TRIBHUVAN UNIVERSITY

INSTITUTE OF SCIENCE AND TECHNOLOGY

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BACHELORS IN INFORMATION TECHNOLOGY (BIT)

(COURSE OF STUDY)

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Tribhuvan University

Institute of Science and Technology

Course of Study

Bachelors in Information Technology

(BIT)

2018

Prepared by

Computer Science and Information Technology Subject Committee

Introduction:

The Bachelors in Information Technology (BIT) curriculum is designed by closely following the courses practiced in accredited international universities, subject to the condition that the intake students are twelve years of schooling in any stream or equivalent from any recognized board. In addition to the foundation and core Information Technology courses, the program offers several elective courses to meet the undergraduate academic program requirement and to fulfill the demand for development and implementation of new technology.

Students enrolled in the four year BIT program are required to take foundation and core courses of Information technology, courses of mathematics, statistics, management, economics, sociology, psychology, research methodology and technical writing, and some elective courses. All undergraduate students are required to complete 120 credit hours of Information Technology and allied courses, and will have opportunity in the field of software development, information security, database administration, network and system administration, and in all the sectors that develop and/or use Information Technology.

Objective:

The main objective of BIT program is to provide students intensive knowledge and skill to design, develop, and use information technology in different areas. It is envisaged that graduate of this program will be equipped with necessary knowledge of Information Technology to compete in this global world.

Eligibility Condition for Admission

A student who seeks admission to BIT program:

- Should have successfully completed twelve years of schooling in any stream.
- Should have secured a minimum of second division.
- Should have successfully passed the entrance examination conducted by Institute of Science and Technology (IOST), TU.
- Complied with all the application procedures.

Course Duration:

The entire course is of eight semesters (four academic years). There is a separate semester examination after the end of each semester.

Bachelors in Information Technology (BIT)

Evaluation, Grading System, and Final Examination

Evaluation:

All the courses except project work and internship should have internal weightage of 40% and external weightage of 60%. For the course having laboratory work, the internal weightage is divided into 20%laboratory work and 20% internal assessment. A student should secure minimum of 40% in each category to pass a course. The final grade and grade point in each course will be the sum of overall weightage of in all categories. There will be a separate practical examination for the 20% weightage of lab work in the presence of an external examiner.

The Project work and Internship are evaluated by different evaluators. To pass Project Work and Internship, students should secure at least 40% marks in the evaluation of each evaluator and the final grade and grade point will be the sum of all the evaluations. For the evaluation of final presentation, an external examiner will be assigned.

Grading System:

The grade awarded to each student in each course is based on his/her overall performance throughinternal and external evaluations. Several evaluation criteria are used for the continuous internal evaluation. External evaluation is solely based on examination conducted by Institute of Science and Technology (IoST). The grade in each course is assigned using a letter grade that indicates the overall performance of each student in each course. The chart below represents letters with its corresponding grading scale, grade point, and performance remarks.

Letter Grade	Grading Scale	Grade Point	Performance Remarks
A+	90 – 100	4	Outstanding
A	80 – less than 90	3.7	Excellent
B+	70 – less than 80	3.3	Very Good
B	60 – less than 70	3	Good
C+	50 – less than 60	2.7	Satisfactory
C	40 – less than 50	2.3	Acceptable
F	0 – less than 40	0	Fail

The performance of each student in each semester shall be evaluated in terms of Semester Grade Point Average (SGPA) which is the grade point average for the semester. SGPA is calculated as

$$SGPA = \frac{Total\ Grade\ Points\ earned\ in\ a\ semester}{Total\ number\ of\ credits\ earned\ in\ the\ semester}$$

The cumulative grade point average (CGPA) is the grade point average for all completed semesters. CGPA is calculated as

$$CGPA = \frac{Total\ Grade\ Points\ earned}{Total\ number\ of\ credits\ completed}$$

Final Examination

Institute of science and technology, Tribhuvan University, will conduct the final examination at the end of each semester for each course except Project Work and Internship. The weightage of this final examination is 60% of the overall weightage.

Course Structure:

Semester I

Course Code	Course Title	Credit Hours	Full Marks
BIT101	Introduction to Information Technology	3	100
BIT102	C Programming	3	100
BIT103	Digital Logic	3	100
MTH104	Basic Mathematics	3	100
SCO105	Sociology	3	100
Total		**15**	**500**

Semester II

Course Code	Course Title	Credit Hours	Full Marks
BIT151	Microprocessor and Computer Architecture	3	100
BIT152	Discrete Structure	3	100
BIT153	Object Oriented Programming	3	100
STA154	Basic Statistics	3	100
ECO155	Economics	3	100
Total		**15**	**500**

Semester III

Course Code	Course Title	Credit Hours	Full Marks
BIT201	Data Structures and Algorithms	3	100
BIT202	Database Management System	3	100
BIT203	Numerical Methods	3	100
BIT204	Operating Systems	3	100
MGT205	Principles of Management	3	100
Total		**15**	**500**

Semester IV

Course Code	Course Title	Credit Hours	Full Marks
BIT251	Web Technology I	3	100
BIT252	Artificial Intelligence	3	100
BIT253	Systems Analysis and Design	3	100
BIT254	Network and Data Communications	3	100
ORS255	Operations Research	3	100
Total		**15**	**500**

Semester V

Course Code	Course Title	Credit Hours	Full Marks
BIT301	Web Technology II	3	100
BIT302	Software Engineering	3	100
BIT303	Information Security	3	100
BIT304	Computer Graphics	3	100
ENG305	Technical Writing	3	100
Total		**15**	**500**

Semester VI

Course Code	Course Title	Credit Hours	Full Marks
BIT351	NET Centric Computing	3	100
BIT352	Database Administration	3	100
BIT353	Management Information System	3	100
RSM354	Research Methodology	3	100
	Elective I	3	100
Total		**15**	**500**

List of Electives:

1. Geographical Information System (BIT355)
2. Multimedia Computing (BIT356)
3. Wireless Networking (BIT357)
4. Society and Ethics in IT (BIT358)
5. Psychology (PSY359)

Semester VII

Course Code	Course Title	Credit Hours	Full Marks
BIT401	Advanced Java Programming	3	100
BIT402	Software Project Management	3	100
BIT403	E-commerce	3	100
BIT404	Project work	3	100
	Elective II	3	100
Total		**15**	**500**

List of Electives:

1. DSS and Expert System (BIT405)
2. Mobile Application Development (BIT406)
3. Simulation and Modeling (BIT407)
4. Cloud Computing (BIT408)
5. Marketing (MGT409)

Semester VIII

Course Code	Course Title	Credit Hours	Full Marks
BIT451	Network and System Administration	3	100
BIT452	E Governance	3	100
BIT453	Internship	6	200
	Elective III	3	100
Total		**15**	**500**

List of Electives:

1. Data Warehousing and Data Mining (BIT454)
2. Knowledge Management (BIT455)
3. Image processing (BIT456)
4. Network Security (BIT457)
5. Introduction to Telecommunications (BIT458)

Introduction to Information Technology

Course Title: Introduction to Information Technology
Course No: BIT101
Nature of the Course: Theory + Lab
Semester: I

Full Marks: 60 + 20 + 20
Pass Marks: 24 + 8 + 8
Credit Hrs: 3

Course Description:
This course covers basic concepts of computers, computer hardware, memory, input/output devices, computer software, data representation, database, computer networks, internet, computer security and applications of IT.

Course Objectives:
The main objective of this course is to provide basic knowledge of fundamental concepts of computer system and Information Technology.

Course Contents:

Unit 1: Introduction to Computer (4 Hrs.)
Introduction of Computer; Characteristics of Computer; History of Computer; Generations of Computer; Digital and Analog Computers; Classification of Computer based on size; The Computer System; Application of Computers

Unit 2: Computer Hardware (8 Hrs.)
Introduction; Central Processing Unit; Components of CPU, Instruction Format; Instruction Set; Instruction Cycle; Microprocessor; Computer Bus, Components of Computer Cabinet(power supply, motherboard, memory chips, expansion slots, ports and interface, processor, cables and storage devices)

Computer Memory: Memory Representation; Memory Hierarchy; CPU Registers; Cache Memory; Primary Memory(RAM, ROM); Secondary Memory (Magnetic Tape; Magnetic Disk; Optical Disk; Magneto-Optical Disk, Flash Memory Device), Access Types of Storage Devices (sequential and direct)

Input and Output Devices: Input-Output Unit; Input Devices; Human Data Entry Devices; Source Data Entry Devices; Output Devices; I/O Port; I/O System

Unit 3: Computer Software (6 Hrs.)
Introduction; Types of Software; System Software; Application Software; Operating System (Introduction, Objectives of Operating System, Types of OS, Functions of OS, Process Management, Memory Management, File Management, Device Management, Protection and Security, User Interface, Examples of Operating Systems); Device Drivers and Utility Software; Programming Languages, Language Translators: assembler, compiler; Software Licensing, Open Source Software; Case study: Unix Vs Windows

Unit 4: Data Representation (5 Hrs.)
Introduction; Number System; Conversion from Decimal to Binary, Octal, Hexadecimal; Conversion of Binary, Octal, Hexadecimal to Decimal; Conversion of Binary to Octal, Hexadecimal; Conversion of Octal, Hexadecimal to Binary; Binary Arithmetic

Unit 5: Computer Networks and Internet Services (10 Hrs.)
Introduction; Importance of Networking; Data Transmission Media (Twisted pair, coaxial cable, optical fiber, RF transmission, microwave transmission, satellite transmission); Data Transmission across Media; Data Transmission and Data Networking; Computer Network; Network Types; Network Topology; Communication Protocol; Network Devices; Wireless Networking
Internet; History of Internet; Internetworking Protocol; The Internet Architecture; Managing the Internet; Internet Connections; Internet Address; WWW, Domain Name System, Internet Services; E-mail and its working principle; E-commerce and E-governance; Web 2.0; Internet of Things (IoT); Wearable Computing; Cloud Computing; Smart City; Case Study: ISP in Nepal and their services

Unit 6: Database Systems (5 Hrs.)
Introduction; Database; Database System; Database Management System; Database System Architectures; Data Models, Database Applications; Introduction to Data Warehousing, Data mining, and BigData

Unit 7: Computer Security (4 Hrs.)
Introduction; Security Threat and Security Attack; Malicious Software; Security Mechanisms (Cryptography, Digital Signature, Firewall, Users Authentication, Intrusion Detection Systems); Security Awareness; Security Policy

Unit 8: Application and Impact of IT (3 Hrs.)
Applications of IT; Impact of IT on Organization and individuals; Societal Impacts of IT, IT Strategic Planning, IT and Business Alignment

Laboratory Works:
The laboratory work includes realizing hardware components of computer, using operating systems, Word Processors, Spreadsheets, Presentation Graphics, Database Management Systems, and Internet and its services.

Text Books:
1. Computer Fundamentals, Anita Goel, Pearson Education India

Reference Books:
1. Introduction to Computers, Peter Norton, 7th Edition, McGraw Hill Education
2. Fundamentals of Information Technology, Leon and Leon
3. Computer Fundamental, Pradeep K. Sinha and Priti Sinha
4. Introduction to Information Technology, E. Turban
5. Information Technology for Management, E.Turban, C. Pollard, G. Wood, Wiley Publication
6. Information Technology for Management, Henry C. Lucas, Jr.

C Programming

Course Title: C Programming
Course No: BIT102
Nature of the Course: Theory + Lab
Semester: I

Full Marks: 60 + 20 + 20
Pass Marks: 24 + 8 + 8
Credit Hrs: 3

Course Description:
This course familiarizes students with basic principles of programming. It introduces structured programming paradigm using a high level language called C. It covers the concept of problem solving techniques, program design, and basic elements of C along with the detailed concept of operators, statements, arrays, functions, pointers, structures and file handling.

Course Objective:
The main objective of this course is to acquaint the students with good program design through structured programming paradigm for developing programs for specific tasks using C Programming Language as well as to present the syntax and semantics of the "C" language.

Course Contents:

Unit 1: Introduction (3 Hrs.)
History and advantages of C; Problems analysis, algorithm and flowchart; Structure of a C Program; Writing, compiling, debugging, executing and testing a C Program in windows and Unix/Unix like environment

Unit 2: Elements of C (3 Hrs.)
C Tokens; C Character Sets; Data types, Constants and Variables; Expression, statements and comments; Escape sequences and Delimiters

Unit 3: Input/output function (2 Hrs.)
Conversion Specifiers; I/O functions; Formatted I/O

Unit 4: Operators and Expression (4 Hrs.)
Arithmetic operators; Relational operators; Logical operators; Assignment operators; Type conversion in assignment; Increment and decrement operators; Ternary operator; Bitwise operator; Other operators (comma, sizeof); Expression evaluation; Operator precedence and associativity

Unit 5: Control Structures (8 Hrs.)
Introduction to selection and iterative statements; GOTO and labels; Selection statements: if, if..else, if..else if ladder, nested if, switch case; Conditional operator; Iterative statement: For Loop, While Loop, Do while Loop, Nested Loop; The odd loop; Controlling the loop execution – break and continue

Unit 5: Arrays and Strings (5 Hrs.)
Introduction to Arrays; Initializing Arrays; The meaning of array indexing; One dimensional and Multidimensional Arrays; String and Basic functions dedicated to string manipulation

Unit 6: Functions (6 Hrs.)
Introduction and types of functions; Declaring, Defining and calling functions; Arguments and Return Statement; Recursive functions; Function call by value and reference; Variables' scope, local variables and function parameters; Arrays as function parameter; Void as a parameter; Parameterizing the main function; External function and variables; Header files; Static variables; Register Variables

Unit 7: The C Preprocessor (2 Hrs.)
Features of C Preprocessor; Macro Expansion; Macros with Arguments; Macros versus Functions; File Inclusion; Conditional Compilation; #if and #elif Directives; #undef Directive; #pragma Directive; The Build Process; Preprocessing; Compiling; Assembling; Linking; Loading

Unit 8: Pointers (5 Hrs.)
Introduction of Pointers, declaration and initialization of pointer variables; An address, a reference, a dereference and the sizeof operator; Pointer to nothing (NULL); Pointer assignment; Pointer Arithmetic; Pointer as argument and Pointer as return values; Pointers vs. arrays; Dynamic memory allocation

Unit 9: Structure and Unions (5 Hrs.)
Definition of Structure; Array of structures; Passing structure and array of structure to function; Pointers to structures and arrays of structures; Self-referential structures; Typedef; Table Lookup; Unions

Unit 10: File Handling (2 Hrs.)
Files vs. streams; Header files needed for stream operations; Opening and closing a stream, open modes, errno variable; Reading and writing to/from a stream; Predefined streams: stdin, stdout and stderr; Stream manipulation: fgetc(), fputc(), fgets() and fputs() functions; Raw input/output: fread() and fwrite() functions; Random access to files

Laboratory Works:
Laboratory work emphasizes the verification of programming concepts learned in class. Therefore, each unit should include sufficient practical lab exercise.

Text / Reference Books:
1. Let Us C, Yashavant P. Kanetkar
2. Brian Kernighan and Dennis Ritchie, The C Programming Language
3. Byron Gottfried, Programming with C, McGraw Hill Education

Digital Logic

Course Title: Digital Logic
Course No: BIT103
Nature of the Course: Theory + Lab
Semester: I

Full Marks: 60 + 20 + 20
Pass Marks: 24 + 8 + 8
Credit Hrs: 3

Course Description:
This course familiarizes students with Number System, Digital Design Fundamentals, Understand and Design Functions of Combinational Logic, Sequential Logic (Counters, Registers and Finite State Machine), Memories, Programmable Logic Devices Integrated Circuit Technologies.

Course Objective:
To provide the concepts used in the design and analysis of digital systems and introduces the principles of digital computer organization and design.

Course Contents:

Unit 1: Number Systems, Operations and Codes (6 Hrs.)
Introduction to Number System, Decimal, Binary, Octal, Hexadecimal Number Systems, Conversion from one number system to another, Complements of Numbers, Addition and Subtraction of Binary Numbers, Binary Codes and Error Detection Codes

Unit 2: Digital Design Fundamentals and Boolean algebra (8 Hrs.)
Digital and Analog Signals, Logic Operations, Introduction to the System Concept, Logic Gates (Basic Gates, Derived Gates, Universal Gates), Logic Function and Boolean Algebra

Unit 3: Simplification of Boolean Functions (5 Hrs.)
K-map, Two and Three variable maps, Four variable maps, product of sum simplification, NAND and NOR implementation, Don't Care conditions

Unit 4: Combinational Logic (7 Hrs.)
Adders and Subtractors, Parallel Binary Adders, Multiplexers and Demultiplexers, Encoders and Decoders, Seven segment decoder, Code Converters

Unit 5: Sequential Logic (4 Hrs.)
Latches, Edge-Triggered Flip-Flops, Flip-Flop Operating Characteristics, Flip-Flop Application

Unit 6: Counters, Registers and Memory (9 Hrs.)
Asynchronous Counters, Synchronous Counters, Up/Down Counters, Counter Applications, Basic Shift Register Operations, Shift Register Types, Bidirectional Shift Registers, Shift Register Counters, Basic Memory Operations and memory types

Unit 7: Processor Logic Design (6 Hrs.)
Processor Organization, Arithmetic Logic Unit, Design of Arithmetic Circuit, Design of Logic Circuit, Design of Arithmetic Logic Unit, Status Register, Design of Shifter

Laboratory Works:

- Familiarization with Logic Gates
- Encode and Decodes
- Multiplexer and De-Multiplexer
- Design of simple combination Circuits
- Design of Adder/combination Circuits
- Design of Flip Flop
- Clock driven sequential circuits
- Conversion of parallel data into serial format
- Generation of timing signal for sequential system

Text Book:

- Mano M.M., *Digital logic and Computer Design*, Pearson Education

References Books:

- Mano M.M. and Ciletti M. M, *Digital Design*, 4th edition
- Brown S. and Vranesic Z., *Fundamentals of Digital Logic with VHDL Design*, 3rd edition, McGraw Hill
- Rafiquzzaman M., *Fundamentals of Digital Logic and Microcomputer Design*, 5th edition, JohnWiley & Sons, Inc.
- Holdsworth B. and Woods C., *Digital Logic Design*, 4th edition
- Mano M. M, Kime C. R , *Logic and computer design fundamentals*, 2nd edition

Basic Mathematics

Course Title: Basic Mathematics
Course No: MTH104
Nature of the Course: Theory
Semester: I

Full Marks: 80 +20
Pass Marks: 32 + 8
Credit Hrs: 3

Course Description:
This course familiarizes students with functions, limits, continuity, differentiation, integration of function of one variable, logarithmic, exponential, applications of derivative and antiderivatives, differential equations, partial derivatives.

Course Objectives:

1. Students will be able to understand and formulate real world problems into mathematical statements.
2. Students will be able to develop solutions to mathematical problems at the level appropriate to the course.
3. Students will be able to describe or demonstrate mathematical solutions either numerically or graphically.

Course Contents:

Unit 1: Functions Limits and Continuity (5 Hrs.)
Functions and Their Graphs, Combining Functions; Shifting and Scaling Graphs, Trigonometric Functions, Graphing with Calculators and Computers, Exponential Functions, Inverse Functions and Logarithms, Rates of Change and Tangents to Curves.

Unit 2: Limits and Continuity (3 Hrs.)
Limit of a Function and Limit Laws, The Precise Definition of a Limit, One-Sided Limits, Continuity, Limits Involving Infinity; Asymptotes of Graphs.

Unit 3: Differentiations (5 Hrs.)
Tangents and the Derivative at a Point, The Derivative as a Function, The Derivative as a Rate of Change, Derivatives of Trigonometric Functions, The Chain Rule, Implicit Differentiation, Derivatives of Inverse Functions and Logarithms, Inverse Trigonometric Functions, Related Rates.

Unit 4: Applications of Derivatives (5 Hrs.)
Extreme values of functions, The Mean value theorem, Monotonic functions and the first derivative test, Concavity and Curve sketching, Indeterminate forms and L'Hôpital's rule, Applied optimization, Newton's method.

Unit 5: Integration (5 Hrs.)
Antiderivatives, Area and estimating with finite sums, Sigma notation and Limits of finite sums, The definite integral, The Fundamental theorem of calculus, Indefinite integrals and the substitution method, Substitution and Area between curves.

Unit 6: Applications of Definite Integrals (3 Hrs.)
Volumes using cross-sections, Volumes using cylindrical Shells, Arc length, Areas of surfaces of revolution, Work and fluid forces, Moments and centers of mass

Unit 7: Techniques of Integrations (5 Hrs.)
Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fractions, Integral tables and computer algebra systems, Numerical integration, Improper integrals.

Unit 8: First Order Differential Equations (4 Hrs.)
Solutions, Slope Fields, and Euler's method, First order linear equations, Applications, Graphical solutions of Autonomous equations, Systems of equations and phase planes.

Unit 9: Infinite Sequence and Series (5 Hrs.)
Sequences, Infinite series, The Integral test, Comparison tests, The Ratio and root tests, Alternating series, Absolute and Conditional convergence, Power series, Taylor and Maclaurin series, Convergence of Taylor series.

Unit 10: Partial Derivatives (5 Hrs.)
Functions of several variables, Limits and continuity in higher dimensions, Partial derivatives, The Chain rule, Directional derivatives and gradient vectors, Tangent planes and differentials, Extreme values and saddle points Lagrange multipliers, Taylor's formula for two variables, Partial derivatives with constrained variables.

Text/Reference Book:
Maurice D. Weir and Joel Hass, Thomas' Calculus, Early Transcendentals, 12th Edition, 2009.

Sociology

Course Title: Sociology
Course No: SCO105
Nature of the Course: Theory
Semester: I

Full Marks: 80 + 20
Pass Marks: 32 + 8
Credit Hrs: 3

Course Description:
This course familiarizes students with the subject matter of sociology in terms of broader understanding of society in relation to information technology. It helps students understand the importance of sociology as its relationship to other sciences. More importantly, it enhances the capability of understanding and analyzing society so that they can apply information technology with better understanding of social structure, social system, social processes, and social institutions to bring social change using new information technology.

Course Objectives:
At the end of this course, students will be able to:

- Describe sociology and discuss its relationship to other sciences (social sciences; history, psychology, anthropology, economics and political science including management and education as well as pure sciences; information technology, biology, and so on).
- Comprehend and explain the fundamental sociological concepts.
- Discuss social structure, social system, social processes, etc. in relation to information technology
- Analyze social structure, social system, cultural practices and develop a framework of applying new information technology in proper way.

Course Contents:
Unit 1: Introduction (9 Hrs.)

a) What is sociology? Sociological viewpoint; the origins of sociology; perspectives within sociology; sociology and social concerns; sociology's four realms.
b) Relationship between sociology and other social and natural sciences: focus on sociology and information technology; biology; chemistry; anthropology; psychology; management; education; law, etc.
c) Traditional society and technological society
d) Sociology and the twenty first century

Unit 2: The Fundamentals of Society (9 Hrs.)

a) Culture: culture and human intelligence; culture, nation, and society
b) The components of culture: symbols; language; values and beliefs; norms; ideal and real culture; material culture and technology; new information technology and culture
c) Development of culture around the world: cultural universals; globalization, diffusion, and technology

Unit 3: The Social Structure (12 Hrs.)

a) The sustaining forces of codes and custom: the more and social control; the major forms of social codes; social codes and the individual life
b) The major forms of social structure: types of social groups; the family; the community; city, country, and region; social class and caste; ethnic and racial groups; herd, crowd, and mass communication; associations and interests; the great association: political and economic; functional systems
c) Information technology and social structure

Unit 4: Social Institutions and Processes (9 Hrs.)

a) Social structure, societies and civilizations
b) Science, technology and society
c) Economic institutions,
d) Political institutions,
e) The family and kinship
f) Social differentiation and stratification

Unit 5: Social Change (6 Hrs.)

a) Change, development, progress
b) Factors in social change
c) Modernity
d) Post-modernity
e) Globalization and changing world

Unit 6: Application of Sociology (3 Hrs.)

a) Sociology, social policy and social planning,
b) Social problems

Required Readings:

Unit 1: Introduction

Curry, Tim, Jiobu, Robert and Schwirian, Kent. 2008. *Sociology for the Twenty First Century*. Fifth Edition. Pp. 1-25.New Jersey: Pearson Prentice Hall.

Schaefer, Richard T. 2006. *Sociology: A Brief Introduction*. Sixth Edition. Pp. 3-26. New Delhi: TATA MCGRAW-HILL.

Inkeles, Alex. 2001. *What is sociology? An introduction to the discipline and profession*. Pp. 1-17; 18-24; 28-46. New Delhi: Prentice Hall of India pvt. Ltd.

Macionis, John J. 1987. *Sociology.* Eighth Edition. Pp. 1-24. New Jersey: Prentice Hall of India.

Haralambos, M. And Heald, R. M. 2009. *Sociology: Themes and Perspective*s. Thirty-fourth Impression. Pp. 1-23. New Delhi: Oxford University Press.

MacIver, R.M. & Page, C.H. 2001. *Society: An Introductory Analysis*. Reprinted. Pp. 1-23. New Delhi: MACMILLAN.

Rocher, Guy. 2004. *A General Introduction to Sociology: A Theoretical Perspective*. Pp. 2-5; 210-255. Calcutta, India: Academic Publishers.

McQuail, Denis. 1985. Sociology of Mass Communication. *Annual Review of Sociology*, Vol. 11 (1985), pp. 93-111. Stable URL: http://www.jstor.org/stable/2083287; Accessed: 05-10-2017 07:12 UTC.

Buttel, Frederick H. 1991 September. Beyond Deference and Demystification in the Sociology of Science and Technology: A Reply to Otero. *Sociological Forum*, Vol. 6, No. 3 (Sep., 1991), pp. 567-577. Stable URL: http://www.jstor.org/stable/684519; Accessed: 05-10-2017 07:18 UTC.

Castells, Manuel. 2000, Sep. Toward a Sociology of the Network Society. *Contemporary Sociology*, Vol. 29, No. 5 (Sep., 2000), pp. 693-699. Stable URL: http://www.jstor.org/stable/2655234; Accessed: 05-10-2017 07:19 UTC.

Wynn, Jonathan R. 2009 June. Digital Sociology: Emergent Technologies in the Field and the Classroom. *Sociological Forum*, Vol. 24, No. 2 (Jun., 2009), pp. 448-456. Stable URL: http://www.jstor.org/stable/40210412; Accessed: 05-10-2017 07:23 UTC.

Woolgar, Steve. 1985 November. Why not a Sociology of Machines? The Case of Sociology and Artificial Intelligence. *Sociology*, Vol. 19, No. 4 (November 1985), pp. 557-572. Stable URL: http://www.jstor.org/stable/42853468; Accessed: 05-10-2017 07:22 UTC.

Rafael, Erwin F. 2013 July-December. Technology as a Social System: A Systems Theoretical Conceptualization. *Philippine Sociological Review*, Vol. 61, No. 2, Classical Sociological Theory in Contemporary Practice. (July-December 2013), pp. 319-347. Stable URL: http://www.jstor.org/stable/43486378; Accessed: 05-10-2017 07:30 UTC.

Unit 2: The Fundamentals of Society

MacIver, R.M. & Page, C.H. 2001. *Society: An Introductory Analysis*. Reprinted. Pp. 136-507. New Delhi: MACMILLAN.

Macionis, John J. 1987. *Sociology.* Eighth Edition. Pp. 59-88. New Jersey: Prentice Hall of India.

Schaefer, Richard T. 2006. *Sociology: A Brief Introduction*. Sixth Edition. Pp. 55-78. New Delhi: TATA MCGRAW-HILL.

Curry, Tim, Jiobu, Robert and Schwirian, Kent. 2008. *Sociology for the Twenty First Century*. Fifth Edition. Pp. 46-60.New Jersey: Pearson Prentice Hall.

MacIver, R.M. & Page, C.H. 2001. *Society: An Introductory Analysis*. Reprinted. Pp. 41-71. New Delhi: MACMILLAN.

Luthar, Breda and Samo Kropivnik. 2011. Class, Cultural Capital, and the Mobile Phone. *Sociologický Časopis / Czech Sociological Review*, Vol. 47, No. 6 (2011), pp. 1091-1118. Stable URL: http://www.jstor.org/stable/23535016; Accessed: 05-10-2017 07:30 UTC.

Unit 3: The Social Structure

MacIver, R.M. & Page, C.H. 2001. *Society: An Introductory Analysis*. Reprinted. Pp. 136-507. New Delhi: MACMILLAN.

Mckee, James B. 1981. *Sociology: The Study of Society*. Pp. 287-408. New York: Holt, Rinehart and Winston.

Pfeffer, Jeffrey and Huseyin Leblebici. 1977 Apr. Information Technology and Organizational Structure. *The Pacific Sociological Review*, Vol. 20, No. 2 (Apr., 1977), pp. 241-261. Stable URL: http://www.jstor.org/stable/1388934; Accessed: 05-10-2017 07:12 UTC.

Lyon, David. 1987 August. Information Technology and Information Society: A response to Fincham. *Sociology*, Vol. 21, No. 3 (August 1987), pp. 467-468. Stable URL: http://www.jstor.org/stable/42854004; Accessed: 05-10-2017 07:15 UTC.

Unit 4: Social Institutions and Processes

Bottomore, T. B. 1986. *Sociology: A Guide to Problems and Literature*. New Edition. Pp. 113-216. New Delhi: Blackie & Son (India).

Davis, Kingsley. 1981. Human Society. First Indian Reprint. Pp. 435-550. New Delhi: Surjeet Publications.

Mckee, James B. 1981. *Sociology: The Study of Society*. Pp. 287-408. New York: Holt, Rinehart and Winston.

Mellor, Philip A. 2004 Winter. Religion, Culture and Society in the 'Information Age'. *Sociology of Religion*, Vol. 65, No. 4, Special Issue: [Culture and Constraint in the Sociology of Religion] (Winter, 2004), pp. 357-371. Stable URL: http://www.jstor.org/stable/3712319; Accessed: 05-10-2017 07:29 UTC.

Unit 5: Social Change

Bottomore, T. B. 1986. *Sociology: A Guide to Problems and Literature*. New Edition. Pp. 283-314. New Delhi: Blackie & Son (India).

Curry, Tim, Jiobu, Robert and Schwirian, Kent. 2008. *Sociology for the Twenty First Century*. Fifth Edition. Pp. 61-79.New Jersey: Pearson Prentice Hall.

Macionis, John J. 1987. *Sociology.* Eighth Edition. Pp. 623-647. New Jersey: Prentice Hall of India.

Giddens, Anthony. 2006. Sociology. Fifth Edition. Pp. 30-71. New Delhi: Polity Press.

Unit 6: Application of Sociology

Guthrie, Doug. 1999 Winter. A Sociological Perspective on the Use of Technology: The Adoption of Internet Technologyin U.S. Organizations. *Sociological Perspectives*, Vol. 42, No. 4 (Winter, 1999), pp. 583-603. Stable URL: http://www.jstor.org/stable/1389575; Accessed: 05-10-2017 07:12 UTC.

Bottomore, T. B. 1986. *Sociology: A Guide to Problems and Literature*. New Edition. Pp. 315-343. New Delhi: Blackie & Son (India).

Diebold, John. 1962 March. The Application of Information Technology. *The Annals of the American Academy of Political and Social Science*, Vol. 340, Automation (Mar., 1962), pp. 38-45. Stable URL: http://www.jstor.org/stable/1033697; Accessed: 05-10-2017 07:11 UTC.

Fox, Nick, Katie Ward and Alan O'Rourke. 2006 April. A Sociology of Technology Governance for the Information Age: The Case of Pharmaceuticals, Consumer Advertising and the Internet. *Sociology*, Vol. 40, No. 2 (APRIL 2006), pp. 315-334. Stable URL: http://www.jstor.org/stable/42858172; Accessed: 05-10-2017 07:17 UTC.

Microprocessor and Computer Architecture

Course Title: Microprocessor and Computer Architecture
Course No: BIT151
Nature of the Course: Theory + Lab
Semester: II

Full Marks: 60 + 20 + 20
Pass Marks: 24 + 8 + 8
Credit Hrs: 3

Course Description:
This course aims at providing fundamental knowledge about computer architecture, Instruction cycle, components of Microprocessor, Intel 8085 and assembly programming.

Course Objectives:
The main objective of this course is to provide basic knowledge of components of Microprocessor, block diagram and assembly language programming using Intel 8085, SAP1 and SAP2 computer architecture, timing diagrams, instruction cycles, machine cycles, control unit, central processing unit, RISC, CISC, Direct Memory Access, Interrupts, serial and parallel interfaces.

Course Contents:

Unit 1: Introduction to Microprocessor (6 Hrs.)
Components of a Microprocessor: Registers, ALU, Control and Timing, System Buses, Microprocessor Systems with Bus Organization, Introduction to SAP1 and SAP2

Unit 2: Intel 8085 (8 Hrs.)
Functional Block Diagram and Pin Configuration, Timing and control Unit, Registers, Data and Address Bus, Intel 8085 Instructions, Operation Code and Operands, Addressing Modes, Interrupts, Flags, Institutions and Data Flow inside 8085, Basic Assembly Language Programming Using 8085 Instruction Sets

Unit 3: Microoperations (3 Hrs.)
Arithmetic Microoperations, Logic Microoperations, Shift Microoperations, Arithmetic Logic Shift Unit

Unit 4: Control Unit and Central Processing Unit (9 Hrs.)
Control Unit of Basic Computer, Computer Arithmetic (Adder, Subtractor, Divider, and Multiplicator), Timing Signal, Micro-Instruction and Micro-Operation Format, Symbolic Microinstructions, Symbolic Micro-program, Binary Micro-Program, Register Organization, Register Stack and Memory Stack, Data transfer and Manipulation, Introduction to RISC and CISC

Unit 5: Fixed point Computer Arithmetic (5 Hrs.)
Addition and Subtraction, Multiplication, Division Algorithm

Unit 6: Input and Output Organization (5 Hrs.)
Introduction to Peripheral Devices, I/O interface, Direct Memory Access (DMA), I/O Processor, Data communication processor

Unit 7: Memory Organization (5 Hrs.)
Hierarchy of Memory System, Primary and Secondary Memory, Virtual Memory, Memory Management hardware

Unit 8: Pipelining (4 Hrs.)
Concept of Pipelining, Arithmetic Pipeline, Instruction Pipeline, Data Dependency, Handling of branch Instruction

Laboratory Works:
The laboratory works should be carried out in 8085 trainer kit. The programming should include arithmetic operation, base conversion, conditional branching etc.

Text Books:
1. Ramesh S. Gaonkar: Microprocessor Architecture, Programming, and Applications with 8085, prentice Hall
2. Morris Mano: Computer system Architecture, Third Edition, prentice Hall

Reference Books:
1. Malvino: Digital Computer system Electronics (An introduction to Microcomputers)
2. Douglas V. Hall: Microprocessor and Interfacing programming and Hardware, McGraw Hill

Discrete Structure

Course Title: Discrete Structure
Course No: BIT152
Nature of Course: Theory + Lab
Semester: II

Full Marks: 60+20+20
Pass Marks: 24+8+8
Credit hours: 3

Course Description: The course introduces the basic concepts of discrete mathematics such as introductory logic, proofs, sets, relations, functions, counting and probability, with an emphasis on applications in information technology.

Course Objectives: The main objective of the course is to introduce basic concepts of discrete mathematics, understand the concepts of graphs, functions, relations and number theory respectively and explore applications of discrete mathematics in information technology.

Course Contents:

Unit 1: Logic and Proof Methods (6 Hrs.)

Propositional Logic: Propositional Logic, Propositional Equivalences, Rule of inferences, Valid Arguments.

Predicate Logics: Predicates and Quantifiers, Negation of Quantified Statements, Proof of quantified statements, Nested Quantifiers, Rules of Inferences, Translating English Sentence to predicate logic expressions.

Proof Methods: Basic Terminologies, Proof Methods (Direct Proof, Indirect Proof, Proof by Contradiction, Proof By Contraposition, Exhaustive Proofs and Proof by Cases), Mistakes in Proof

Unit 2: Sets, Relations and Functions (7 Hrs.)

Sets: Sets and Subsets, Power Set, Cartesian Product, Set Operations, Venn Diagram, Inclusion-Exclusion Principle, Computer Representation of Sets.
Relations: Relations and their Properties, N-ary Relations with Applications, Representing Relations, Closure of Relations, Equivalence Relations, Partial Ordering
Functions: Basic Concept, Injective and Bijective Functions, Inverse and Composite Functions, Graph of Functions, Functions for Computer Science (Ceiling Function, Floor Function, Boolean Function, Exponential Function)

Unit 3: Induction and Recursion (5 Hrs.)

Induction: mathematical Induction, Strong Induction and Well Ordering, Induction in General
Recursive Definitions and Structural Induction, Recursive Algorithms, Proving Correctness of Recursive Algorithms.

Unit 4: Number Theory (6 Hrs.)

Integers: Integers and Division, Primes and Greatest Common Divisor, Extended Euclidean Algorithm, Integers and Algorithms, Applications of Number Theory (Linear Congruencies, Chinese Remainder Theorem, Computer Arithmetic with Large Integers)
Matrices: Zero-One Matrices, Boolean Matrix Operations

Prime Number and its applications

Unit 5: Counting and Discrete Probability (9 Hrs.)

Counting: Basics of Counting, Pigeonhole Principle, Permutations and Combinations, Two Element Subsets, Counting Subsets of a Set, Binomial Coefficients, Generalized Permutations and Combinations, Generating Permutations and Combinations with examples.

Discrete Probability: Introduction to Discrete Probability, Probability Theory, Probability Calculation in Hashing, Expected Value and Variance, Randomized Algorithms

Advanced Counting: Recurrence Relations, Solving Recurrence Relations (Homogeneous and Non-Homogeneous equations),

Unit 6: Tree and Graphs (11 Hrs.)

Graphs: Graphs Basics, Graph Types, Graph Models, Graph Representation, Graph Isomorphism, Connectivity in Graphs, Euler and Hamiltonian Path and Circuits, Matching Theory, Shortest Path Algorithm (Dijkstra's Algorithm), Travelling Salesman Problem, Graph Coloring

Trees: Introduction and Applications, Tree Traversals, Spanning Trees, Minimum Spanning Trees (Kruskal's Algorithm)

Laboratory Works:

The laboratory work consists of implementing the algorithms and concepts discussed in the class. Student should implement problems with following concepts;

- Set Operations, relations and functions
- Primality Testing, Number Theory Algorithms, and Operations on Integers
- Counting and Some Recursive Algorithms
- Predicate Logic
- Algorithms for Tree, Graphs

Text / Reference Books:

1. Kenneth H. Rosen, Discrete mathematics and its applications, Seventh Edition McGraw Hill Publication, 2012.
2. Bernard Kolman, Robert Busby, Sharon C. Ross, Discrete Mathematical Structures, Sixth Edition Pearson Publications, 2015
3. Joe L Mott, Abraham Kandel, Theodore P Baker, Discrete Mathematics for Computer Scientists and Mathematicians, Printice Hall of India, Second Edition, 2008

Object Oriented Programming

Course Title: Object Oriented Programming
Course No: BIT153
Nature of Course: Theory + Lab
Semester: II

Full Marks: 60+20+20
Pass Marks: 24+8+8
Credit hours: 3

Course Description: The course familiarizes students with the concepts of object oriented programming using C++.

Course Objective: The main objective of this course is to understand the basics of object oriented programming. This course covers the C++ concepts such as objects, class, operator overloading, inheritance and polymorphism, file I/O, exception handling and templates.

Course Contents:

Unit 1: Introduction to Object Oriented Programming (3 Hrs.)
Overview of structured and object oriented programming approach, Characteristics of object oriented languages

Unit 2: Basics of C++ programming (5 Hrs.)
C++ Program Structure, Character Set and Tokens, Data Type, Type Conversion, Preprocessor Directives, Namespace, Input/Output Streams and Manipulators, Dynamic Memory Allocation with new and delete, Control Statements.
Functions: Function Overloading, Inline Functions, Default Argument, Pass by Reference, Return by Reference, Scope and Storage Class.
Pointers: Pointer variables declaration & initialization, Operators in pointers, Pointers and Arrays, Pointer and Function.

Unit 3: Class and Objects (8 Hrs.)
Class and Object, Accessing members of class, Initialization of class object (Constructor), Destructor, Default Constructor, Parameterized Constructor, Copy Constructor, The Default Copy Constructor, Objects as Function Arguments, Returning Objects from Functions, Structures and Classes, Memory allocation for Objects, Static members, Member functions defined outside the class.

Unit 4: Operator Overloading (7 Hrs.)
Fundamental of operator overloading, Restriction on operator overloading, Operator functions as a class members, Overloading unary and binary operator, Data Conversion (basic to basic, basic to user-defined, user-defined to basic, user-defined to user-defined)

Unit 5: Inheritance (7 Hrs.)
Introduction to inheritance, Derived Class and Base Class, Access Specifiers (private, protected, and public), Types of inheritance, Public and Private Inheritance, Constructor and Destructor in derived classes, Aggregation, Ambiguity

Unit 6: Virtual Function, Polymorphism, and other C++ Features (5 Hrs.)
Concept of Virtual functions, Late Binding, Abstract class and pure virtual functions, Virtual Destructors, Virtual base class, Friend function and Static function, Assignment and copy initialization, Copy constructor, This pointer, Concrete classes, Polymorphism and its roles.

Unit 7: Function Templates and Exception Handling (4 Hrs.)
Function templates, Function templates with multiple arguments, Class templates, templates and inheritance, Exceptional Handling (Try, throw and catch), Use of exceptional handling.

Unit 8: File and Streams (6 Hrs.)
Stream Class Hierarchy, String I/O (Reading I/O, Writing I/0, Detecting end of file), Character I/O, Object I/O (Writing an object to Disk, Reading an object from Disk), File pointers

Laboratory Works:
Students should be able to implement the above mentioned concepts of Object Oriented Programming using C++ language.

Text Book:
1. Robert Lafore, Object Oriented Programming in C++, Fourth Edition, SAMS publications.

Reference Books:
1. Deitel and Deitel, C++ How to Program, Third Edition, Pearson Publication.
2. Joyce Farrell, Object-oriented programming using C++, Fourth Edition, Cengage Learning.
3. Herbert Schildt, C++ The Complete Reference, Fourth Edition, Tata McGraw Hill Publication.

Basic Statistics

Course Title: Basic Statistics
Course No: STA154
Nature of the Course: Theory + Lab
Semester: II

Full Marks: 60 + 20 + 20
Pass Marks: 24 + 8 + 8
Credit Hrs: 3

Course Description:
The course familiarizes students with the basic concepts of statistics including introduction, diagrammatical and graphical representation, descriptive statistics, probability, random variables, sampling, and correlation and regression.

Course Objective:
To impart the knowledge of descriptive statistics, correlation, regression, concept of sampling and sampling distribution, theoretical as well as applied knowledge of probability and some probability distributions.

Course Contents:

Unit 1: Introduction (5 Hrs.)
Basic concept of statistics; Application of Statistics in different fields including information technology; Scales of measurement; Variables; Types of Data and data source; Data preparation-editing, coding, and transcribing.

Unit 2: Diagrammatical and Graphical Presentation of Data (3 Hrs.)
Bar diagrams; Pie diagrams; Pareto chart; Graph of frequency distribution

Unit 3: Descriptive Statistics (7 Hrs)
Measures of central tendency; Measures of dispersion; Measures of skewness; Measures of kurtosis; Moments; Steam and leaf display; five number summary; box plot.
Problems and illustrative examples related to IT

Unit 4: Introduction to Probability (7 Hrs.)
Concepts of probability; Definitions of probability; Laws of probability; Bayes theorem; prior and posterior probabilities
Problems and illustrative examples related to IT

Unit 5: Random Variables and Mathematical Expectation (3 Hrs.)
Concept of a random variable; Types of random variables; Probability distribution of a random variable; Mathematical expectation of a random variable; Addition and multiplicative theorems of expectation(without proof).
Problems and illustrative examples related to IT

Unit 6: Probability Distributions (6 Hrs.)
Probability distribution function**;** Binomial distribution; Poisson distribution; Normal distribution and their characteristic features. Applications of these distributions in IT related data problems.

Problems and illustrative examples related to computer Science and IT

Unit 7: Sampling and Sampling Distribution (7 Hrs.)
Definitions of population; sample survey vs. census survey; sampling error and non sampling error; Types of sampling; Standard error of mean; standard error of proportion; sampling distribution of mean and proportion; Need of inferential Statistics; Concept of estimation; confidence interval estimation for mean and proportion.
Problems and illustrative examples related to IT

Unit 8: Correlation and Linear Regression (7 Hrs.)
Bivariate data; Bivariate frequency distribution; Correlation between two variables; Karl Pearson's coefficient of correlation(r); Spearman's rank correlation; Regression Analysis: Fitting of lines of regression by the least squares method; coefficient of determination

Problems and illustrative examples related to IT

Laboratory Works:
Practical (Computational Statistics):
Practical problems to be covered in the Computerized Statistics laboratory

Practical problems

S. No.	Title of the practical problems (Using any statistical software such as Microsoft Excel, SPSS, STATA etc. whichever convenient).	No. of practical problems
1	Diagrammatical and graphical presentation of data	1
2	Computation of measures of central tendency (ungrouped and grouped data) Use of an appropriate measure and interpretation of results and computation of partition Values	1
3	Computation measures of dispersion (ungrouped and grouped data) and computation of coefficient of variation.	1
4	Measures of skewness and kurtosis using method of moments, Measures of Skewness using Box and whisker plot.	2
5	Scatter diagram, correlation coefficient (ungrouped data) and interpretation. Compute manually and check with computer output.	1
6	Fitting of simple linear regression model (Results to be verified with computer output), Mean residual sum of squares, residual plot	1
7	Conditional probability and Bayes theorem	3
8	Problems related to Binomial, Poisson and Normal probability distributions	2
9	Problems related sampling and sampling distribution of mean and proportion, confidence interval estimation for mean and proportion	3
	Total number of practical problems	**15**

Text Books:

1. Michael Baron (2013). Probability and Statistics for Computer Scientists. 2nd Ed., CRC Press, Taylor & Francis Group, A Chapman & Hall Book.

2. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, & Keying Ye(2012). Probability & Statistics for Engineers & Scientists. 9th Ed., Printice Hall.

Reference Books:

1. Douglas C. Montgomery & George C. Ranger (2003). Applied Statistics and Probability for Engineers. 3rd Ed., John Willey and Sons, Inc.
2. Richard A. Johnson (2001). Probability and Statistics for Engineers. 6th Ed., Pearson Education, India

Economics

Course Title: Economics
Course No: ECO155
Nature of the Course: Theory
Semester: II

Full Marks: 80 + 20
Pass Marks: 32 + 8
Credit Hrs: 3

Course Description:
This course covers the basic concepts of microeconomics and macroeconomics. In encompasses basic economic problems, demand, supply, market equilibrium, elasticity of demand and supply, consumer choice, production, cost, revenue, market structure, concept of national product and income and its measurement, monetary and fiscal policies.

Course Objectives:
The main objective of this course is to make students familiar with the basic concepts of economics.

Course Content:

Unit 1: Economic Issues and Concepts (4 Hrs.)
Introduction to economics with reference to Alfred Marshall and Lionel Robbins' definitions ; Concept of microeconomics and its scope; Main characteristics of free market, centrally planned and mixed economic systems; Society's production possibility curve/frontier, and choice, scarcity and opportunity cost

Unit 2: Demand, Supply and Price (10 Hrs.)
Meaning of demand and supply; Law of demand and supply; Individual and market demand and supply (with schedule and graph/curve); movement along and shift of a demand and supply curves; market equilibrium: the interplay of demand and supply; change in market equilibrium due to factors shifting the demand and supply curves; price, income and cross-price elasticities of demand and their measurement by percentage and arc/mid-point methods; price elasticity of supply; concept of consumer and producer surpluses; government intervention in the market through price floor ,price ceiling and taxand effect

Unit 3: Consumer Choice: Indifference Theory (6 Hrs.)
Concept of utility, total utility and marginal utility; Law of diminishing marginal utility; Indifference curve analysis: Meaning and assumptions of indifference curve analysis; basic properties of indifference curves; right-angled (L-shaped) and linear (straight line) indifference curves, marginal rate of substitution (MRS); consumer's budget line; consumer's equilibrium, income consumption curve (ICC) and price consumption curve (PCC) for normal, inferior, and Giffen goods.

Unit 4: Production (6 Hrs.)

Meaning of production and production function (Cobb-Douglas production function) ; production with one variable input: the law of diminishing marginal productivity/returns; production with two variable inputs: concept of isoquant; property of isoquants ;right-angled(L-shaped) and linear(straight line) isoquants; concept of isocost curve (meaning, equation, slope); producer's equilibrium ,condition for optimum employment of one, two and many inputs/factors of production; Production in the long run: Concepts of returns to scale with possible causes of each

Unit 5: Costs and Revenue (5 Hrs.)

Concept of economic cost as a sum of explicit and implicit costs; concept of short run total costs (fixed and variable) and unit costs (average fixed, average variable, average total, and marginal) and their curves; relation between average variable, average total and marginal costs; costs in the long run: average and marginal costs; causes of U-shaped and L-shaped long run average cost curves

Concepts of total, average and marginal revenues and their curves in the perfect competition and imperfect competition markets

Unit 6: Market Structure (8 Hrs.)

Perfect competition: characteristics, and price and output determination in the short and long run using the total and marginal approaches; Monopoly market: Characteristics, sources of monopoly, and price and output determination in the short and long run using the total and marginal approaches; Monopolistic competition: Features and price –output determination using total and marginal approaches; Oligopoly market: Basic features/characteristics; centralised cartel

Unit 7: National Product and its Measurement (4 Hrs.)

Concept of macroeconomics and its scope; Concepts of gross domestic product (GDP), gross national income (GNI), net national product (NNP),national income(NI), personal income(PI),disposable personal income(DPI); measurement of national income and output by expenditure, income (cost of production) and value added approaches.

Unit 8: Macroeconomic Policies (2 Hrs.)

Concept of expansionary and contractionary fiscal and monetary policies; tools of fiscal and monetary policies

Text / Reference Books:

1. Lipsey, R.G., &Chrystal, K.A. (2008). ***Economics***, 11th ed., (Indian Edition).New Delhi: Oxford University Press.
2. Samuelson, P.A. & Nordhaus, W.D. (2005). ***Economics***, 18thed. New Delhi: Tata McGraw-Hill Publishing Company Ltd.

Data Structures and Algorithms

Course Title: Data Structures and Algorithms
Course No: BIT201
Nature of the Course: Theory + Lab
Semester: III

Full Marks: 60 + 20 + 20
Pass Marks: 24 + 8 + 8
Credit Hrs: 3

Course Description:
The course familiarizes students with different concepts of data structures, abstract types, and algorithms.

Course Objective:
This course aims to provide sufficient theoretical and practical knowledge of data structure and algorithms required to build efficient programs.

Course Contents:

Unit 1: Background and Concept of Data Structures (2 Hrs.)
- Introduction: Data Types, Data Structure, Abstract Data Type
- Background for Data Structure: Array, Array as an ADT, Structure, Pointer, Class in C++

Unit 2: Algorithms (2 Hrs.)
- Fundamentals of Algorithm
- Elementary Analysis of algorithm with asymptotic notations and their properties, time and space complexities

Unit 3: Stack (4 Hrs.)
- Definition
- Primitive Operations, Stack as an ADT
- Stack Applications: Evaluation of Infix, Postfix and Prefix expressions, converting from infix to postfix

Unit 3: Queue (3 Hrs.)
- Definition
- Primitive Operations, Queue as an ADT
- Circular and Priority Queues

Unit 4: Recursion (2 Hrs.)
- Definition and Principle
- Application of recursion with TOH problem, Factorial, Fibonacci Sequences

Unit 5: List (9 Hrs.)

- Definition, Static and Dynamic List Structure
- Operations on Linked List
- Linked implementation of a stack
- Linked implementation of a queue
- Circular Linked List
- Doubly Linked List
- Doubly Circular Linked List

Unit 6: Tree (7 Hrs.)

- Definition and basic terminologies
- Binary Tree: Introduction, Types of Binary Tree, Operations
- Binary Search Tree: Insertion, Deletion, Searching
- Tree Traversal: Pre-order traversal, In-order traversal, Post-order traversal
- Applications of Binary Tree

Unit 7: Sorting (6 Hrs.)

- Introduction and types of sorting
- Algorithm and implementation of Bubble Sort, Insertion Sort, Selection Sort, Quick Sort, Merge Sort
- Comparison and Efficiency of sorting algorithms

Unit 8: Searching (5 Hrs.)

- Introduction
- Sequential Search, Binary Search and Tree Search
- Comparison and Efficiency of Searching
- Hashing

Unit 9: Graph (5 Hrs.)

- Definition, Representation of Graph, Types of Graph
- Graph Traversal: Depth First Search, Breadth First Search
- Spanning Tree, Prim's Algorithm, Kruskal's algorithm and Round Robin Algorithm
- Shortest Path Algorithm, Greedy and Dijkstra's Algorithm

Laboratory works:

Data Structure and Algorithm is highly practical oriented course. Each unit should include plenty of programming practices. Laboratory work should include implementation of Stack, Queue, Lists, Tree, Graphs, and Recursive functions as well as implementation of Sorting Algorithms and Searching Algorithms.

Text Book:

1. Data structure using C and C++, Langsam, Augenstein, Tenenbaum

References Books:

1. Horowitz and Sahni, Fundamentals of Data Structures
2. Aho, Hopcroft and Ullman, Data Structure and Algorithms

Database Management System

Course Title: Database Management System
Course No: BIT202
Nature of the Course: Theory + Lab
Semester: III

Full Marks: 60 + 20 + 20
Pass Marks: 24 + 8 + 8
Credit Hrs: 3

Course Description:
The course covers the basic concepts of databases, database system concepts and architecture, data modeling using ER diagram, relational model, SQL, relational algebra and calculus, normalization, transaction processing, concurrency control, and database recovery.

Course Objective:
The main objective of this course is to introduce the basic concepts of database, data modeling techniques using entity relationship diagram, relational algebra and calculus, basic and advanced features SQL, normalization, transaction processing, concurrency control, and recovery techniques.

Course Contents:

Unit 1: Database Concepts and Architecture (4 Hrs.)
Database, Database Management System, Database Users, and Benefits of Databases; Data Models, Schemas, and Instances; Three-Schema Architecture and Data Independence; Database Languages and Interfaces; the Database System Environment; Centralized and Client/Server Architectures for DBMSs; Classification of Database Management Systems

Unit 2: Data Modeling Using the Entity-Relational Model (5 Hrs.)
Using High-Level Conceptual Data Models for Database Design; Entity Types, Entity Sets, Attributes, and Keys; Relationship Types, Relationship Sets, Roles, and Structural Constraints; Weak Entity Types; ER Diagrams, Naming Conventions, and Design Issues; Relationship Types of Degree Higher Than Two; Subclasses, Superclasses, and Inheritance; Specialization and Generalization; Constraints and Characteristics of Specialization and Generalization

Unit 3: The Relational Data Model and Relational Database Constraints (5 Hrs.)
Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; Update Operations, Transactions, and Dealing with Constraint Violations; Basic Relational Algebra Operations

Unit 4: SQL (10 Hrs.)
Data Definition and Data Types; Specifying Constraints; Basic Retrieval Queries; Complex Retrieval Queries; INSERT, DELETE, and UPDATE Statements; Views

Unit 5: Relational Database Design (7 Hrs.)
Relational Database Design Using ER-to-Relational Mapping; Informal Design Guidelines for Relational Schemas; Functional Dependencies; Normal Forms Based on Primary Keys; General Definitions of Second and Third Normal Forms; Boyce-Codd Normal Form; Multivalued Dependency and Fourth Normal Form; Properties of Relational Decomposition

Unit 6: Transaction Processing and Concurrency Control, and Recovery (8 Hrs.)
Introduction to Transaction Processing; Transaction and System Concepts; Desirable Properties of Transactions; Serializable Schedule; Two-Phase Locking and Timestamp Ordering Concurrency Control Techniques

Unit 7: Database Recovery Techniques (3 Hrs.)
Recovery Concepts; NO-UNDO/REDO Recovery Based on Deferred Update; Recovery Technique Based on Immediate Update; Shadow Paging; Database Backup and Recovery from Catastrophic Failures

Unit 8: NoSQL (3 Hrs.)
Structured and Unstructured Data, Introduction to NoSQL Databases, Discussion of basic architecture of Hbase, Cassandra and MongoDb.

Laboratory Works:
The laboratory work includes writing database programs to create and query databases using basic and advanced features of structured query language (SQL).

Text Books:
1. Fundamentals of Database Systems; Seventh Edition; RamezElmasri, Shamkant B. Navathe; Pearson Education
2. Database System Concepts; Sixth Edition; AviSilberschatz, Henry F Korth, S Sudarshan; McGraw-Hill
3. NoSQL for Dummies; Adam Fowler; John Wiley & Sons, Inc.

Reference Books:
1. Database Management Systems; Third Edition; Raghu Ramakrishnan, Johannes Gehrke; McGraw-Hill
2. A First Course in Database Systems; Jaffrey D. Ullman, Jennifer Widom; Third Edition; Pearson Education Limited

Numerical Methods

Course Title: Numerical Methods
Course No: BIT203
Nature of the Course: Theory + Lab
Semester: III

Full Marks: 60 + 20 + 20
Pass Marks: 24 + 8 + 8
Credit Hrs: 3

Course Description:
This course covers different concepts of numerical techniques of solving non-linear equations, system of linear equations, integration and differentiation, and ordinary and partial differential equations.

Course Objective:
The main objective of this course is to provide concepts of numerical techniques for solving different types of equations and developing algorithms for solving scientific problems.

Course Contents:

Unit 1: Solution of Nonlinear Equations (7 Hrs.)

1.1 Errors in Numerical Calculations, Sources of Errors, Propagation of Errors, Review of Taylor's Theorem

1.2 Concept of Non-linear Equations, Solving Non-linear Equations: Trial and Error Method, Bisection Method, Newton Raphson Method, Secant Method, Fixed Point Method, False Position Method, Newton's Method for Calculating Multiple Roots, Evaluating Polynomials with Horner's Method

Unit 2: Interpolation and Regression (8 Hrs.)

2.1 Concept of Interpolation and Extrapolation, Lagrange's Interpolation, Newton's Interpolation using divided differences, forward differences and backward differences.

2.2 Concept of Regression, Regression vs. Interpolation, Least Squares Methods, Linear Regression, Non-linear Regression: Exponential and Polynomial

Unit 3: Numerical Differentiation and Integration (9 Hrs.)

3.1 Concept of Differentiation, Differentiating Continuous Functions (Two-Point and Three-Point Formula), Differentiating Tabulated Functions by using Newton’s Differences, Maxima and minima of Tabulated Functions

3.2 Concept of Integration, Newton-Cote's Quadrature Formulas, Trapezoidal rule, Multi-Segment Trapezoidal rule, Simpson's 1/3 rule, Multi-Segment Simpson's 1/3 rule, Simpson's 3/8 rule, Multi-Segment Simpson's 3/8 rule

Unit 4: Solving System of Linear Equations (8 Hrs.)

4.1 Existence of Solutions, Properties of Matrices, Matrix Representation, Gaussian Elimination Method, Partial and Complete Pivoting, Gauss-Jordan method, Inverse of matrix using Gauss-Jordan method

4.2 Matrix factorization and Solving System of Linear Equations by using Do-little and Cholesky'salgorithm

4.3 Iterative Solutions of System of Linear Equations, Jacobi Iteration Method, Gauss-Seidal Method

4.4 Eigen Values and Eigen Vectors Problems, Power Method.

Unit 5: Solution of Ordinary Differential Equations (8 Hrs.)

5.1 Concept of Differential Equations, Initial Value Problem, Taylor Series Method, Euler's Method, Heun's Method, Runge-Kutta Methods

5.2 Solving System of Ordinary Differential Equations, Solution of the Higher Order Equations, Boundary Value Problems, Shooting Method

Unit 6: Solution of Partial Differential Equations (5 Hrs.)

6.1 Concept of Partial Differential Equations, Classification of PDE, Deriving Difference Equations, Laplacian Equation and Poisson's Equation.

Laboratory works:

The laboratory exerciseshould consist programs for implementing

- Non-linear equations
- System of linear equations
- Interpolation and Regression
- Numerical integration and differentation
- Solving ordinary and partial differential equations

Text Books:

1. W. Chency and D. Kincaid, "*Numerical Mathematics and Computing*", 7th Edition, Brooks Cole Publisher
2. C.F. Gerald and P.O. Wheatley, *"Applied Numerical Analysis*", 9th Edition, Addison Wesley Publisher

Reference Books:

1. W.H. Press, B.P. Flannery et al., "*Numerical Recipes: Art of Scientific Computing*", 3rd Edition, Cambridge Press.
2. J. M. Mathews and K. Fink, "Numerical Methods using MATLAB ", 4rd Edition, Prentice Hall Publication

Operating Systems

Course Title: Operating Systems
Course No: BIT204
Nature of the Course: Theory + Lab
Semester: III

Full Marks: 60 + 20 + 20
Pass Marks: 24 + 8 + 8
Credit Hrs: 3

Course Description:
The course covers fundamental concepts of operating system as well as, Process management, Memory management, File systems, and I/O Managements and Disk Managements.

Course Objectives:
The main objective of this course is to introduce fundamental concepts of operating system and its components and functions.

Course contents:

Unit 1: Introduction and Evolution (6 Hrs.)

1.1. Background of Operating system, Operating System as an Extended Machine and Resource Manager, hardware review.
1.2. Evolution of Operating System: batch system, multiprogramming, time-sharing, real-time, mainframe operating systems, handheld, embedded, smart-card, distributed and personal computer operating systems.
1.3. Operating system Concepts: Hardware Review, Booting Computer, System Calls, Address Spaces, Files, Client-Server Model.

Unit 2: System Structures (4 Hrs.)

2.1 Operating system Components: Process Managements, Memory Managements, I/O managements, Operating system services and system calls
2.2 Operating system structures: Monolithic system, Layered system, Micro Kernels, Exo Kernels, Virtual Machines, Storage Structures, I/O structures, Files structures, and system Protections:

Unit 3: Process Management and Synchronization (10 Hrs.)

2.1. Process management: Process Model, Process creation, process termination, process states, attributes; Thread Model: thread creation, termination, User Thread and Kernel Thread., Process scheduling and Context Switch, Scheduling Algorithms: First Come First Serve, Shortest Job First, Priority, Round Robin and Shortest time Remaining First.
2.2. Inter-process communication and synchronization: race conditions, critical regions, mutual exclusion, busy waiting, sleep and wakeup, semaphores, monitors, message passing, classical IPC problems and Deadlock Modelling, Deadlock Handling: Prevention, detection and Recovery.

Unit 4: Memory Management and File system (13 Hrs.)

3.1. Memory management: address spaces, multiprogramming, swapping, overlays, Memory allocations, Fragmentations, virtual memory, paging, page replacements algorithms: Principle of optimality, First in First out, LRU, LFU, NRU, Clock, Second Chance Page replacement, Working set, segmentation, and segmentation with paging.

3.2. File systems: File operations, Access Methods, Directories and Levels, Directories Operations, file system mounting and sharing, protection, access Control, File system layout, File system Implementation, File system Examples.

Unit 4: Input/output Management (12 Hrs.)

4.1. Input Output management: I/O devices, Devices Controller, Memory Mapped I/O, Direct Memory Access (DMA), I/O software Principles: programmed I/O, Interrupt driven I/O, DMA based I/O, I/O Software Layers.

4.2. Disk management: Disk structure, Disk scheduling, error handling and formatting, stable storage management.

Text / Reference Books:

1. Andrew S. Tanenbaum, Modern Operating Systems, 2nd Edition, Prentice-Hall.
2. Silberschatz, Galvin and Gagne, Operating System Concepts, 6th Edition, Addition Wesley.

Principles of Management

Course Title: Principles of Management
Course No: MGT205
Nature of the Course: Theory
Semester: III

Full Marks: 80 + 20
Pass Marks: 32 + 8
Credit Hrs: 3

Course Description:
The course covers fundamental concepts of management including organization, decision making, planning, controlling, and concepts of motivation, leadership, and communication.

Course Objectives:
Upon completion of this course, students are expected to be able to:
1. Focus on the foundations of management, covering the essential concepts in management.
2. Reflection of contemporary trends in management.
3. It offers strong practical focus and also covering latest research studies in the field.

Course contents:

Unit 1: Introduction to Managers and Management (5 Hrs.)
What is Management and what do managers do? Defining management; Management functions; Management roles; Management skills; History of management

Unit 2: Organizational Culture and Environment (5 Hrs.)
The manager: Omnipotent or symbolic? The organization's culture; Environment: Defining environment, specific environment, general environment, Influence on management practice

Unit 3: Decision Making the Essence of Manager's Job (5 Hrs.)
The decision making process; the rational decision maker; Decision making styles; analyzing decision alternatives: Certainty, Risk, Uncertainty, Group decision making

Unit 4: Planning (5 Hrs.)
The foundations of planning; The definition of planning; Purposes of planning; Types of plans; Contingency factors on planning; Objectives: The foundation for planning; Multiplicity of objectives; Real versus stated objectives; Traditional objective setting; Management by objectives

Unit 5: Organization Structure and Design (5 Hrs.)
Defining organization structure and design; Building the vertical dimension of organizations; Building the horizontal dimension of organizations; The contingency approach to organization design; Application of organization design

Unit 6: Motivation (5 Hrs.)
Motivating employees; what is motivation? Contemporary approaches to motivation; Contemporary issues in motivation; from theory to practice: suggestions for motivating employees

Unit 7: Leadership (4 Hrs.)
Managers verses leaders; Trait theories; Behavioral theories; Contingency theories; Emerging approaches to leadership; Contemporary issues in leadership

Unit 8: Communication (4 Hrs.)
Communication and interpersonal skills; Understanding communication; Communication styles of men and women; Feedback skills; Delegation skills'; Conflict management skills; Negotiation skills

Unit 9: Controlling **(4 Hrs.)**
Foundations of control: What is control? The importance of control; The control process; Types of control; Qualities of effective control; The dysfunctional side of control; Ethical issues in control

Unit 10: Controlling tools and techniques (3 Hrs.)
Information controls; financial controls; Operations controls; Behavioral controls

Text/Reference Books:

1. Robbins, S.P. & Coulter, Mary (1996) Management; Prentice Hall.
2. Robbins, S.P. & Decenzo, David A. (2001) Fundamentals of Management, Pearson.
3. Robbins, S.P., Coutler, M. & Bohara, N. (2010). Management (10 th ed.) New Delhi: Prentice Hall.

Web Technology I

Course Title: Web Technology I
Course No: BIT251
Nature of the Course: Theory + Lab
Semester: IV

Full Marks: 60 + 20 + 20
Pass Marks: 24 + 8 + 8
Credit Hrs: 3

Course Description: This course covers the concepts of HTML, CSS, JavaScript and XML.

Course Objectives: The main objective of this course is to provide basic knowledge of HTML, CSS and client side scripting using JavaScript. In addition, the course covers the concepts of XML.

Course Contents:

Unit 1: Introduction (4 Hrs.)

Web Basics: Internet, Intranet, WWW, Web Page; Web Site: Static and Dyanamic; Client Server Architecture: Single Tier, Two-Tier, Multi-Tier; Web Clients; Web Servers; HTTP: HTTP Request and Response; URL, Client Side Scripting, Server Side Scripting, Web 1.0, Web 2.0

Unit 2: Markup Language (11 Hrs.)

Introduction to HTML; Elements of HTML Document: HTML, Head, and Body tags; HTML Elements and HTML Attributes, Document Type Declaration; Comments in HTML; Entity and Character References; Headings, Paragraph, Divison, Formatiing: b, i, small, sup, sub; Spacing: Pre, Br; Formatting Text Phrases: span, strong, tt; Image element; Anchors; Lists: Ordered and Unordered and Definition; Tables; Frames; Forms: Form Elements, Meta Tag, HTML Events: Window Events, Form Element Events, Keyboard Events, Mouse Events, HTML5 Basics: Audio, Video, Canvas, Main, Section, Article, Header, Footer, Aside, Nav, Figure Tags

Unit 3: Style Sheets (10 Hrs.)

Introduction; Cascadding Style Sheets (CSS); CSS Syntax; Inserting CSS: Inline, Internal, External, ID and Class Selectors; Colors; Backgrounds; Borders; Text; Font; List; Table; CSS Box Model; Normal Flow Box Layout: Basic Box Layout, Display Property, Padding, Margin; Positioning: Relative, Float, Absolute; CSS Media Queries; Basics of Responsive Web Designs, Slicing: Converting image design into HTML

Unit 4: Client Side Scripting (12 Hrs.)

Introduction to JavaScript; Basic Syntax; Structure of JavaScript Program; Variables and Data Types; Statements: Expression, Keyword, Block; Operators; Flow Controls, Looping, Functions; Popup Boxes: Alert, Confirm, Prompt; Objects and properties; Constructors; Arrays; Built-in Objects: Window, String, Number, Boolean, Date, Math, RegExp, Form, User Defined Objects; Event Handling and Form Validation, Error Handling, Handling Cookies, Basics of AJAX and jQuery

Unit 5: XML (8 Hrs.)

Introduction; XML Documents; Syntax Rules; XML Elements; XML Attributes; XML Tree; XML Namespace XML schema languages: Document Type Definition(DTD), XML Schema Definition (XSD); XSD Simple Types, XSD Attributes; XSD Complex Types; XML Style Sheets (XSLT), XQuery

Laboratory Works:

The laboratory work includes creating web pages and applications with client side scripting using HTML, CSS, JavaScript and XML technologies.

Text Books:

1. Web Technologies: A Computer Science Perspective, Jeffrey C. Jackson , *Pearson Prentice Hall*

Reference Books:

1. HTML5 and CSS3 for the Real World", Estelle Weyl, Louis Lazaris, Alexis Goldstein, *Sitepoint*
2. Dynamic Web Programming and HTML5, Paul S. Wang, *CRC Press*
3. HTML5 Programming with JavaScript for Dummies, John Paul Mueller
4. JavaScript: The Web Technologies Series, Don Gosseli, *Course Technology Cengage Learning*
5. Web Technologies: Html, Javascript, Php, Java, Jsp, Asp.Net, Xml And Ajax, Black Book, *Dreamtech Press*
6. An Introduction to XML and Web Technologies Anders Møller and Michael I. Schwartzbach *Addison-Wesley*
7. www.w3schools.com

Artificial Intelligence

Course Title: Artificial Intelligence
Course No: BIT252
Nature of the Course: Theory + Lab
Semester: IV

Full Marks: 60 + 20 + 20
Pass Marks: 24 + 8 + 8
Credit Hrs: 3

Course Description:
The course introduces the concepts artificial intelligent. It includes the basics of artificial intelligence, intelligent agents, problem solving, searching, knowledge representation systems, probabilistic reasoning, neural networks, machine learning and natural language processing.

Course Objectives:
The main objective of the course is to introduce fundamental concepts of artificial intelligence and to learn intelligent agents, identify AI problems and solve the problems using searching, design knowledge representation and expert systems, understand concepts of machine learning and natural language processing.

Course Contents:

Unit I: Introduction (3 Hrs.)
Artificial Intelligence (AI), History of AI, AI Perspectives, Turing Test, Foundations of AI, Scope of Symbolic AI, Applications of AI

Unit II: Agents (5Hrs.)
Introduction of Agents; Configuration of Agents: PEAS description of Agents; Types of Agents: Simple Reflexive, Model Based, Goal Based, Utility Based, Learning Agent; Environment Types: Deterministic, Stochastic, Static, Dynamic, Observable, Semi-observable, Single Agent, Multi Agent

Unit III: Problem Solving by Searching (10 Hrs.)
Problem Solving; State Space Representation; Problem Formulation; Constraint Satisfaction Problems
Solving Problems by Searching; Performance evaluation of search techniques; Uninformed Search: Depth First Search, Breadth First Search, Depth Limited Search, Iterative Deepening Search, Bidirectional Search;
Informed Search: Greedy Best first search, A* search, Hill Climbing;
Game playing: Adversarial search techniques, Mini-max Search, Alpha-Beta Pruning
Problem Decomposition: Goal Trees, AO*

Unit IV: Knowledge Representation (14 Hrs.)

Knowledge; Knowledge Representation; Issues in Knowledge Representation, Knowledge Representation Systems; Properties of Knowledge Representation Systems

Logic Based: Propositional and Predicate; Propositional Logic: Syntax, Semantics; CNF Form; Inference using Resolution; Backward Chaining and Forward Chaining; Predicate Logic: FOPL: Syntax, Semantics; Quantification; Inference with FOPL: Unification and Lifting; Inference using Resolution

Semantic Nets, Frames, Rule Based Systems, Scripts, Conceptual Dependency

Statistical Reasoning: Uncertain Knowledge, Random Variables, Prior and Posterior Probability, Bayes' Rule, Bayesian Networks, Reasoning in Belief Networks, Dempster-Shafer Theory

Unit V: Neural Network (2 Hrs.)

Neural Networks: Introduction; Mathematical Model of ANN, Designing a neuron, Types of ANN: Feed-forward, Recurrent, Single Layered, Multi-Layered, Learning Rule, Learning Rate, Application of Artificial Neural Networks

Unit VI: Machine Learning (5 Hrs.)

Machine Learning; Concepts of Learning: Supervised, Unsupervised and Reinforcement Learning; Leaning by Analogy; Learning by Genetic Algorithm; Learning by Back-propagation

Unit VII: Expert System (3 Hrs.)

Expert Systems; Architecture of Expert System; Development of Expert Systems; Applications of Expert Systems

Unit VIII: Natural Language Processing (3 Hrs.)

Natural Language Processing: Natural Language Understanding and Natural Language Generation

Steps in NLP: Lexical Analysis, Syntactic Analysis, Semantic Analysis, Discourse and Pragmatic Analysis; Ambiguities in NLP

Laboratory Works:

The laboratory work consists of implementation of intelligent agents and expert systems, searching techniques, knowledge representation systems and machine learning techniques. Students are advised to use LISP, PROLOG, or any other high level language.

Text Books:

1. Stuart Russel and Peter Norvig, *Artificial Intelligence A Modern Approach*, Pearson

Reference Books:

1. E. Rich, K. Knight, Shivashankar B. Nair, *Artificial Intelligence*, Tata McGraw Hill.
2. George F. Luger, *Artificial Intelligence: Structures and Strategies for Complex Problem Solving*, Benjamin/Cummings Publication
3. D. W. Patterson, *Artificial Intelligence and Expert Systems*, Prentice Hall.
4. P. H. Winston, *Artificial Intelligence*, Addison Wesley.
5. Tutorials for LISP and PROLOG

Systems Analysis and Design

Course Title: Systems Analysis and Design
Course No: BIT253
Nature of the Course: Theory + Lab
Semester: IV

Full Marks: 60 + 20 + 20
Pass Marks: 24 + 8 + 8
Credit Hrs: 3

Course Description:
This course familiarizes students with the concepts of information systems development including foundations, planning, analysis, design, implementation and maintenance.

Course Objectives:
The main objective of this course is to provide knowledge of different concepts of system analysis and design so that students will be able to develop information systems using different methodologies, tools and techniques.

Course Contents:

Unit 1: Foundations for Systems Development (12 Hrs.)

1.1. The Systems Development Environment: Introduction; A Modern Approach to Systems Analysis and Design; Developing Information Systems and the Systems Development Life Cycle; The Heart of the Systems Development Process and Traditional Waterfall SDLC; CASE Tools

1.2. Other Approaches: Prototyping; Spiral; Rapid Application Development; Introduction to Agile Development

1.3. Introduction to Object Oriented Development

1.4. Managing the Information Systems Project: Introduction; Managing the Information Systems Project; Representing and Scheduling Project Plans; Using Project Management Software

Unit 2: Planning (5 Hrs.)

2.1. Identifying and Selecting Systems Development Projects: Introduction; Identifying and Selecting Systems Development Projects; Corporate and Information Systems Planning

2.2. Initiating and Planning Systems Development Projects: Introduction; Initiating and Planning Systems Development Projects; Process of Initiating and Planning IS Development Projects, Assessing Project Feasibility; Building and Reviewing the Baseline Project Plan

Unit 3: Analysis (13 Hrs.)

3.1. Determining System Requirements: Introduction; Performing Requirements Determination; Traditional Methods for Determining Requirements; Contemporary Methods for Determining System Requirements; Radical Methods for Determining System Requirements

3.2. Structuring System Process Requirements: Introduction; Process Modeling; Data Flow Diagrams; Modeling Logic with Decision Tables, Decision Trees, and Pseudocodes

3.3. Structuring System Data Requirements: Introduction; Conceptual Data Modeling; Gathering Information for Conceptual Data Modeling; Introduction to E-R Modeling

Unit 4: Design (7 Hrs.)

4.1. Designing Databases: Introduction; Database Design; Relational Database Model; Normalization; Transforming E-R Diagrams Into Relations; Merging Relations; Physical File and Database Design; Designing Fields; Designing Physical Tables

4.2. Designing Forms and Reports: Introduction; Designing Forms and Reports; Formatting Forms and Reports; Assessing Usability

4.3. Designing Interfaces and Dialogues: Introduction; Designing Interfaces and Dialogues; Interaction Methods and Devices; Designing Interfaces; Designing Dialogues; Designing Interfaces and Dialogues in Graphical Environments

Unit 5: Implementation and Maintenance (4 Hrs.)

5.1. System Implementation: Introduction, System Implementation, Software Application Testing, Installation, Documenting the System, Training and Supporting Users, Organizational Issues in Systems Implementation

5.2. Maintaining Information Systems: Introduction, Maintaining Information Systems, Conducting Systems Maintenance

Project Work: Students should prepare a project report that includes at least analysis, design, and implementation phase of system analysis and design. The project can be done in groups with at most four members in each group.

Text Books:

1. Joseph S. Valacich and Joey F. George, *Modern Systems Analysis and Design*, 8th Edition, Pearson

References Books:

1. Kenneth E. Kendall and Julie E. Kendall, System Analysis and Design, 9th Edition, Pearson
2. Jeffrey Whitten and Lonnie Bently, System Analysis and Design Methods, 7th Edition
3. Scott Tilley and Harry J. Rosenblatt, System Analysis and Design, 11th Edition

Network and Data Communications

Course Title: Network and Data Communications
Course No: BIT254
Nature of the Course: Theory + Lab
Semester: IV

Full Marks: 60 + 20 + 20
Pass Marks: 24 + 8 + 8
Credit Hrs: 3

Course Description:
The course covers fundamental concepts about Data communication, Data Transmission and Computer Network with their functionalities at Physical, Data, Network, Transport and Application Layer respectively.

Course Objective:
The main objective of this course to introduce analog and digital signals with their conversion and transmission; Protocols: OSI, TCP/IP; Medium of transmission; Multiplexing Techniques; Switching Techniques; Error Detection and Correction; Data Link Control; Routing Algorithms; Transport Protocols; Congestion Control; Domain Name System, Electronic Mail, File Transfer.

Course Contents:

Unit 1: Fundamental of Data Communication (6 Hrs.)
Components, Data Representation, Data Flow, Distributed Processing, Network Criteria, Physical Structures, Network Models, Categories of Networks; Basic Concepts about Bridge, Hub, Swtich, Router, NIC, MAC-address, Gateway; The Internet, Protocols and Standards, OSI, TCP/IP; Addressing.

Unit 2: Physical Layer and Media (12 Hrs.)
Analog and Digital; Periodic Analog Signals, Digital Signals; Basic Concepts about Noise, Distortion, Attenuation, Nyquist Bit Rat, Shannon Capacity, Bandwidth, Throughput, Latency; Conversion: Analog to Analog, Digital to Digital, Analog to Digital , Digital to Analog; Transmission modes; Multiplexing: Time Division Multiplexing, Frequency Division Multiplexing, Wavelength Division Multiplexing; Guided Media, Unguided Media; Switching: Circuit Switching and Packet Switching.

Unit 3: Data link layer (8 Hrs.)
Functionality of Data link Layer; Error detection and Correction: Introduction, Block Coding, Linear Block Codes, Cyclic codes, Checksum; Data Link Control: Framing, Flow and Error Control, Protocols, Noiseless Channels, Noisy Channels; Multiple Access: Random Access. ALOHA, Controlled Access; Basic concepts about Cellular telephony and Satellite network.

Unit 4: Network layer (8 Hrs.)
Functionality of Network Layer; Internetworking; IPv4, IPv6; Directing; Forwarding; Routing: Static vs. Dynamic Routing; Routing Algorithms: Shortest-path, Flooding, Flow-based, Distance-vector, Link-state; Congestion control and prevention: Leaky-bucket algorithm, Token-bucket algorithm; Network layer protocols: IP, NAT, ICMP, IGMP, RIP, ARP, RARP, OSPF, IGRP, EIGRP, BGP.

Unit 5: Transport layer (6 Hrs.)
Functionality of Transport layer; Client Server Paradigm, Multiplexing and De-multiplexing, Connectionless vs. Connection Oriented Service, Reliable vs. Unreliable; Basic Overview of TCP and UDP; Congestion Control and Quality of Service: Network Performance; Congestion Control: Open-loop and Closed loop.

Unit 6: Application layer (5 Hrs.)
Functionality of Application Layer; Domain Name System: Namespace, Domain Name Space, Distribution of Name Space, DNS in the Internet: Generic Domains, Country Domains, Inverse Domain, Resolution: Resolver, Mapping Names to Addresses, Address to Names, Recursive Resolution, Caching; Electronic mail: SMTP, POP, IMAP; File transfer: FTP, Telnet; Dynamic host configuration protocol (DHCP), HTTP, WWW, SNMP.

Laboratory Works:
Students should be able to configure network hardware and software; should be able to design and set up networks by using simulators and devices.

Text Book:
1. Behrouz A. Forouzan; "Data Communications and Networking", 4th Edition, McGraw Hill.

Reference Books:
1. William Stallings; "Data And Computer Communications", 8th Edition Prentice Hall of India, New Delhi.
2. A.S. Tanenbaum; "Computer Network", 4th Edition, Pearson Education International.

Operations Research

Course Title: Operations Research
Course No: ORS255
Nature of the Course: Theory
Semester: IV

Full Marks: 80 + 20
Pass Marks: 32 + 8
Credit Hrs: 3

Course Description:
The course covers fundamental concepts of operations research including introduction, optimization, queuing models theory of games, decision theory, and networking analysis.

Course Objective:
The main objective of this course is to develop knowledge and skill to the students on the Operations research tools and techniques such as optimization, queuing theory, theory of games, decision theory and networking analysis

Unit 1: Introduction (3 Hrs.)
History, Development of operations research, Objective of OR, Scope of OR, Nature and Definition of OR, Characteristics of OR, Scientific Method in OR, Models and Modeling in OR, Limitation of OR, Applications of OR

Unit 2: Optimization
2.1.Linear programming I: Formulation and Graphic Solution (3 Hrs.)
Introduction to Linear programming problem, Formulation of linear programming problem, general statement of linear programming problem, Assumptions underlying linear programming, solution to linear programming-graphic method ,some special cases in linear programming

2.2 Linear programming II: Simplex Method (6 Hrs.)
Simplex method, Solution to maximization problems, solution to minimization problems, Big-M method, some special cases in linear programming

2.3 Transportation problem (5 Hrs.)
VAM method for generating initial basic feasible solution, Testing Optimality condition by using MODI Method, Balanced and unbalanced transportation problem.

2.4 Assignment problem (3 Hrs.)
Introduction, Hungarian Assignment Method (HAM), some special cases: Unbalanced assignment problems, constrained assignment problem.

Unit 3: Queuing Models (6 Hrs.)
Introduction, economies of the queuing problem, queuing system and its essential elements, types of queuing model (focused on only Single channel system and multi-channel system), operating characteristics of single channel system (Poisson-exponential single server model-infinite population),Poisson-exponential, multiple server model-infinite population.

Unit 4: Theory of Games (6 Hrs.)
Introduction, Basic terminologies, Two persons zero-sum game, pure strategy and mixed strategy, dominance rule, algebraic method, arithmetic method and graphical method.

Unit 5: Decision Theory (5 Hrs.)
Introduction, decision making environment, Decision making criteria under risk: EMV criterion, EOL criterion, EVPI, Decision tree analysis, Marginal analysis, Decision making criteria under uncertainty.

Unit 6: Networking Analysis (8 Hrs.)
PERT/CPM networks, scheduling the activities: Earliest and Latest Times, Time-cost trade off analysis.

Text / Reference Books:

- Sharma, J.K. (2013). *Operations Research Theory and application*.(5^{th}ed). New Delhi:Laxmi Publications
- Operations Research: An Introduction, Handy A. Taha, 10/e, Pearson