National Institute of Technology Raipur												
Course of Study and Scheme of Examination							B. Tech. 4th Semester				Branch:IT (Information Technology)	
S. No.	Subject Code	Subject Name	Periods per Week			TA	Examination Scheme				Total Marks	Credits
							MSE/MTR		ESE/ESVE			
			L	T	P		Theory	Prac.	Theory	Prac.		
1	IT104101IT	Computer Organization	3	1	0	20	30	-	50	-	100	4
2	IT104102IT	Theory of Computation	3	1	0	20	30	-	50	-	100	4
3	IT104103IT	Database Management System	3	1	0	20	30	-	50	-	100	4
4	IT104104IT	Internet and Web Technologies	3	1	0	20	30	-	50	-	100	4
5	T104004MA	Mathematics-IV (Probability and Statistics)	4	0	0	20	30	-	50	-	100	4
6	IT104105IT	Software Engineering	3	1	0	20	30	-	50	-	100	4
7	IT104401IT	DBMS Lab	0	0	2	40	-	20	-	40	100	1
8	IT104402IT	Web Technology Lab	0	0	2	40	-	20	-	40	100	1
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Computer Organization

[4th Semester, Second Year]

Course Description

Offered by Department	Credits	Status	Code
Information Technology	3-1-0, (4)	Core	IT104101IT

[Pre-requisites: Digital Electronics & Logic Design (IT103102IT)]

Course Objectives

1. Conceptualize the basics of organizational and architectural issues of a digital computer.
2. To understand the design of the various functional units and components of computers.
3. Learn the function of each element of a memory hierarchy.
4. To provide the knowledge of Parallel Processing and communication method.

Course Content

Unit 1: Processor Basics

CPU Organization, Fundamental and features, Data representation – Basic formats, Fixed and Floating point representation, Instruction set, formats, types and programming considerations, Addressing modes.

Unit 2: Data Path and Control Design

Fixed point arithmetic multiplication algorithms: hardware algorithms, Booth multiplication algorithm, Division algorithm: Hardware algorithm, Divide overflow algorithm, Combinational ALU and Sequential ALU, Floating point arithmetic operations. Control Design: Basic concepts, Hard-wired control, Micro Programmed Control, CPU control Unit and Multiplier Control Unit, Pipeline control: Instruction pipelines, Pipeline Performance, Superscalar processing.

Unit 3: Memory Organization and System Organization

Memory Device Characteristics, RAM Technologies and Serial Access Memories Technology, Multilevel Memory Systems, Address translation and Memory allocation systems, Cache memory: Features, Address mapping.

Unit 4: Communication method:

Basic concepts, Bus control, Programmed I/O, DMA, Interrupts and I/O processors, Parallel Processing: Processor-level Parallelism, Multiprocessor and Fault Tolerance System.

Course Materials

Required Text: Text books

1. Computer System Architecture By, M. Morris Mano Prentice- Hall, 1993.
2. Computer Architecture & Organization By John P. Hayes, McGraw Hill-1998

Optional Materials: Reference Books

1. Structured Computer Organization by Andrew S. Tanenbaum.
2. Computer architecture a quantitative approach, Patterson D. A. and Hennessy, J. L., Second Edition, Morgan Kaufman, 1996.
3. Computer Organization and Architecture, W. Stallings, LPE

Theory of Computation

[4th Semester, Second Year]

Course Description

Offered by Department	Credits	Status	Code
Information Technology	3-1-0, (4)	Core	IT104102IT

[Pre-requisites: Discrete Structures (IT103101IT)]

Course Objectives

1. To understand the basic mathematical models of computation.
2. To construct automata for any given pattern and find its equivalent regular expressions.
3. To gain knowledge in computational theory.
4. To understand that there are limitations on what machines can do and learn, examples of undecidable problems.

Course Content

Unit 1: Machines

Basic machine, FSM, Transition graph, Transition matrix, Deterministic and non-deterministic FSM'S, Equivalence of DFA and NDFA, Mealy & Moore machines, minimization of finite automata, Two-way finite automata.

Unit 2: Regular Sets and Regular Grammars

Alphabet, words, Operations, Regular sets, Finite automata and regular expression, Pumping lemma and regular sets, Application of pumping lemma, closure properties of regular sets.

Unit 3: Formal Grammars & Languages

Basic definitions and examples of languages, Chomsky hierarchy, Regular grammars, context free & context sensitive grammars, context free languages, non-context free languages, Chomsky normal forms, binary operations on languages.

Unit 4: Pushdown Automata , Turing Machines & Undecidability

Pushdown automata, TM model, representation and languages acceptability of TM Design of TM, Universal TM & Other modification, Recursive function, Decidability, Kleen's theorem. Properties of recursive & recursively enumerable languages, Universal Turing machine and an undecidable problem, Rice's theorem & some more undecidable problems.

Course Materials

Required Text: Text books

1. Michael Sipser , Introduction of the Theory of computation, Cengage publishing co Inc.

Optional Materials: Reference Books

1. John E. Hopcroft, Jeffery Ullman, Introduction to Automata theory, Languages & computation, Narosa Publishers.
2. E.V. Krishnamurthy, Introductory Theory of computer science. K.L.P. Mishra, Theory of computer Science, Prentice Hall of India Pvt. Ltd.
3. John C Martin, Introduction to language & the theory of computation, McGraw hill Education (India) Ltd.

Database Management System

[4th Semester, Second Year]

Course Description

Offered by Department	Credits	Status	Code
Information Technology	3-1-0, (4)	Core	IT104103IT

[Pre-requisites: Discrete Structures (IT103101IT), Data Structures (IT10I025IT), Computer Programming (C & C++)]

Course Objectives

1. To understand basic database concepts, including the structure and operation of the relational data model.
2. To construct simple and moderately advanced database queries using Structured Query Language (SQL).
3. To apply logical database design principles with database normalization.
4. To understand the concept of a database transaction, concurrency control, recovery, and Indexing techniques.

Course Content

Unit 1: Introduction and Relational Data Models

Introduction to database systems, Various components of a DBMS; ER Model - Conceptual data modeling - entities, entity types, various types of attributes, relationships, relationship types, ER diagram, Concept of relations, schema-instance distinction, keys, referential integrity and foreign keys, relational algebra operators: selection, projection, cross product, various types of joins, division, example queries, tuple relation calculus, domain relational calculus, converting the database specification in ER notation to the relational schema.

Unit 2: Structured Query Language

Introduction, data definition in SQL, table, key and foreign key definitions, update behaviors. Querying in SQL - basic select-from-where block and its semantics, nested queries - correlated and uncorrelated, notion of aggregation, aggregation functions group by and having clauses, embedded SQL, Introduction to NoSQL and MongoDB.

Unit 3: Dependencies and Normal forms

Various Database Design Strategies, Functional Dependencies, dependency theory - functional dependencies, Armstrong's axioms for FD's, closure of a set of FD's & its applications (equivalences & canonical form), Normalization for Relational Databases: motivation for normal forms, definitions of 1NF, 2NF, 3NF and BCNF, decompositions and desirable properties of them, algorithms for 3NF and BCNF normalization, multi-valued dependencies and 4NF, join dependencies and definition of 5NF.

Unit 4: Transaction processing, Error recovery, Data Storage and Indexes

Transaction Processing: concepts of transaction processing, ACID property, isolation problems, schedules and recoverability, serializability of schedules. Concurrency Control: Locking based protocol, Time-stamp based protocol, multi-version schemes, Validation based protocol, Multiple granularity. Error Recovery: Failure classification, deferred update, immediate update, Shadow paging. Data Storage and Indexes: file organizations, primary, secondary index structures, various index structures - hash-based, dynamic hashing techniques, multi-level indexes, B+ trees.

Course Materials

Required Text: Text books

1. Database system concepts, Korth & Sudarshan, MH.
2. Introduction to Database Systems, C.J.Date, Pearson Education.
3. Database Management Systems, Ramakrishnan & Gehrke, MH.

Optional Materials: Reference Books

1. Principles of Database Systems, 2nd Edn., Ullman, J.O, Galgotia Publications.
2. Fundamentals of Database Systems, Elmasri & Navathe, Pearson Education.
3. Database Design Fundamentals, Rishe, PHI.

Internet and Web Technology

[4th Semester, Second Year]

Course Description

Offered by Department	Credits	Status	Code
Information Technology	3-1-0, (4)	Core	IT104104IT

[Pre-requisites: Object Oriented Methodology (IT103103IT)

Course Objectives

1. To have an overview of Internet Protocols and Client/Server models.
2. To understand the basics of Web Designing using HTML, DHTML, and CSS.
3. To acquire knowledge and skills for creation of web site considering both client and server side programming.
4. To gain ability to develop responsive web application.

Course Content

Unit 1: Introduction to Internet Technology

Introduction, Evolution of Internet and its applications, Overview of Internet Protocol, Internet Addressing, Domain Name Server , Internet Service Providers, Three Tier Web Based Architecture:JSP,ASP,J2EE,Dot-Net System.

Unit 2: HTML,CSS and Client Side Scripting

HTML: Elements, tags, usages, Standards and Issues, DHTML. Cascading Style Sheets: Syntax, Properties, Selectors, Approaches to dynamic pages: CGI, Java Applets, Active X. Java Script: Syntax, Object model, Flow Control, Functions & Objects, events and event handlers, Data type conversion & Equality, Accessing HTML form elements.

Unit 3: XML, Internet Security & Firewalls

Extensible Markup Language: Standards and Standards that build on XML, Document Type Definition: Building blocks, Parameter, Entities & Conditional Sections, Resolving a naming conflict, Using Namespaces, XML Schema, Web Security, Firewalls, Authentication, Authorization and Accounting(AAA).

Unit 4: Server Side Scripting and Website Planning & Hosting

PHP: Syntax, decision making, arrays, functions, forms, file & error handling, MySQL,
Node.js: Modules, events, File System; Python: Basic Syntax, Variables, Casting, lists, Flow control, function, file handling. Web Page Lay-Outing, Host Site maintenance & registration, Search Engines and Indexes.

Course Materials

Required Text: Text books

1. Alexis Leon and Mathews Leon “Internet for Every One”, Tech World.
2. Steven Holzner , “XML: A Beginner's Guide” McGraw Hill Education.
3. Martin C. Brown–“Python the complete reference”, McGraw Hill

Optional Materials: Reference Books

1. Laura Lemay, Rafe Colburn, Jennifer kyrnin Mastering “HTML, CSS & Java Script Web Publishing”, BPB publications.
2. Eric Ladd, Jim O’Donnell “Using HTML, XML and JAVA”, Prentice Hall of India.
3. Paul Wilton “Beginning Java Script ”,SPD Publications.
4. Luke welling, Laura Thomson “PHP and MySQL Web Development” Pearson Education.

Mathematics-IV (Probability and Statistics)

[4th Semester, Second Year]

Course Description

Offered by Department	Credits	Status	Code
Mathematics	4-0-0, (4)	EPR	IT104001MA

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

Course Objectives

The objective of this subject is to expose student to understand the importance of probability theory and statistical analysis in science and engineering.

1. Introduce the concepts of probability theory and random variables having probability distributions.
2. Introduce the multivariate random variables with their joint probability distributions as well as weak law of large numbers, strong law of large numbers, and central limit theorem.
3. Introduce the general concepts of sampling distributions with sample regression analysis and confidence intervals.
4. Introduce the testing of hypothesis with some suitable statistic from the sample.

Course Content

UNIT-1: Probability and Random Variables

Classical and relative-frequency-base definitions of probability, axiomatic definition of probability, Bayes rule, Random variables, Probability mass and density functions, Distribution function, Expectation, Moments, Moment generating function, Characteristic function, Chebyshev's inequality, Binomial, Geometric, Negative Binomial, Poisson, Uniform, Exponential, Normal distributions.

UNIT-2: Functions of Random Variables

Vector random variables, Joint probability distributions and their properties, Conditional distribution and density, Statistical independence, Transformation of multiple random variables, Distribution and density of a sum of random variables, Jointly Gaussian random variables, Weak law of large numbers, Strong law of large numbers, Central limit theorem.

UNIT- 3 : Sampling Theory

Correlation, Correlation coefficient, Rank correlation, Regression analysis, Sample, populations, Statistic, Parameter, Sampling distribution, Standard error, Unbiasedness, Efficiency, Maximum likelihood estimator, Point and interval estimations.

UNIT - 4 : Decision Theory: Testing of Hypothesis

Testing of hypothesis for sampling distributions of means, sum and differences of means, proportions,sum and differences of proportions, variances for large and small samples (Z-test, t-test, $\chi 2$ –test and F-test).

Course Materials

Required Text: Text books

1. Probability and Statistics for Engineers and Scientists by Ronald E. Walpole, Sharon L. Myers and Keying Ye, Pearson Prentice Hall.
2. Probability and Statistics for Engineers by Anthony J. Hayter, Cengage Learning.

Optional Materials: Reference Books

1. Probability and Statistics for Engineers by Richard A. Johnson, PHI Learning Private Limited.
2. Statistical Methods by N. G. Das, McGraw Hill.
3. Probability and Statistical Applications by Meyer, Oxford & IBH Publishing Co. Pvt. Ltd.

Software Engineering

[4th Semester, Second Year]

Course Description

Offered by Department	Credits	Status	Code
Information Technology	3-1-0, (4)	Core	IT104105IT

[Pre-requisites: Object Oriented Methodology (IT103103IT), Computer Programming (C++), DBMS]

Course Objectives

1. To introduce software project and to understand about the different software processes & their uses.
2. To understand good coding practices, including documentation, contracts, regression tests and daily builds.
3. To understand how Software engineering & Project Management is concerned with concepts, methods and tools for professional software development.

Course Content

Unit 1: Software Process

Life cycle models (waterfall, incremental, spiral, WINWIN Spiral, evolutionary, prototyping, object oriented, and component based development). Verification and Validation. Software Requirements: Functional and non-functional requirements, user and system requirement, requirement engineering, prototyping in the software process, rapid prototyping techniques, user interface prototyping, SRS.

Unit 2: Design Concepts and Principles

Software Design process, Architectural design: software architecture data design, architectural design transformation and transaction mapping. User interface design principles, monitoring and control system, Software configuration Management

Unit 3: Testing and Maintenance

Software testing: black box testing, white box testing, structural testing, regression testing. s/w testing strategies, strategic approach and issues, unit testing, integration testing, validation testing, system testing and debugging, Software quality Assurance, Capability maturity model, Software maintenance, Reengineering, Reverse Engineering, cyclomatic complexity, s/w quality metrics.

Unit 4: Introduction to Software Project Management

Software cost estimation models, Software quality measures, function oriented models, COCOMO model, Delphi method, Scheduled Earned Value Analysis, Task Network, Dynamic software maintenance, case studies.

Course Materials

Required Text: Text books

1. Software Engineering – A practitioner's approach, Roger S. Pressman, McGraw-Hill international Edition, 5th edition , 2001
2. Object Oriented Modelling & Design, Remgaugh J. Blaha, M. Premeralant, W. Eddy F. and Lorsen W .(PHI)

Optional Materials: Reference Books

1. Software engineering, Ian Sommervile, Person Education Aisa, 6th edition , 2000
2. An Integrated Approach to Software Engineering, Pankaj Jalote, Springer Verlag
3. Software Engineering – An Engineering Approach, James F. Peters and Witold Pedryez, Johan Wiley and Sons, New Delhi, 2000.
4. Sams teach urself UML in 24 hours , 3rd edition , Joseph Schmuller , 2004.

Database Management System Lab

[4th Semester, Second Year]

Course Description			
Offered by Department	Credits	Status	Code
Information Technology	0-0-2, (1)	Lab	IT104401IT

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

Web Technology Lab

[4th Semester, Second Year]

Course Description			
Offered by Department	Credits	Status	Code
Information Technology	0-0-2, (1)	Lab	IT104402IT

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