.	9
Module II	Propositions and Logical Operators, Tautologies, logical equivalence of Statements. Normal Forms CNF & DNF. Predicate Logic, Quantifiers and Nested Quantifiers. Proofs and Logical Inference, Prenex Normal Form (PNF). Induction Based Proofs.	8
Module III	Counting: Inclusion and Exclusion Principles, Product and Sum Rules, Permutation and combination, BInomial and Multinominal Coefficient. Derrangements. Stirling numbers of the 1st and 2nd kind. Bell's Number, Catalan Number. Recursion: Solving First and Second order Non Homogeneous Linear Recurrence Relations.	9

	Generating Functions and its application in solving Recurrence Relations.	
Module IV	Number Theory: Division Algorithm, Euclid's Algorithm. Fundamental Theorem of Algebra. Congruence. Solving Linear Diophantine Equations. Chinese Remainder Theorem. Graphs, Subgraphs, Graph Representation. Isomorphism of graphs. Walks, apths, circuits. Eulerian and hamoltonian Paths. Connectedness and Components, Cut Set. Trees, Spanning tree in a graph. Shortest Path.	9
Module V	Planar Graph: Matching and Bipartite Graph Coloring of a graph	9
	Total	44
Text	1. Discrete Mathematics and its Applications; Kenneth H Rosen, Kamala Krithivasan; 7th, McGraw Hill Education; 2011.	
Reference	1. Discrete Mathematics for Computer Scientists and Mathematicians; Joe L Mott, Abraham Kandel, Theodore P Baker; 2nd, Pearson India Education Services Pvt.Ltd; 2018. 2. Discrete Mathematical Structures with Applications to Computer Science; J P Tremblay, R Manohar; McGraw Hill Education; 2016.	

Course Code	**Course Name**	**L**	**T**	**P**	**C**	**Year**	**Semester**
CS201	Design and Analysis of Algorithms	3	1	0	4	2nd	3rd

Course Objective: The objective of this course is to teach different algorithm techniques for effective problem solving. The use of different paradigms of problem solving will be used to illustrate clever and efficient ways to solve a given problem. In each case emphasis will be placed on rigorously proving correctness of the algorithm. In addition, the analysis of the algorithm will be used to show the efficiency of the algorithm over the naive techniques.

Topic		Hour
Module I	Introduction and Recursion: Algorithm Phases, Asymptotic Notations and Analysis- space and time complexity measures, lower and upper bounds; Various Algorithm Design Techniques, Pseudo code, Models of Computation- Turing Machine Model and Random Access Machine Model. Classification of Recursion, Application of Recursion, Various Solution Methodology for recurrence relations.	7
Module II	Divide-and-conquer and Dynamic Programming: Binary Searching, Quick Sort, Merge Sort, Matrix Chain Multiplication Problem, Travelling Salesman Problem, Shortest Path Problems.	10
Module III	Greedy Method: 0/1 knapsack Problem, Job Sequencing with Deadlines, Minimum Spanning Trees, Optimal Sub-Structure.	8
Module IV	Backtracking, Branch and Bound and Lower Bound Theory: N–Queens Problem, Hamiltonian Cycle Problem, and Graph Coloring Problem. Backtracking vs Branch and Bound, 15-Puzzle Problem. Computational Model - Comparison Tree, Oracles and Adversary Arguments. Lower Bound for Sorting; Selection algorithms.	8

Module V	Graph Algorithms and NP completeness: Connectivity, Topological Sort, Shortest Paths Network Flow; Disjoint Set Union Problem; String Matching, Disjoint Set Manipulation, Classification of Problems- Decision Problems, Optimisation Problems, Classification of Algorithms- Deterministic Algorithms, Non-deterministic Algorithms, Classes of Problems- P, NP, NP–Complete, and NP-Hard. Relationship among Classes of Problems, Reducibility, Cook's Theorem, Satisfiability, C-SAT Problem, Clique Decision Problem.	9
	Total	42
Text	1. Introduction to Algorithms; Thomas H Cormen, Charles E Leiserson, Ronald L Rivest; 3rd, PHI Learning Private Limited; 2018. 2. Design and Analysis of Computer Algorithms; A Aho, J E Hopcroft, J D Ullman; , Addison-Wesley; 1974.	
Reference	1. Algorithm Design; Jon Kleinberg, Eva Tardos; 14th, Pearson India Education Services Pvt.Ltd; 2017. 2. Fundamentals of Computer Algorithms; Ellis Horowitz, Sartaj Sahni, S Rajasekaran; 2nd Edition, University Press; 2011. 3. Algorith Design: Foundations, Analysis and internet Examples; M T Goodrich, R Tamassia ; , John Wiley & Sons; 2001.	

Course Code	**Course Name**	**L**	**T**	**P**	**C**	**Year**	**Semester**
CS207	Computer Organization and Architecture	3	1	0	4	2nd	3rd

Course Objective: This course will introduce students to the fundamental concepts underlying modern computer organization and architecture. Main objective of the course is to familiarize students about hardware design including logic design, basic structure and behavior of the various functional modules of the computer and how they interact to provide the processing needs of the user. It will cover machine level representation of data, instruction sets, computer arithmetic, CPU structure and functions, memory system organization and system input/output devices.

Topic		Hour
Module I	Basic structure of computers: Functional units, Basic operational concepts, Technologies for building processors and memory, Performance measures.	5
Module II	Instruction and Arithmetic for computers: Language of the computer: MIPS instruction set, addressing modes, and assembly language programming. Signed and unsigned numbers, addition, subtraction, multiplication- Booth's Algorithm, integer division- Restoring division and non-restoring division, floating point representation.	12
Module III	Processor Design: Single cycle, multi-cycle, pipelined processor design.	8
Module IV	Memory architecture: Basic Concepts, Main Memory, Internal and External Memory, Virtual Memory, Read-Only Memory, Cache	8

	Memory – basics of Caches (direct, set-associative, multi-way set associative), measuring and Improving Cache Performance.	
Module V	Input–Output Design: Basic Concepts, Programmed I/O, Interrupt-Driven I/O, Direct Memory Access (DMA), Buses, Input–Output Interfaces.	8
	Total	41
Text	1. D. A. Patterson and J. L. Hennessy, Computer Organization and Design, 5th Ed., Morgan Kaufmann, 2017. 2. W. Stallings, Computer Organization and Architecture: Designing for Performance, 8th Ed., Pearson Education India. 2010.	
Reference	1. V. C. Hamacher, Z. G. Vranesic and S. G. Zaky, Computer Organization, 5th Ed., McGraw Hill, 2017. 2. David Money Harris and Sarah L. Harris, Digital Design and Computer Architecture, second edition, Morgan Kaufmann, 2017.	

Course Code	**Course name**	**L**	**T**	**P**	**C**	**Year**	**Semester**
HS201	Management Concepts and Technology	2	0	0	2	2nd	3rd
Topic	**Contents**						**No. of Lectures**
Module-I	Principles of Management: Concept of Management, Functions of Management, Planning and its Nature &Organising, Designing organizational Structure, Authority relationships,						**04**
Module-II	Delegation of Authority. Staffing: Motivation and its Theory, Leadership Communication. Directing, Controlling & its techniques. Coordinating; Principles of Economic: Microeconomics: Concept of consumption, production, exchange, distribution.						**05**
Module-III	Demand analysis: Concept, kind of demand, change in demand, law of demand; Utility analysis: Marginal, total, consumer surplus, consumer equilibrium; Production analysis: Law of supply, different factors of production, law of returns, economies of scale.						**06**
Module-IV	Cost analysis: Cost concept, importance of cost behaviour, cost classification; Pricing analysis: Different kinds of markets, pricing & equilibrium in different markets - perfect, imperfect, monopoly.						**05**
Module-V	Income distribution: Briefing them about rent, wages, interest and profit. The international economics: Changing scenario, globalization, structural adjustment programme, stabilization policy, the multinational corporation. IBRD, IMF, GATT, WTO, ITO, IDA, IFC, MIGA.						**05**
	Total						**25**
Text	1. Business Organisation& Management - C.R Basu. 2. Essentials of Management - Harold Koontz, HeingWerhrich. 3. An introduction to Positive Economics; Lipsey. 4. Modern Microeconomics; A. Koutsoyiannis.						

	5. Managerial Economics - Analysis, Problems and Cases; P.L. Mehta. 6. Business Economics; ManabAdhikary.