National Institute of Technology Raipur													
Course of Study and Scheme of Examination							B. Tech. 3rd Semester					Branch:IT (Information Technology)	
S. No.	Subject Code	Subject Name	Periods per Week			TA	Examination Scheme				Total Marks	Credits
			L	T	P		MSE/MTR		ESE/ESVE			
							Theory	Prac.	Theory	Prac.		
1	IT103101IT	Discrete Structures	3	1	0	20	30	-	50	-	100	4
2	IT103102IT	Digital Electronics & Logic Design	3	1	0	20	30	-	50	-	100	4
3	IT103103IT	Object Oriented Methodology	3	1	0	20	30	-	50	-	100	4
4	IT103104IT	Communication Systems	3	1	0	20	30	-	50	-	100	4
5	IT103105IT	Operating System	3	1	0	20	30	-	50	-	100	4
6	IT103003MA	Mathematics-III (Computational Mathematics)	4	0	0	20	30		50		100	4
7	IT103401IT	OOPS Lab (Java)	0	0	2	40	-	20	-	40	100	1
8	IT103402IT	Operating System Lab (Unix)	0	0	2	40	-	20	-	40	100	1
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Discrete Structures

[3rd Semester, Second Year]

Course Description

Offered by Department	Credits	Status	Code
Information Technology	3-1-0, (4)	Core	IT103101IT

[Pre-requisites: Mathematics-I]

Course Objectives

1. To reason mathematically about basic data types and structures such as numbers, sets, graphs, and trees.
2. To model and analyze computational processes using analytic and combinatorial methods.
3. To apply principles of discrete probability to calculate probabilities and expectations of simple random processes.

Course Content

Unit-1: Mathematical Logic, Set Theory, Relations, and Functions

Basic concept of mathematical logic, Statements, Connectives, Logical equivalence, Logical implication & quantifiers, Basic concept of Boolean Algebra and its Properties, Boolean functions, Disjunctive & conjunctive normal forms of Boolean functions, First Order Predicate Logic, Basic concept of set theory, Relations, Properties of relation in a set, Equivalence relation, Composition of relations, Partial order & total order relations, Lattices & Hasse diagram, Introduction to function, Types of functions, Composition of functions and some special functions.

Unit-2: Group Theory

Binary Operation, Algebraic Structure, Semi groups, Monoid, Groups, Abelian Groups, Finite Groups, Addition and Multiplication Modulo, Order of Group, Subgroups, Permutation Group, Cyclic Group, Cosets, Lagrange's theorem, some theorems on sub groups, Isomorphism, Automorphism, Homomorphism of groups, Normal Subgroup, Quotient group, Rings and Fields.

Unit-3: Graph Theory

Introduction to graph theory, Types of graphs (Simple, Di-Graph, Non-Directed Graph, Multi-Graph, Connected, Regular, Cycle, Cyclic, Acyclic, Complete, Wheel, Bi-partite & Complete Bi-Partite), Complement of Graph, Eulerian, Hamiltonian, Isomorphic graphs, Planarity (Region & Properties), Polyhedral Graph, kuratowski`s theorem, Coloring, Matchings & Coverings, Spanning Tree, Connectivity (Edge & Vertex).

Unit-4: Combinatorics and Probability

Permutation and combination, Counting & Summation, Pigeon-hole principle, Mathematical induction, Principle of Inclusion and Exclusion, Generating function, Recurrence relation, Probability: Conditional Probability; Mean, Median, Mode and Standard Deviation; Random Variables; Distributions: uniform, normal, exponential, Poisson, Binomial.

Course Materials

Required Text: Text books

1. Elements of discrete mathematics by C.L. Liu, Tata McGraw-Hill, publications.
2. Discrete Mathematical structures, by Bernard Kolman, Robert C. Busby and Sharon Cutler Ross, Pearson Education.

Optional Materials: Reference Books

1. A Text Book of Discrete Mathematics, Swapan Kumar Sarkar, S. Chand & Company Ltd.
2. Graph theory with applications to engineering and computer science, by Narsingh Deo, Prentice Hall of India.
3. Discrete mathematics for computer scientists and mathematicians, by J.L. Mott, A. Kandel and T.P. Baker, Prentice Hall of India.
4. Discrete Mathematical Structures with applications to computer science, by J.P. Tremblay and R. Manohar, Tata McGraw-Hill.

Digital Electronics & Logic Design

[3rd Semester, Second Year]

Course Description

Offered by Department	Credits	Status	Code
Information Technology	3-1-0, (4)	Core	IT103102IT

[Pre-requisites: Physics-I, Physics-II]

Course Objectives

1. Able to perform the conversion among different number systems. Familiar with basic logic gates AND, OR & NOT, XOR, XNOR.
2. Understand Boolean algebra and basic properties of Boolean algebra; able to simplify simple Boolean functions by using the basic Boolean properties.
3. To design, analyze and interpret Combinational circuits.
4. To design, analyze and Interpret Sequential circuit.

Course Content

Unit-1 : CODES-Binary codes

Introduction & usefulness, Weighted & Non-weighted codes, Sequential codes, self-complementing codes, Cyclic codes, 8-4-2-1 BCD code, Excess-3 code, Gray code: Binary to Gray and Gray to binary code conversion, Error detecting code, Error correcting code, 7-bit Hamming code, ASCII code, EBCDIC code. Realization of Boolean Expressions: Reduction of Boolean expressions using laws, theorems and axioms of Boolean Algebra, Boolean expressions and logic diagram, Converting AND/OR/Invert logic to NAND/NOR logic, SOP and POS Forms and their Realization.

Unit-2: Minimization Techniques

Expansion of a Boolean expression to SOP form, Expansion of a Boolean expression to POS form, Two, Three & Four variable K-Map: Mapping and minimization of SOP and POS expressions. Completely and Incompletely Specified Functions - Concept of Don't Care Terms; Quine – Mc Clusky Method.

Unit-3 : Combinational Circuits

Adder & Subtractor: Half adder, Full adder, half subtractor, Full subtractor, Parallel Binary adder, Look Ahead carry adder, Serial adder, BCD adder. Code converter, Parity bit generator/Checker, Comparator. Decoder: 3-line to 8-line decoder, 8-4-2-1 BCD to Decimal decoder, BCD to Seven segment decoder. Encoder: Octal to binary and Decimal to BCD encoder. Multiplexer: 2- input Multiplexer, 4-input multiplexer, 16-input multiplexer Demultiplexer: 1-line to 4-line & 1-line to 8- line demultiplexer, Multiplexer as Universal Logic Function Generator, Programmed Array Logic (PAL). PLA and PLD.

Unit-4 : Sequential Circuits

Flip-Flops & Timing Circuit: S-R Latch; Gated S-R Latch; D Latch; J-K Flip-flop; T Flip-Flip: Edge Triggered S-R, D, J-K and T Flips-Flops; Master - Slave Flip-Flops; Direct Preset and Clear Inputs. Shift Registers: PIPO, SIPO, PISO, SISO, Bi-Directional Shift Registers; Universal Shift register. Counter: Asynchronous Counter: Ripple Counters; Design of asynchronous counters, Effects of propagation delay in Ripple counters, Synchronous Counters: 4-bit synchronous up counter, 4-bit synchronous down counter, Design of synchronous counters, Ring counter, Johnson counter, Pulse train generators using counter, Design of Sequence Generators; Digital Clock using Counters.

Digital Logic Families: Introduction; Simple Diode Gating and Transistor Inverter; Basic Concepts of RTL and DTL; TTL: Open collector gates, TTL subfamilies, IIL, ECL; MOS Logic: CMOS Logic, Dynamic MOS Logic, Interfacing: TTL to ECL, ECL to TTL, TTL to CMOS, CMOS to TTL, Comparison among various logic families, Manufacturer's specification.

Course Materials

Required Text: Text books

1. Fundamentals of Digital Circuits: A. Anand Kumar, PHI
2. Digital Integrated Electronics: H. Taub and D. Schilling: TMH

Optional Materials: Reference Books

1. Digital Fundamentals: Floyd & Jain: Pearson Education
2. Digital Electronics: A.P. Malvino: TMH.

Object Oriented Methodology

[3rd Semester, Second Year]

Course Description

Offered by Department	Credits	Status	Code
Information Technology	3-1-0, (4)	Core	IT103103IT

[Pre-requisites: Programming in C, Computer Programming (C++)]

Course Objectives

1. To provide a detailed understanding of the object-oriented concept.
2. Understanding inheritance and exception handling.
3. To relate practical and theoretical concepts with the help of java, GUI and UML programming.

Course Content

Unit-1: Object-Oriented Concepts

Introduction to class and instances, An Overview of Java, Data types, Variables and Arrays, Operators, Expressions, Control statements, String handling. Package definition, Types of interfaces & Streams, File operations.

Unit-2: Inheritance, Polymorphism & Exception Handling

Inheritance, Polymorphism, method overriding, access specifiers, Fundamentals of exception handling, Exception types, Multithreading, Java thread model, creating threads, thread priorities, synchronizing threads, inter-thread communication.

Unit-3: Socket Programming & GUI

Introduction to socket programming, Graphical User Interface Components, Threads, Multithreading, Java Database Connectivity, Networking, Collections, GUI Programming: MVC Architecture, Event Handling, Applets, and Swing: Applet design, AWT packages, Applet event handling, parameters to applets.

Unit-4: Object-Oriented Modelling

Building blocks of UML, Structural & Behavioral Modeling. UML Diagrams: Modeling Requirements, Use Case Diagrams, Sequence Diagrams, Class Diagram, Activity Diagram, Statechart Diagram, Deployment Diagram.

Course Materials

Required Text: Text books

1. Java The complete reference, 9th edition, Herbert Schildt, McGraw Hill Education (India) Pvt. Ltd.
2. Understanding Object-Oriented Programming with Java, updated edition, T. Budd, Pearson Education.
3. Michael Blaha, James Rumbaugh: Object-Oriented Modeling and Design with UML, 2nd Edition, Pearson Education, 2005

Optional Materials: Reference Books

1. An Introduction to programming and OO design using Java, J. Nino, and F.A. Hosch, John Wiley & Sons.
2. Introduction to Java programming, Y. Daniel Liang, Pearson Education.
3. Object Oriented Programming through Java, P. Radha Krishna, Universities Press.
4. Practical Object-Oriented Design with UML - Mark Priestley, 2nd Edition, Tata McGraw-Hill, 2003.
5. Object-Oriented Design with UML and JAVA - K. Barclay, J. Savage, Elsevier, 2008.
6. The Unified Modeling Language User Guide - Booch, G., Rumbaugh, J., and Jacobson, I, 2nd Edition, Pearson, 2005.

Communication Systems

[3rd Semester, Second Year]

Course Description

Offered by Department	Credits	Status	Code
Information Technology	3-1-0, (4)	Core	IT103104IT

[Pre-requisites: Physics-I, Physics-II]

Course Objectives

1. To acquire the knowledge about various modulation and demodulation techniques of analog communication system.
2. To analyze various parameters of analog communication techniques.
3. To understand the building blocks of digital communication system.
4. To study the concept of information theory and coding

Course Content

Unit-1: Amplitude Modulation System

Need for Modulation, Amplitude Modulation, Modulation Index for Sinusoidal AM, Frequency spectrum for Sinusoidal AM, Average power for Sinusoidal AM, Effective voltage and current for sinusoidal AM, Balanced Modulator, AM demodulation, The Square law demodulator, PLL, Non-sinusoidal modulation, DSBSC Modulation, SSB modulation and generation & demodulation, VSB, FDM.

Unit-2: Angle Modulation System

Phase and frequency modulation and their relationship. Frequency deviation, spectrum of FM Signal, BW of FM Signal, Effect of modulation on BW, constant BW, FM phasor diagram, Narrow band FM. Armstrong and Parameter variation methods of FM generation and FM demodulators.

Unit-3 : Digital Communication

Sampling theorem, Pulse Modulation: PAM, PPM, PWM, Digital Base Band Modulation technique: Bandwidth of digital data, Base band System, PCM, Uniform & Non-uniform Quantization, Base band modulation, Correlative Coding, DPCM, Delta Modulation, Fundamentals of Binary ASK, PSK, FSK, Generation & detection of BASK, BPSK, BFSK, Fundamentals of QPSK & DPSK, Generation & detection of QPSK & DPSK, MSK, M-array PSK signaling schemes, Equalization Principles, Optimum filter, Matched filter, Error probability of various Digital Modulation technique.

Unit-4: Elements of Information Theory

Average Information, Entropy, Information Rate. Communication Channel. Discrete and Continuous channel, Shannon-Hartley Theorem and its Implications, Channel capacity, Gaussian channel, Bandwidth s/N trade off.

Course Materials

Required Text: Text books

1. Electronic Communications by Roddy & Coolen, PHI.
2. Electronic Communication System by Kenedy & Davis, TMH
3. Modern Digital & Analogue Communication systems, B.P. Lathi, Ed.-3, Oxford Press

Optional Materials: Reference Books

1. Principles of Communication system by H. Taub and K.L. Shiling.
2. An Introduction to the Principle of Communication Theory by J.C. Hancock, Mc-Graw Hill.
3. Signal Processing, Modulation and Noise -by Betts, English University Press, London.
4. Communication System-by A.B. Carlson ,Mc-Graw Hill.

Operating System

[3rd Semester, Second Year]

Course Description

Offered by Department	Credits	Status	Code
Information Technology	3-1-0, (4)	Core	IT103105IT

[Pre-requisites: Programming in C, Computer Programming (C++), Data Structure]

Course Objectives

1. To understand the services provided by an operating system and scheduling concept.
2. To study the process Synchronization and Deadlock algorithms.
3. To know the management aspects of memory management.
4. To gain knowledge on operating system concepts that includes File concept, I/O Management & Disk Scheduling and Android.

Course Content

Unit 1: Introduction

Operating system and function, Evolution of operating system, Batch, Interactive, Time Sharing and Real Time System, System protection. Operating System Structure: System Components, System structure, Operating System Services. Process: Process concept, PCB, Process Operation, Inter Process Communication, CPU Scheduling.

Unit 2: Processes Synchronization

Principle of Concurrency, Producer Consumer Problem, Critical Section problem, Semaphores, Classical problems in Concurrency.
Deadlock: Deadlock Characterization, Prevention, Avoidance, Detection and Recovery.

Unit 3: Memory Management

Multiprogramming with fixed partition, Multiprogramming with variable partition, Multiple base register, Paging, Segmentation, Virtual memory concept, Demand paging, Performance, Paged replaced algorithm, Allocation of frames, Thrashing, Cache memory, Organization, Impact on performance.

Unit 4: File System

File Concept, File Organization and Access Mechanism, File Directories, File Sharing, Implementation Issues. I/O Management & Disk Scheduling**:** I/O devices and organization of I/O function, I/O Buffering, Disk I/O, Disk scheduling algorithms, Case study: WINDOWS-NT, Linux, Unix, Inferno.
Android: History of Android, Architecture, Android Versions & different development tools.

Course Materials

Required Text: Text books

1. Operating System concepts, Silberscatz A and Peterson, J.L, PE- LPE.

Optional Materials: Reference Books

1. Operating System Design & Implementation, Tanenbaum, A.S., PHI.
2. Operating system concepts Galvin, Silberscatz John Weiley & Sons
3. Operating systems H.M.Deital Pearson Education
4. Operating System Concept & Design, Milenkovic M, McGraw Hill.
5. Operation System, Stalling William, Maxwell MCMillan International Editions.

Mathematics-III (Computational Mathematics)

[3rd Semester, Second Year]

Course Description

Offered by Department	Credits	Status	Code
Mathematics	4-0-0, (4)	EPR	IT103001MA

[Pre-requisites: Mathematics-I, Mathematics-II]

Course Objectives

To enable the students to apply the knowledge of Mathematics in various fields:

1. To solve the algebraic, transcendental and simultaneous linear equations and its application.
2. To solve the problems related to data appear equal or unequal intervals and to obtain a functional relationship between the observed values.
3. To calculate the derivative of the function and evaluate the definite Integral from set of numerical values.
4. To solve ordinary differential equations using different numerical techniques.

Course Content

UNIT-1: NUMERICAL SOLUTIONS OF ALGEBRAIC, TRANSCENDENTAL AND SIMULTANEOUS LINEAR EQUATIONS

Errors in numerical computation, Error type, Bisection Method, Regula-Falsi Method, Secant Method, Newton-Raphson Method, Direct Methods: Gauss Elimination, Gauss-Jordan &Crout'sTriangularisation Method, Iterative Methods: Jacobi, Gauss-Seidel & Relaxation Methods.

UNIT-2:INTERPOLATION AND CURVE FITTING

Finite differences, Forward, Backward & Central Difference Interpolation Formulae, Lagrange's method and Newton's Divided Difference method, Principle of Least Squares, Fitting a Straight Line, Fitting a Parabola, Exponential Function, Method of Group Averages.

UNIT-3:NUMERICAL DIFFERENTIATION AND INTEGRATION

Derivatives using Forward, Backward and Central difference methods, Derivatives using unequally spaced values, Newton-Cote's Quadrature method, Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule, Weddle's rule.

UNIT-4:NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS

Picard's method, Taylor's Series method, Euler's Modified method, Runge-Kuttamethod of Fourth Order, Milne's Method, Adams–Bashforth to solve ODE.

Course Materials

Required Text: Text books

1. M. K. Jain, S. R. K. Iyengar & R. K. Jain Numerical Methods for Scientific and Engineering Computation, New Age International (P) Limited, Publisher.
2. B. S. Grewal, Numerical Method in Engineering and Science, Khanna Publisher.
3. J. D. Hoffman, Numerical Methods for Engineers and Scientists, McGraw-Hill, Inc. Publisher.

Optional Materials: Reference Books

1. P. Kandasamy, K. Thilagavathy, & K. Gunavathi, Numerical Methods, S. Chand Publisher.
2. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons Inc. Publisher.
3. S. S. Sastry, Introductory methods of numerical analysis, PHI, Publisher.

OOPS Lab using Java & UML

[3rd Semester, Second Year]

Course Description			
Offered by Department	Credits	Status	Code
Information Technology	0-0-2, (1)	Lab	IT103401IT

List of 10 -15 Assignment/Practical will be allotted by the Instructor in the respective Lab.

Operating System Lab(Unix)

[3rd Semester, Second Year]

Course Description			
Offered by Department	Credits	Status	Code
Information Technology	0-0-2, (1)	Lab	IT103402IT

List of 10 -15 Assignment/Practical will be allotted by the Instructor in the respective Lab.