SCHOOL OF ENGINEERING & TECHNOLOGY,

NAGALAND UNIVERSITY,

DEPARTMENT OF INFORMATION TECHNOLOGY

D.C COURT JUNCTION, DIMAPUR CAMPUS, NAGALAND

Contents

Department of Information Technology

1.1.Vision of the Department of Information Technology

The Department of Information Technology focuses on training students in creating Computer Based Information Systems for efficient storage, processing, analysis and dissemination of information to cater to the needs of the people in making the decision-making process more effective.

1.2. Mission of the Department of Information Technology

M1- To impart quality education through a well-designed curriculum and academic facilities to meet the computing needs of the industry and society.

M2- To impart skillsto the students and incorporate team spirit, efficient problem-solving skills, and adaptability to various technological challenges.

M3 – To enable students to become good communicators and efficient leaders and develop entrepreneurship skills.

M4- Encourage ethical values and the spirit of social commitment.

1.3. Educational Program Objectives (PEOs)

EPO1: The graduate will have creativity and the ability to specify, design, implement, test and maintain Software systems.

EPO2: Graduates will communicate effectively, work collaboratively and exhibit a high level of professionalism and ethical responsibility for pursuing a successful career in Information Technology/ Computer Science and Engineering.

EPO5: Graduates will have imbibed in them the spirit of research and continuous self-learning to adapt to the changing professional and societal needs.

2. **Program Outcomes (POs)**

1. Students will learn programming and various algorithms to solve complex engineering problems.
2. Students will be able to analyse data and visualize the outcome using software.
3. Students will be able to Design/developsolutions for real world applications.
4. Students will be able to do research in various fields of Information Technology.
5. Students will possess the skill to work with latest software.
6. Students will be able to work in a team and communicate with team members to complete real world projects.

2.1 Program-Specific Outcomes (PSOs)

PSO1- Students will be able to apply analytics in solving real world problems.

PSO2- Students will learn how to gather, process and disseminate Information through the use of Technology.

PSO3- Analyse various algorithms and be able to judge proper use of the algorithms in problem solving.

DEPARTMENT OF INFORMATION TECHNOLOGY

SCHOOL OF ENGINEERING AND TECHNOLOGY – NAGALAND UNIVERSITY***Course Structure***

Course Category	**Total Credits**
Base courses	42
Core Courses	76
Elective Courses	15
Open Elective Courses	6
Projects	19
Total Credits	**158**

SEMESTER 1				
THEORY				
Sl.No	***Subject Code***	***Course Name***	***Credits***	Marks
1.	G1T01	Engineering Mathematics-I	4	100
2.	G1T02	Engineering Physics-I	3	100
3	G1T03	Technical English	3	100
4	G1T04	Electrical Engineering	3	100
5	G1T05	Engineering Chemistry	3	100
6	G1T06	Engineering Graphics	1	100
Total Credits (Theory)			17	600
PRACTICAL				
1	G1L01	Engineering Physics-I Lab	1	100
2	G1L02	Engineering Chemistry Lab	1	100
3	G1L03	Engineering Graphics Lab	2	100
Total Credits(Practical)			4	300
Total Credits			21	900

Course Name: Engineering Mathematics-I
Subject Code: G1T01
Credits:4
Marks:100

Course Outcome:

CO1: Students be able to apply mathematical methods and principles to solve problems in their respective fields.

CO2: Students have knowledge how to apply mathematical methods in computer programming language.

Contents:

Unit I

Rank of a matrix, Characteristic equation – Eigenvalues and Eigenvectors of a real matrix , properties of eigenvalues and eigenvectors , consistency of linear system of equations, Cayley-Hamilton Theorem, Diagonalization of matrices, Reduction of a quadratic form to canonical form by orthogonal transformation.

Unit II

Convergence and Divergence of series, Tests of convergence (Comparison test, Integral test, Comparison of ratios and D'Alembert's ratio test), Alternating series, Absolute and conditional convergence, Power Series, Convergence of exponential, logarithmic and Binomial Series.

Unit III

Curvature in cartesian and polar co-ordinates, centre and radius of curvature, circle of curvature, evolutes and involutes, envelopes.

Unit IV

Leibntz theorem, partial differentiation, Euler's theorem, Jacobians, Taylor series for function of two variables, maxima and minima of function of two variables, Lagrange's method of undetermined multipiers.

Unit V

Beta and gamma functions and relationship between them.

Applications of single integration to find volume of solids and surface area of solids of revolution, Double integral, change of order of integration, double integral in polar coordinates, applications of double integral to find area enclosed by plane curves, triple integral, change of variables, volume of solids, Dirichlet's integral.

Textbooks:

1**)** Higher Engineering Mathematics: B. S. Grewal

2) Advanced Engineering Mathematics: E. Kreyszig

Reference Books:

1)Advanced Engineering Mathematics: Jain and Iyenger

2)Advanced Engg. Mathematics: Michael D. Greenberg

3) Advanced Engineering Mathematics (7th Edition): Bali N., Goyal M.

Course Name: Engineering Physics-I
Subject Code: G1T02
Credits:3
Marks:100

Course Outcome:

CO1: Understand basic tenets of classical mechanics and learn how they lie at the core of engineering across disciplines.
CO2: Prepare students to perform calculations about existing engineering techniques and pursue further research if need be.
CO3: Create a foundation for the next course Engineering Physics –II.

Contents:

UNIT I - Classical Mechanics:
Overview of Newtonian Mechanics in rectilinear coordinate system.Motion in plane polar coordinates.Conservation principles.Collision problem in laboratory and centre of mass frame.Rotation about fixed axis.Non-inertial frames and pseudo forces.Rigid body dynamics.

UNIT II - Special Theory of Relativity
Michelson Morley experiment, Inertial frames of reference, postulates of special theory of relativity, Lorentz transformation equation of space and time, length contraction, time dilation, addition of velocities, variation of mass with velocity, mass-energy equivalence.

UNIT III - Vector Calculus
Scalar and vector fields, Gradient of a scalar field, divergence and curl of a vector field, line, surface and volume integral, Gauss divergence theorem, Stoke's theorem, Spherical polar coordinates.

UNIT IV - Quantum Theory
Wave-particle duality, de Broglie concept of matter waves, Davisson and Germer experiment, Heissenberg's uncertainty principle, Schrodinger wave equation.Probabilities and Normalization.Expectation values.Eigenvalues and eigenfunctions. Applications in one dimension: Particle in a box, Finite Potential well, Harmonic oscillator.

UNIT V – Optics
Coherent sources, Conditions of interference, Young's double slit andFreshnel'sbiprism experiment, Newton's ring. Different Types of Diffraction, Difference between Interference and Diffraction, Fraunhofer Diffraction at a Single Slit and Double slit, Plane transmission diffraction grating spectra.

Texts:

1. D. Kleppner and R. J. Kolenkow, An Introduction to Mechanics, Tata McGraw-Hill, 2000.
2. R. Eisberg and R. Resnick, Quantum Physics of Atoms, Molecules, Solids, Nuclei and

Particles, 2nd Ed., John-Wiley, 1985.

References:

1. R. P. Feynman, R. B. Leighton, and M. Sands, The Feynman Lectures on Physics, Vol. I,
Norosa Publishing House, 1998.
2. J.M. Knudsen and P.G. Hjorth, Elements of Newtonian Mechanics, Springer, 1995.
3. R. Resnick, Introduction to Special Relativity, John Wiley, Singapore, 2000.
4. A. Beiser, Concepts of Modern Physics, Tata McGraw-Hill, New Delhi, 1995.
5. S. Gasiorowicz, Quantum Physics, John Wiley (Asia), 2000.
6. F. W. Sears, H. D. Young, M. W. Zemansky, University Physics, Narosa Publishing House.

Course Name: Technical English
Subject Code: G1T03
Credits:3
Marks:100

Course Outcome:

CO1: Enable the students to develop their communication skills in English.
CO2: Facilitate student to a reasonably good skill in pronunciation
CO3: Train them to use language effectively to face interviews, group discussions and public speaking.

Contents

FOCUS ON LANGUAGE: VOCABULARY

GeneralVocabulary–Changingwordsfromoneform toanother–Nouns–Compoundnouns–Adjectives,Comparativeadjectives–Adverbs–Adverbforms–PrefixesandSuffixes–Spelling and Punctuation – British and American vocabulary. Technical Vocabulary – Synonyms and antonyms - Different grammatical forms of the same word – Numerical adjectives – Articles – Conjunctions and prepositions – Conjunctions used in adverbial phrases and clauses – Abbreviations and acronyms – Foreign words and phrases.

FOCUS ON LANGUAGE: GRAMMAR

Subject–Verb Agreement – Tenses – Present Tense – Past Tense – Future Tense – Active and PassiveVoice–Gerundsand Infinitives– CauseandEffectExpressions–'If'conditionals–Correction ofErrors. Phrasesand structuresindicatinguseandpurpose–Using connectives–Imperativeand'should'–Yes/Noquestion forms–Reportedspeech –Relative clauses – Adverbial clauses of time, place and manner.

READING

Skimming for gist –Inference – Reading in Context, Meaningsincontext – Intensive Reading –Sequencing of Sentences. Intensivereadingandpredictingcontent–Readingandinterpretation– Critical reading – Creative and critical thinking.

WRITING

Paragraph Writing – Description –Comparison andContrast–Definition – Instructions – Formal Letter Writing – Letters to the Editor – Accepting and Declining an Invitation – Permission Letter. Paragraph development - Process description– Descriptive writing - Writing analytical paragraphs–Recommendations–Instructions–Checklists-Letterof application–content, format – Writing Proposals – Report Writing – Types, format, structure, data collection, content, form.

LISTENING AND SPEAKING

Listeningandtransfer ofinformation–ListeningandNote-taking – Creative Thinking and

Speaking – Conversation Techniques – Persuasive Speaking – Group Discussion and Oral Reports . Non-verbal communication – Listening – Stress and intonation - Correlating verbal and non- verbal communication – Discussion of problems and solutions – Oral instructions.

TEXT BOOKS

1. Meenakshi Raman and Sangeeta Sharma, "Technical Communication: English Skills for Engineers", Second Edition, Oxford University Press, 2011.

REFERENCE BOOKS

1. Andrea, J. Rutherford, "Basic Communication Skills for Technology", Second Edition, Pearson Education, 2007.
2. Pickett, Nell Ann, Ann A.Laster and Katherine E.Staples. "Technical English: Writing, Reading and Speaking". New York: Longman, 2001.

Course Name: Electrical Engineering
Subject Code: G1T04
Credits:3
Marks:100

Course Outcome:

CO1: Able to design circuits,test and regularly maintain electrical appliances.
CO2: Able to reconstruct the inbuilt design to increase production efficiency.

Contents:

Introduction:

Basic concepts of Circuit elements & sources, series- parallel circuits, Circuit laws (KCL & KVL), Faraday's laws, Induced emfs and inductances, electromechanical laws, Ohms law, Voltage-Current relations for resistor, inductor, capacitor, introduction to phasor diagrams.

FUNDAMENTALS OF Electrical CIRCUITS

Introduction to DC and AC circuits, Mesh analysis, Nodal analysis, Ideal sources – equivalent resistor, current, Division, voltage division, Concept of three-phase supply and phase sequence. Voltages, currents and power relations in three phase balanced star-connected loads and delta-connected loads

ELECTRICAL MEASURING INSTRUMENTS

Basic principles and Classification of instruments -Moving coil and moving iron instruments. Construction and Principle of operation of dynamometer type wattmeter and single-phase induction type energy meter.

Introduction to Transformers:

Single phase transformers: Construction (core and shell types). Principle of working, emf equation, voltage and current ratios. Losses, phasor diagrams, Voltage regulation and efficiency, autotransformers (construction and working principle, comparisons with single phase transformers) applications of transformer.

Electrical Machines

Introduction: Working principle of DC machine as a generator and a Motor. Types and constructional features.

DC Generators: Emf equation of generator, relation between emf induced and terminal voltage brush drop and armature reaction.

DC motor: working principle, Back emf and its significance, torque equation.

Types of D.C. motors, characteristics and applications. Necessity of a starter

For DC motor.

Synchronous Generators: Principle of operation. Types and constructional features. Emf equation

Three Phase Induction Motors: Concept of rotating magnetic field. Principle of operation. Types and Constructional features. Slip and its Significance.

Power System

Transmission Lines, Types and classification, phenomenon associated (skin effect, Ferranti's effect, proximity effect and corona), types of substations, types of Distribution systems, introduction to protection of power system (switchgears & circuit breakers basics only)

Reference Books:

. Electrical Engineering Fundamentals (V. Del Toro PHI)
. Engineering Circuit Analysis (W. H. Hayt and J.E. Kemmerly Mc-Graw Hill)
.A Textbook of Electrical Technology Volume- I – (B.L.Theraja, S.Chand and Company Ltd., New Delhi.)
.Basic Electrical Engineering, V.K. Mehta, S.Chand and Company Ltd., New Delhi.
.Theory and problems of Basic Electrical Engineering- (I.J.Nagrath and Kothari, Prentice-Hall of India Pvt. Ltd.)

Course Name: Engineering Chemistry
Subject Code: G1T05
Credits:3
Marks:100

Course Outcome:

CO1: Impart basic knowledge related to the the importance of engineering chemistry for industrial use.
CO2: Enable the engineering student to upgrade the existing technologies and pursue further research.

Contents

UNIT 1: GENERAL CHEMISTRY

a.**Periodic Table** and properties

b. **Atomic Structure** Planck's Quantum theory, Wave-particle duality, Uncertainty principle,Quantum mechanical model of hydrogen atom

c. **Phase rule** and its application to one component system (water

d. **Chemical Kinetics:** Rates of chemical reactions, temperature dependence of chemical reactions; theories of reaction rates – collision and transition state theory,photochemical reactions and free radical polymerization.Homogeneous, heterogeneous,and enzymatic catalysis. Concepts of promotors, inhibitors, and poisoners.), Types andtheories of corrosion.

UNIT 2: COORDINATION COMPOUNDS: Ligands, nomenclature, isomerism, stereochemistry. Concept of CF, VB & MO Theories.

UNIT 3: BONDING IN ORGANIC COMPOUNDS: Classification, trivial names and IUPAC system of nomenclature of organic compounds. Inductive effect, hydrogen bond, conjugation, resonance. Methods of determining reaction mechanisms. Nucleophilic and electrophilic substitutions and additions to multiple bonds. Elimination reactions. Nucleophilic and electrophilic aromatic substitution. Reactive intermediates- carbocations, carbanions, carbenes, nitrenes, free radicals. Molecular rearrangements involving electron-deficient atoms.

UNIT 4: POLYMERS: Introduction & Classification of polymers mechanism of polymerization (Addition, condensation and co-ordination), Bio polymerization, Bio degradable polymerization, preparation properties and technical application of thermoplastics (PVC, PVA, Teflon) & thermosets (PF, UF), Natural elastomers and synthetic rubber (SBR,GR –N) . Silicones.

UNIT 5: INSTRUMENTAL ANALYSIS: Basic principles of spectrometry viz UV-Vis/ IR/ NMR/Mass/ GC and HPLC.

UNIT 6: ENGINEERING MATERIALS

Cement: Basic constituents and significance, Manufacturing of Portland cement by Rotary Kiln Technology, Chemistry of setting and hardening of cement and role of gypsum

Fuel: Classification, calorific value (Bomb calorimeter); Coal: source, classification, carbonization of coal.Petroleum- classification, different fractions and uses; Cracking of hydrocarbons, knocking and octane number, cetane number, synthetic petrol and petrochemicals.Biogas and solar energy.

Glass: Definition, Properties, Manufacturing of glass, Types of silicate glasses and their commercial uses, Importance of annealing in glass making.

Textbooks:

1. A Text Book of Engineering Chemistry, Sashi Chawla, Dhanpat Rai & Sons.
2. Concise Inorganic Chemistry, J.D. Lee, Blackwell Science.
3. Basic Inorganic Chemistry, F.A. Cotton, Wiley.
4. Physical Chemistry, Samuel Glasstone, McMillan India Ltd.
5. Engineering Chemistry. B.K. Sharma, Krishna Prakashan.
6. Engineering Chemistry, Jain & Jain, Dhanpat Rai & Sons.
7. Quantitative Chemical Analysis. A.I. Vogel, Longman.
8. Inorganic Chemistry. R.K. Dave.
11. A Handbook of Analytical Inorganic Chemistry. D. Sharma.
12. Advance Organic Chemistry. B.G. Bahl & Anand Bahl. S. Chand & Comp. Ltd.
13. Modern Inorganic Chemistry. K.D. Modon, S. Chand & Comp. Ltd.

Course Name: Engineering Graphics

Subject Code: G1T06

Credits:3

Marks:100

Course Outcome:

CO1: Enable the student to develop graphics skill.

CO2: Help the student to read and interpret the Engineering Drawing.

Contents:

Unit 1

Plane geometry and machine parts:Introduction of engineering graphics: Principles of projection lines and dimension B.I.S code of practice (SP 46) Scale, representative fraction, plain scale, diagonal scale, Vernier scale and scale of chords.Engineering curves: Classification of engineering curves. Construction of coins, Cycloidal curves involute and spiral.Loci of points: Simple mechanisms like slider crank mechanism four bar chain mechanism etc.

Unit 2

Solid geometry:Introduction to projection of point, line and plane:Projection of line inclined to both planes and simple cases. True length, of straight linen and its inclination with reference planes (traces are not included). Projection of perpendicular and oblique planes.Introduction to projection of solids, section of solids and interpenetration of solids:Classification of solids, projection of right and regular solids with their axis inclined to both planes. Projection of sphere. Section of pyramid, cone, prism and cylinder, Method of determining line of intersection and curve of intersection.

Unit 3

Orthographic projections: Orthographic projection: Conversion of pictorial view into orthographic views, type of sections (full,half,offset,broken,removed,revolved) section view, orthographic reading,missing view and missing lines problems. Isometric View: conversion of orthographic view into isomeric view. Introduction to computer aided Drafting: Advantage of CAD, elements of CAD, components of computer, input and output devices,type of software, basic functions drafting software.

Books:

1. Engineering Drawing Volume-I & II- P.J.Shan.
2. Engineering Drawing-N.D Bhatt & V.M Panchal.

Course Name: Engineering Physics-I Lab
Subject Code: G1L01
Credits:1
Marks:100

Course Outcome:

CO1: Develop hands-on experimental skills in setting up and conducting physics experiments relevant to engineering disciplines.
CO2: Learn precision measurement techniques, including the use of laboratory instruments such as oscilloscopes, spectrometers, and sensors.
CO3: Encourage innovation and creative thinking when designing experiments and exploring novel applications of physics principles

Course Name: Engineering Chemistry Lab
Subject Code: G1L02
Credits:1
Marks:100

Course Outcome:

CO1: Adhere to safety protocols and practices when working with chemicals, laboratory equipment, and experimental setups.
CO2: Develop proficiency in basic laboratory techniques, including measuring, mixing, and handling chemicals and laboratory apparatus.
CO3: Conduct quantitative analysis of chemical substances to determine their composition and concentration accurately.
CO4: Develop effective scientific report writing skills, including documenting experimental procedures, data analysis, results, and conclusions.

Course Name: Engineering Graphics Lab

Subject Code: G1L03
Credits:2
Marks:100

Course Outcome:

CO1: Develop proficiency in constructing basic geometric shapes and figures using drawing instruments such as compasses and rulers.
CO2: Learn dimensioning techniques, including linear dimensions, angular dimensions, and tolerances, to provide clear and precise information on drawings.
CO3: Produce pictorial drawings, including isometric, oblique, and perspective drawings, to enhance visualization of objects.
CO4: Apply problem-solving skills to create drawings that accurately represent engineering designs and concepts.
CO5: Collaborate with peers on drawing projects to simulate teamwork and sharing of responsibilities.

SEMESTER 2				
THEORY				
Sl.No	**Subject Code**	**Course Name**	**Credits**	**Marks**
1	G2T01	Engineering Mathematics-II	***4***	100
2	G2T02	Engineering Physics-II	***3***	100
3	G2T03	Fundamentals of Computing	3	100
4	G2T04	Basic Electronics	3	100
5	G2T05	Engineering Mechanics	3	100
6	G2T06	Environmental Science	0	100
Total Credits (Theory)			16	600
PRACTICAL				
1	G2L01	Workshop Practice	2	100
2	G2L02	Basic Electronics Lab	1	100
3	G2L03	Fundamentals of Computing Lab	1	100
	G2L04	Engineering Physics-II Lab	1	100
Total Credits(Practical)			**5**	400

Course Name: Engineering Mathematics-II
Subject Code: G2T01
Credits:4
Marks:100

Course Outcome:

CO1: Students will be able to apply mathematical methods and principles to solve problems in their respective fields.

CO2: Students know how to apply mathematical methods in the computer programming language.

Contents:

Unit I Vector Calculus

Gradient and directional derivative, Divergence and Curl and their physical interpretations, Irrotational and Solenoidal vector fields, Line integral over a plane curve, Surface Integral and Volume Integral - Green's, Gauss divergence and Stoke's theorems(without proof) and their applications

Unit II Complex analysis

Functions of complex variables, analytic functions, zerosand singularities, complex integration, Taylor and Laurent series, Residues - residue theorem, evaluation of real integrals using residue theorem

Unit III Ordinary Differential Equations

Exact differential equations, linear differential equations of second and higher order with constant coefficient, method of variation of parameters, Cauchy's and Legendre's linear equations, simultaneous linear equations with constant coefficients.

Unit IV

Series solution of ODE with special emphasis to Legendre and Bessel's equation.

Unit V Laplace transform

Laplace transforms of elementary functions, properties of Laplace transforms, existence conditions, transforms of derivatives, transforms of integrals, multiplication by t, division by t. Evaluation of integrals by Laplace transforms. Laplace transform of unit step function, unit impulse function and periodic function. Inverse transforms, convolution theorem, application to linear differential equations and simultaneous linear differential equations with constant coefficients and applications to integral equations.

Textbooks:

1. Higher Engineering Mathematics: B. S. Grewal
2. Advanced Engineering Mathematics: E. Kreyszig
3. Calculus and Analytic Geometry: G. B. Thomas, R. L. Finney

Reference books:

1. Advanced Engineering Mathematics: Jain and Iyenger
2. Advanced Engg. Mathematics: Michael D. Greenberg
3. Advanced Engineering Mathematics (7th Edition): Bali N., Goyal M.

Course Name: Engineering Physics-II
Subject Code: G2T02
Credits:3
Marks:100

Course Outcome:

CO1: Understand basic tenets of electromagnetism and solid state physics and learn how

they underline modern engineering equipment across discipline.
CO2: Prepare students to evaluate and upgrade engineering instrumentation and pursue further research if need be.

Contents:

UNIT I - Electrostatics

Gauss's Law and its integral and differential forms, applications, Poisson and Laplace equations. Maxwell's equations, Basic Concepts of Electromagnetic Waves and its solution in free space.

UNIT II - Magnetostatics

Lorentz force, Biot-Savart and Ampere's laws and their applications, Divergence and Curl of Magnetostatic fields, Magnetic vector Potential, Force and torque on a magnetic dipole, Magnetic materials, Magnetization,

UNIT III - Band theory of solids

Origin of energy bands in solids, motion of electrons in a periodic potential- The Kronig-Penny model, Brillouin zones, effective mass Metals. semi-metals, semi-conductors and insulators and their energy band structure. Extrinsic and intrinsic semiconductors, doping - Fermi energy for doped and undoped semiconductors, the p-n junction (energy band diagrams with Fermi energy), the unbiased diode, forward and revesrse biased dides- its characteristics, tunnel diode, zener diode, photo-diode, LED, the photo-voltaic cell, the transistor, its characteristics, common base, common emitter, common collector.

UNIT IV - X-rays

Origin of X-rays, Continuous and characteristics X-ray spectra, Moseley's Law, Absorption of X-rays, Diffraction of X-rays, Bragg's Law, Bragg's spectrometer, Practical applications of X-rays, Compton effect.

Text/References Books:

1. S. O. Pillai, Solid State Physics, New Age International Publishers.

2. Charles Kittel, Introduction to Solid State Physics, Wiley India.

3. A. J. Dekker, Solid State Physics, Macmillan.

4. F. W. Sears, H. D. Young, M. W. Zemansky, University Physics, Narosa Publishing House

5. S. M. Sze, Semiconductor Devices: Physics and Technology, Wiley India.

Course Name: Fundamentals of Computing
Subject Code: G2T03
Credits:3
Marks:100

Course Outcome:

CO1: Students will have a a basic fundamental knowledge of computers.
CO2: Able to solve basic mathematical problems using C programming language.
CO3: Understand the necessity of Programming Language.

Contents:

Unit I

Introduction to Computer systems and software: Classification, History, Types of Computers. Elements of a Computer System: Block Diagram of The Computer System, Introduction to various units.Hardware: CPU, Memory, Input and Output devices, Auxiliary storage devices.Software: System and Application Software, Utility packages.

Unit II

Basic programming using C: Concept of variables, program statements and function calls from the library (Printf, for example). C data types, int, char,float etc., C expressions, arithmetic operations, relational and logic operations, C assignment statements, extension assignment of the operations. C primitive input output using getchar and putchar, exposure to the scanf and printf functions, C statements, conditional executing using if, else. Optionally, switch and break statements may be mentioned.

Unit III

Iterations and subprograms: Concept of loops, an example of loops in C using 'for', while and do-while. Optionally, continue may be mentioned. One dimensional arrays and example of iterative programs using arrays, 2-d arrays Use in matrix computations. Concept of Sub-programming, functions: Example of functions. Arguments passing mainly for the simple variables.

Unit IV

Pointers and Strings: Pointers, relationship between arrays and pointers Argument passing using pointers, Array of pointers. Passing arrays as arguments. Strings and C string library. Structure and Unions. Defining C structures, passing strings as arguments programming examples.

Unit V

File Handling:-Types of I/O. Formatted Console Input output Functions. Text mode vs binary mode. Storing and retrieving records form files.

TEXT BOOKS:

1.Introduction to Computers by Peter Norton, McGraw Hill
2.YashwantKanetkar,"Let us C", BPB publications, 2nd Edition, 2001.
3.Programming C, Gottfried, Schaum outline series.
4.HerbertSchildt,"C: The complete reference", OsbourneMcgraw Hill,4th Edition, 2002.

REFERENCE BOOKS:

1. Introduction to Computers, Balagurusamy
2.Raja Raman,"Computer programming in C", pre3ntice Hal of India,1995.
3.Kernighan & Ritchie, " C Programming Language", The (Ansi C Version), PHI, 2nd Edition.

Course Name: Basic Electronics
Subject Code: G2T04
Credits:3
Marks:100

Course Outcome:

CO1: Students possess knowledge of the construction, operation, and characteristics of semiconductor devices.
CO2: Acquired knowledge to solve small-scale circuits consisting of semiconductor devices.
CO3: Analyse DC and AC response of small signal amplifier circuits using device models.

Contents

1.**Semiconductor Diodes:** Semiconductor materials- intrinsic and extrinsic types, Ideal Diode, Terminal characteristics of diodes: p-n junction under open circuit condition, p-n junction under forward bias and reverse bias conditions, p-n junction in breakdown region, Zener diode and applications, Rectifier Circuits, Clipping and Clamping circuits

2. Bipolar Junction Transistors (BJTs): Physical structure and operation modes, Active region operation of transistor,Transistor as an amplifier, Basic BJT amplifier configuration: common emitter, common base and common collector amplifiers, Biasing the BJT: fixed bias, emitter feedback bias, collector feedback bias and voltage divider bias, Transistor as a switch: cut-off and saturation modes.

3. Field Effect Transistor (FET): Enhancement-type MOSFET: structure and physical operation, current-voltage characteristics, Depletion-type MOSFET, Basic MOSFET amplifier configuration: common source, common gate and common drain types, Junction Field-Effect Transistor (JFET)

1. **Amplifiers and Oscillators:** Single Stage CE Amplifier, decibels and half power points., The Barkhausen Criterion for Oscillations, BJT RC phase shift oscillator, Hartley Colpitts and crystal oscillator using FET. Expression for output frequency
2. **Operation Amplifier (Op-amps):** Ideal Op-amp, Differential amplifier: differential and common mode operation common mode rejection ratio (CMRR), Practical op-amp circuits: inverting amplifier, non -inverting amplifier, Other applications of op-amps: voltage follower, addition, subtraction, integration and differentiation.

Text books:

1. R.P. Jain, " Modern Digital Electronics " TMH, 3rd Ed, 2004.
2. Morris Mano, " Digital Design ", PHI, 2nd Ed, 2002.

Reference books:

1. R.J. Tocci, " Digital Systems", PHI,2000.
2. Malvino and Leach, " Digital principles and applications", TMH, 2000.
3. I.J. Nagrath ," Electronics, Analog & Digital", PHI, 1999.
4. J.M. Yarbrough, " Digital Logic-Application and Design ", PWS publishing,1999.
5. B.S. Nai," Digital Electronics and Logic Design ", PHI, 2000.
6. Balabanian and Carlson, " Digital Logic Design principles", Wiley pub., 2000

Course Name: Engineering Mechanics
Subject Code: G2T05
Credits:3
Marks:100

Course Outcome:

CO1: Develop the capacity to predict the effects of force and motion while carrying out the creative design functions of engineering.
CO2: Help the student develop the behavior of machines and structures.
CO3: Develop the ability to visualize problem formulation.

Contents

Unit I

Basic concept of force systems: Force and Equilibrium, Basic Concepts, Force Moments and couple, principle of Transmissibility, Verignon's theorem, Resultant of force Systems-concurrent and Non-concurrent coplanar Forces, Funicular polygon. Free body diagram.

Beams Bending moment and shear force diagrams for statically determinate beams.

Unit II

Plane Trusses: plane structures, Various method of analysis of Trusses, Method of joints,

Unit III

Properties of surfaces: Method of sections and Graphical Moment of Inertia, Centre of gravity, centroids of Une,Area, volume and Composite bodies, Area Moment of Inertia and Mass Moment of Inertia for plane figures and bodies including composite bodies, Product Moment of inertia, Parallel axis theorem, principle moment of inertia .

Unit IV

Friction: Introduction, Dry Friction, Co-efficient of static friction. Friction cone, Screw jack and Belt friction.

Unit V

Kinematics of Rigid Bodies:Plane motion, Absolute motion, Relative motion, Translating axes and Rotating axes.Kinetics of Rigid Bodies: plane motion, Force, Mass and acceleration, Work and energy, Impulse and momentum, principle and dynamic equilibrium.

Books:

Engineering Mechanics, R.S. Khurmi, S Chand Pub
Beer. F.P. &Johnston,F.R. : Mechanics for Engineers, Mc Graw Hill.
Meriam, J.L. : Dynamics, John Wiley.
Shames, I.H. : Engineering Mechanics, Prentice Hall of India.
Dayaratnam, P. : Statics, Tata McGraw Hill.
Timoshenko, S. and Young D. : Engineering Mechanics, Mc Graw Hill.

Course Name: Environmental Science

Subject Code: G2T06

Credits:3

Marks:100

Course Outcome:

CO1: Helps the students to understand the critical linkages between ecology-society-economy.

CO2: Develop critical thinking for shaping strategies (scientific, social, economic and legal).

CO3: Acquire values and attitudes towards understanding complex environmental, economic social challenges.

Contents

UNIT 1: ENIVRONMENT AND ECOSYSTEMS

Environmental education: definition - scope - objectives and importance. Concept of an ecosystem – types (terrestrial and aquatic ecosystems) – structure and function – ecological succession - food chains, food webs and ecological pyramids

UNIT 2: BIODIVERSITY

Introduction: definition - genetic, species and ecosystem diversity - value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values - threats to biodiversity: habitat loss, poaching of wildlife - endangered and endemic species of India, Conservation of biodiversity: in-situ and ex-situ conservations.

UNIT 3: POLLUTION AND WASTE MANAGEMENT

Classification of pollutants and their effects. Air and water pollution — causes, effects and control measures. Waste water treatment (general) – primary, secondary & tertiary stages. Solid waste management: causes - effects of municipal waste, hazardous waste, bio

medical waste - process of waste management.

UNIT 4: CURRENT ENVIRONMENTAL ISSUES

Environmental ethics -issues and possible solutions- population explosion, climatic change, ozone layer depletion, global warming, acid rain and green house effect. Sustainable development: definition, objectives and environmental dimensions of sustainable development- environmental audit for sustainable development.

UNIT 5: ENVIRONMENTAL PROTECTION

National and international concern for environment: Important environmental protection acts in India – water, air (prevention and control of pollution) act, wild life conservation and forest act – functions of central and state pollution control boards - international effort – key initiatives of Rio declaration, Vienna convention, Kyoto protocol and Johannesburg summit. Concept of Green Chemistry and Green engineering.

TEXT BOOKS

1. Sharma.B.K. and Kaur, "Environmental Chemistry"" Goel Publishing House, Meerut, 1994.
2. De.A.K., "Environmental Chemistry", New Age International (p) lt., , New Delhi, 1996.
3. Kurian Joseph & R. Nagendran, "Essential of Environmental Studies"" Pearson Education, 2004.

REFERENCE BOOKS

1. Dara S.S., A Text Book of Environmental Chemistr y and pollution control, S.Chand & Company Ltd., New Delhi, 2004.

Course Name:Workshop Practice
Subject Code: G2L01
Credits:2
Marks:100

Course Outcome:

CO1: Understand and adhere to safety protocols, including the proper use of personal protective equipment (PPE) and safe work practices in the workshop.
CO2: Master marking and layout techniques for accurately cutting, drilling, and machining materials.
CO3: Develop woodworking skills, including sawing, planning, sanding, and joinery techniques, to create wooden projects.
CO4: Apply workshop skills to fabricate small engineering projects or prototypes, following engineering drawings and specifications.
CO5: Learn workshop organization and housekeeping practices to maintain a safe and organized work environment.
CO6: Collaborate effectively with peers on workshop projects, simulating teamwork and sharing of responsibilities.

Course Name:Basic Electronics Lab
Subject Code: G2L02
Credits:1
Marks:100

Course Outcome:

CO1: Identify and describe common electronic components, including resistors, capacitors, diodes, transistors, and integrated circuits (ICs).
CO2: Develop proficiency in using breadboards to create and prototype electronic circuits without soldering.
CO3: Assemble and test basic electronic circuits, including power supplies, amplifiers,

oscillators, and digital logic circuits.
CO4: Process and analyze analogue and digital signals using electronic circuits and filters.
CO5: Apply problem-solving skills to analyze and address challenges that may arise during circuit construction and troubleshooting.

Course Name:Fundamentals of Computing Lab
Subject Code: G2L03
Credits:1
Marks:100

Course Outcome:

CO1: Develop proficiency in at least one programming language commonly used for introductory computing courses, such as C, Java, etc.
CO2: Understand and apply fundamental algorithms and data structures to solve problems efficiently.
CO3: Enhance problem-solving skills by tackling a variety of computational problems and challenges.
CO4: Learn how to represent algorithms using flowcharts and pseudocode to plan and visualize program logic.
CO5: Understand the concept of algorithmic complexity (big O notation) and its relevance to inefficient algorithm design.
CO6: Complete a significant coding project that showcases the skills and knowledge gained during the course.

Course Name:Engineering Physics-II Lab
Subject Code: G2L03
Credits:1
Marks:100

Course Outcome:

CO1: Acquire skills in collecting experimental data, recording observations, and performing data analysis using mathematical and statistical methods.
CO2: Investigate optical phenomena, such as interference, diffraction, polarization, and dispersion, through practical experiments.
CO3: Familiarize with optical instruments, including microscopes, telescopes, and spectrometers, and understand their principles of operation.
CO4:Explore magnetic properties of materials, including magnetic susceptibility, hysteresis, and magnetic domains**.**
CO5: Conduct research, data analysis, and experimentation to support the understanding of physical phenomena and principles.

SEMESTER 3				
THEORY				
1	ECB303	Digital Electronics & Logic Design	3	100
2	ITB301	Object Oriented Programming	3	100
3	ITB302	Computer Organization & Architecture	3	100
4	ITB303	Data Structures	3	100
5	MAT3T2	Differential Calculus	4	100
Total Credits (Theory)			16	500
PRACTICAL				

1	ITB311	Object-Oriented Programming Lab	1.5	100
2	ITB312	Data Structures Lab	1.5	100
3	ECB313	Digital Electronics & Logic Design Lab	1.5	100
Total Credits (Practical)			4.5	300
Total Credits			20.5	800

Course Name: Digital Electronics & Logic Design
Subject Code: ECB303
Credits:3
Marks:100

Course Outcome:

CO1: Enable students to efficiently understand the analogue and digital signal used in computer system.
CO2: Enable students to analyse different types of digital electronic circuit using various mapping and logical tools.

Contents

Unit I: Introduction To Digital System Design
Number systems, binary arithmetic and codes: positional number system; binary, octal and hexadecimal number systems; representation of signed numbers; binary arithmetic – addition, subtraction, multiplications and division; fixed and floating point numbers; binary coded decimal codes; Gray codes; error detection and correction codes-parity check codes and Hamming code.

Unit II: Boolean Algebra and Switching Functions
Boolean algebra; basic postulates and fundamental theorems of Boolean algebra; truth tables; basic logic operations and gate symbols ; algebraic forms of switching functions- SOP and POS forms, minterms and maxterms; derivation of canonical forms; minterms and maxterms; simplification of switching functions- K-map and quine- Mc Cluskey tabular minimization methods; synthesis of combinational logic circuits-NAND and NOR networks.

Unit III: Logic Families
Introduction to different logic families; operational characteristics of BJT in saturation and cut-off regions; operational characteristics of MOSFET as switch; TTL inverter- circuit description and operation; CMOS inverter-circuit description and operation; other TTL and CMOS gates; electrical behavior of logic circuits- noise margins, fanout, transmission time, propagation delay, power dissipation.

Unit IV: Combinational Logic Modules
Decoders, encoders, multiplexers, de-multiplexers and their applications; three state devices and buses; code converter; binary adders: half adder and full adder, ripple carry adder, carry-look-ahead adder; subtractors ; multipliers; ALU; comparators; parity circuits; circuit timing-timing diagrams and specifications ; combinational circuit design examples.

Unit V: Sequential Logic Devices And Circuits
Latches; flip- flops; registers, shift-registers; counters ripple counters , synchronous counters , up-down counters, BCD counters, ring counters, timing diagrams and specifications; state machine models-synchronous state machines; state machine design

examples design examples; design using ASM charts ; timing hazards and races ; design and analysis of asynchronous sequential circuits: pulse mode and fundamental mode.

Unit VI: Programmable Logic Devices (PLDs)

PROMs, PLAs, PAL, Semiconductor memory: organization, Operation, and classification.

Textbooks:

1. J.F. Wakerly, Digital Design-principles and practices , 3rd Ed, Pearson Education; 2001.
2. V.P.Nelson, H.T.Nagle, B.D. Carroll and J.D. Irwin, Digital Logic Circuit Analysis and Design, Prentice-Hall,1995.
3. R.F.Tinder, Engineering Digital Design, 2nd Ed. Harcourt India,2001.

References:

1. F.J. Hill and G.R. Peterson, Computer –aided Logical Design, 4th Ed. John Wiley, 1993.
2. M.D. Ercegovac, T. Lang and J.H. Moreno, Introduction to Digital Systems, John Wiley, 2000.
3. M. Mano, Digital Design, 2nd Ed. PHI, 1997.
4. Z. Kohavi, Switching and Finite Automata Theory; TMH, 2000.

Course Name: Object Oriented Programming
Subject Code: ITB301
Credits:3
Marks:100

Course Outcome:

CO1: Students have knowledge of the syntax and semantics of C++ programming language and basic concepts of Object Oriented Programming.
CO2: Students are able to solve problems using C++ programming language methods efficiently.
CO3: Students will have knowledge of how to use C++ in the Project work.

Contents

UNIT I

Introduction: Introducing Object-Oriented Approach related to other paradigms (functional, data decomposition), Characteristics of Object –Oriented Languages.

Basic terms and ideas: Abstraction, Encapsulation, Information hiding, Inheritance, Polymorphism, Review of C, Difference between C and C++, cin, cout, new, delete operators.

UNIT II

Classes and objects : Abstract data types, Objects & classes, attributes, methods, C++ class declaration, State identity and behavior of an object,Constructors and destructors, instantiation of objects, Default parameter value,Copy Constructor, Static Class Data, Constant and Classes, C++ garbage collection, dynamic memory allocation.

UNIT III

Inheritance and Polymorphism : Inheritance, Types of Inheritance, Class hierarchy, derivation-public, private & protected, Aggregation, composition vs Classification hierarchies, polymorphism, Type of polymorphism- Compile time and runtime, Method polymorphism, polymorphism by parameter, Operator overloading, Parametric Polymorphism, Generic function – template function,f unction name overloading, Overriding inheritance methods.

UNIT IV

File and Exception Handling : Persistent objects, Streams and files, Namespaces, Exception handling, Generic Classes.

UNIT V

Standard Template Library: Standard Template Library, Overview of Standard Template Library, Containers, Algorithms, Iterators, Other STL Elements, The Container Classes, General Theory of Operation, vectors.

Text Books:

1. Grady Booch, Robert A. Maksimchuk, Michael W. Engle "Object-Oriented Analysis and Design with Applications (3rd Edition)"
2. Bruce, Foundations of Object Oriented Languages, PHI
3. Jana, C++ & Object Oriented Programming, PHI
4**.** Rambaugh, James Michael, Blaha - "Object Oriented Modelling and Design" - Prentice Hall India/ Pearson Education**.**

Reference Books:

1. Rajaram: Object Oriented Programming and C++, New Age International
2. Olshevsky : Revolutionary guide to Object Oriented Programming using C++, Shroff / Wrox Mahapatra: Introduction to System Dynamic Modelling, Universities Press.

Course Name: Computer Organization & Architecture
Subject Code: ITB302
Credits:3
Marks:100

Course Outcome:

CO1: Students have knowledge of computer architecture and functionality of the central processing unit.

CO2: Understand some of the design issues in terms of speed, technology, cost, and and performance.

CO3: Understand different number systems, binary addition and subtraction, 2's complement representation and operations with this representation

Contents

Unit 1: Functional blocks of a computer: CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU – registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Case study – instruction sets of some common CPUs. Data representation: signed number representation, fixed and floating point representations, character representation. Computer arithmetic – integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-and add, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic.

Unit 2: Introduction to x86 architecture. CPU control unit design: hardwired and micro-programmed design approaches, Case study – design of a simple hypothetical CPU. Memory system design: semiconductor memory technologies, memory organization. Peripheral devices and their characteristics: Input-output subsystems, I/O device

interface, I/O transfers – program controlled, interrupt driven and DMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes – role of interrupts in process state transitions, I/O device interfaces – SCII

Unit 3: Pipelining: Basic concepts of pipelining, throughput and speedup, pipeline hazards. Parallel Processors: Introduction to parallel processors, Concurrent access to memory and cache coherency.

Unit 4: Memory organization: Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, replacement algorithms, write policies.

Textbooks:

1. " Computer Organization and Design: The Hardware/Software Interface", 5th Edition by David A. Patterson and John L. Hennessy, Elsevier.
2. " Computer Organization and Embedded Systems" , 6th Edition by CarlHamacher, McGraw Hill Higher Education.

Reference books:

1. " Computer Architecture and Organization", 3rd Edition by John P. Hayes, WCB/McGraw-Hill
2. " Computer Organization and Architecture: Designing for Performance" , 10th Edition by William Stallings, Pearson Education.
3. " Computer System Design and Architecture", 2nd Edition by Vincent P. Heuring and Harry F. Jordan, Pearson Education.

Course Name: Data Structures
Subject Code: ITB303
Credits:3
Marks:100

Course Outcome:

CO1: Students are able to implement linear data structures such as stacks, queues, linked lists and their applications.
CO2: Students can implement basic operations on binary trees.
CO3: Students will understand and implement various traversal techniques of graph.

Contents

UNIT I

Basic concept of data structures, mathematical preliminaries-big oh notation, notion of space and time complexity, simple algorithms and illustration of their complexity, recursion.

UNIT II

Abstract Data Types **–** Algorithm Notations - Basic data structures – Arrays **–** Lists **–** Singly linked lists **–** Doubly linked lists **–** Circular lists - Stacks and Queues – Applications of Stack and Queues

UNIT III

Trees – Binary Trees – Binary tree representation and traversals – Threaded binary trees, Counting, Binary Tree, AVL Trees – Binary tree representation of general trees – Application of trees: Set representation – Graph and its representations – Graph Traversals .

UNIT IV

Insertion sort – Merge sort – Quick sort – Heap sort, Radix sort – Sorting with disks – K-

way Merging – Sorting with Tapes – Polyphase Merge

UNIT V Linear Search – Binary Search - Hash Tables – Overflow Handling – Cylinder Surface Indexing – Hash Index – B-Tree Indexing.

Text books:

1. E. Horowitz and S. Sahani, "Fundamentals of Data Structures", Galgotia Book source Pvt. Ltd. 1999.
2. R.L.Kruse, B.P. Leung, C.L. Tondo, " Data Structure and program design in C",PHI,2000.
3. Sartaj Sahni, "Data Structures, Algorithms, and Applications in C++", Second Edition, McGraw Hill NY, Silicon Press, 2005.

Reference books:

1. Schaum's outline series, " Data Structure", TMH, 2002.
2. Y.Langsamet. Al., " Data Structures using C and C++", PHI,1999.
3. Yashwantkanethkar, " Data Structure through C", BPB, 2005.
4. AV Aho, J hopcroft, JD Ullman, "Data Structures and Algorithms", Addison-Wesley.
5. Goodrich, Michael T., Roberto Tamassia, David Mount. "Data Structures and Algorithms in C++", Seventh Edition, Wiley Publishers, 2004.
6. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, 3rd edition, Pearson Education India, 2007.
7. Jean-Paul Tremblay and Paul G. Sorenson, An Introduction to Data Structures with Applications, Second Edition, Tata McGraw-Hill, New Delhi, 1991.
8. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", Third Edition, Prentice Hall of India, , 2010.

Course Name: Differential Calculus
Subject Code: MAT3T2
Credits:3
Marks:100

Course Outcome:

CO1: Gain proficiency in calculus computations.
CO2: Able to analyse and describe the behaviour of functions: limits, derivatives, and integrals.
CO3: Students will be equipped with the knowledge and expertise to confidently solve application problems in various fields."

Contents

Unit 1: Sequences and series*:* Convergence of sequence and series, tests for convergence, power series, Taylor's series. Series for exponential, trigonometric and logarithmic functions.

Unit 2: Multivariable Calculus (Differentiation*):* Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence.

Unit 3: Multivariable Calculus (Integration): Multiple Integration: double and triple integrals (Cartesian and polar), change of order of integration in double integrals, Change of variables (Cartesian to polar). Theorems of Green, Gauss and Stokes, orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds.

Unit 4: First order ordinary differential equations
Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.
Unit 5: Ordinary differential equations of higher orders: Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation; Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.

Text Books/Reference Books:
1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
5. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
6. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
7. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edition, Wiley India, 2009.
8. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
9. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
10. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
11. G.F. Simmons and S.G. Krantz, Differential Equations, Tata McGraw Hill, 2007.

Course Name: Object-Oriented Programming Lab
Subject Code: ITB311
Credits:1.5
Marks:100

Course Outcome:

CO1: Students should be proficient in writing C++ code, including proper syntax, data types, control structures, and basic input/output operations.
CO2: Ability to design and implement classes that model real-world entities or abstract concepts, including appropriate member functions, attributes, and access modifiers.
CO3: Understanding of inheritance hierarchies, the use of base and derived classes, and the ability to implement polymorphism through method overriding and virtual functions.
CO4: Collaborative development of larger software projects using OOP principles, possibly involving multiple classes and modules.

Books:

1. "C++ A Beginner's Guide" by Herbert schildt.
2. "Object Oriented Programming with C++" by Balagurusamy.
3. "Programming in C++" by Mahapatra P B.
4. "Programming in C++" by Kamthane

Course Name: Data Structures Lab
Subject Code: ITB312
Credits:1.5
Marks:100

Course Outcome:

CO1:Students should have a solid understanding of essential data structures, including arrays, linked lists, stacks, and queues.
CO2: Proficiency in more complex data structures like trees (binary trees, binary search trees, AVL trees), graphs (basic graph algorithms, adjacency matrix/adjacency list representation), and hash tables.
CO3: Familiarity with sorting algorithms (e.g., bubble sort, quicksort, mergesort) and searching algorithms (e.g., linear search, binary search).
CO4: Familiarity with graph traversal algorithms (e.g., breadth and depth-first search) and basic graph algorithms (e.g., finding shortest paths).

Books:
1."Computer Basics and C Programming" by Rajaraman V.
2. "The C Programming Language" by Brian W Kernighan / Dennis Ritchie.
3. "C in Depth" by Deepali Srivastava and S K Srivastava.

Course Name: Digital Electronics & Logic Design Lab
Subject Code: ECB313
Credits:1.5
Marks:100

Course Outcome:

CO1:students should have a clear understanding of basic digital logic gates (AND, OR, NOT, NAND, NOR, XOR, XNOR) and their truth tables.
CO2: Proficiency in applying Boolean algebra principles to simplify logic expressions and design digital circuits.
CO3: Understanding and implementation of sequential logic circuits, such as flip-flops, latches, registers, and counters.
CO4: Implementation of adder and subtractor circuits, including half-adders and full-adders.

Books:
1. "Digital Logic and Computer Design" by Mano.
2. “Digital Electronics Logic Design for RGPV (SEM-IV EEE/EE Course-2015)" by A P Godse Dr D A Godse

SEMESTER 4
THEORY

1	MAT4T2	Discrete Mathematics	4	100
2	ITB401	Computer Graphics & Virtual Reality	3	100
3	ITB402	Operating System	3	100
4	ITB403	Algorithm Analysis and Design	3	100
5	ITB404	Formal Language & Automata Theory	3	100
Total Credits (Theory)			16	500
PRACTICAL				
1	ITB411	Algorithm Analysis and Design Lab	1.5	100
2	ITB412	Operating System Lab	1.5	100
3	ITB413	Computer Graphics Lab	1.5	100
Total Credits (Practical)			4.5	300
Total Credits			20.5	800

Course Name: Discrete Mathematics
Subject Code:MAT4T2
Credits:3
Marks:100

Course Outcome:

CO1: Help students to use correct mathematical terminology and notations.
CO2: Could able to construct direct and indirect proof correctly.
CO3: Could able to apply logical reasoning to solve a variety of problems.

Contents

Unit 1: Sets, Relation and Function: Operations and Laws of Sets, Cartesian Products, Binary Relation, Partial Ordering Relation, Equivalence Relation, Image of a Set, Sum and Product of Functions, Bijective functions, Inverse and Composite Function, Size of a Set, Finite and infinite Sets, Countable and uncountable Sets, Cantor's diagonal argument and The Power Set theorem, Schroeder-Bernstein theorem. Principles of Mathematical Induction: The Well-Ordering Principle, Recursive definition, The Division algorithm: Prime Numbers, The Greatest Common Divisor: Euclidean Algorithm, The Fundamental Theorem of Arithmetic.

Unit 2: Basic counting techniques-inclusion and exclusion, pigeon-hole principle, permutation and combination.

Unit 3: Propositional Logic: Syntax, Semantics, Validity and Satisfiability, Basic

Connectives and Truth Tables, Logical Equivalence: The Laws of Logic, Logical Implication, Rules of Inference, The use of Quantifiers. Proof Techniques: Some Terminology, Proof Methods and Strategies, Forward Proof, Proof by Contradiction, Proof by Contraposition, Proof of Necessity and Sufficiency.

Unit 4: Algebraic Structures and Morphism: Algebraic Structures with one Binary Operation, Semi Groups, Monoids, Groups, Congruence Relation and Quotient Structures, Free and Cyclic Monoids and Groups, Permutation Groups, Substructures, Normal Subgroups, Algebraic Structures with two Binary Operation, Rings, Integral Domain and Fields. Boolean Algebra and Boolean Ring, Identities of Boolean Algebra, Duality, Representation of Boolean Function, Disjunctive and Conjunctive Normal Form

Unit 5: Graphs and Trees: Graphs and their properties, Degree, Connectivity, Path, Cycle, Sub Graph, Isomorphism, Eulerian and Hamiltonian Walks, Graph Colouring, Colouring maps and Planar Graphs, Colouring Vertices, Colouring Edges, List Colouring, Perfect Graph, definition properties and Example, rooted trees, trees and sorting, weighted trees and prefix codes, Bi-connected component and Articulation Points, Shortest distances.

Textbooks:

1. Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata McGraw – Hill
2. Susanna S. Epp, Discrete Mathematics with Applications,4th edition, Wadsworth Publishing Co. Inc.
3. C L Liu and D P Mohapatra, Elements of Discrete Mathematics A Computer Oriented Approach, 3rd Edition by, Tata McGraw – Hill.

Reference books:

1. J.P. Tremblay and R. Manohar, Discrete Mathematical Structure and It's Application to Computer Science", TMG Edition, TataMcgraw-Hill
2. Norman L. Biggs, Discrete Mathematics, 2nd Edition, Oxford University Press.
3. Schaum's Outlines Series, Seymour Lipschutz, Marc Lipson, Discrete Mathematics, Tata McGraw - Hill

Course Name: Computer Graphics & Virtual Reality
Subject Code:ITB401
Credits:3
Marks:100

Course Outcome:

CO1: Design and develop GUI-based graphics packages and games.
CO2: Implement different algorithms for line clipping,
CO3: Prepare mini software with different material objects and light effect techniques.

Contents

UNIT-I

Introduction to Computer Graphics, Display devices, Bitmap and Vector based Graphics, Overview of coordinate system, scan conversion of: point, line using differential analyzer and Breshenham's algoritm, circle using midpoint approach. Curve Generation: Bezier and B-Spline curves. Introduction to fractals: generation procedure, classification, dimension

and Koch Curve.

UNIT-II

Area Filling:Inside/Outside test, scanline polygon fill algorithm, Boundary fill and floor fill algorithm. Basic 2D transformations: Translation, Rotation, Scaling, Reflection, Shear – Homogeneous Matrix representation and composite transformation.

UNIT-III

Introduction to 2D viewing, viewing pipeline, view coordinate reference frame, window to viewport transformation, point clipping. Line clipping: Cohen Sutherland Algorithm, Liang Barsky algorithms. Polygon clipping: Sutherland Hodgeman polygon clipping and Weiler Atherton. Text Clipping.

UNIT-IV

Three Dimensional Transformations: Translation, Scaling, Rotation and Composite. 3D object representation: Polygon surfaces, Tables, Meshes. 3D viewing pipeline, viewing transformation, Projections: Parallel (oblique and orthographic), Perspective (one point); visibility – Z-Buffer.

UNIT-V

Introduction to Animation, key frame animation, animation sequence, Motion control methods, morphing, mesh warping.

UNIT-VI

Virtual Reality : Basic Concepts , Classical Components of VR System , Types of VR Systems, Three Dimensional Position Trackers, Navigation and Manipulation Interfaces, Gesture. Interfaces, Graphical Display, Sound displays, and Haptic Feedback . Input Devices ,Graphical Rendering Pipeline , Haptic Rendering Pipeline, Open GL rendering pipeline.Applications of Virtual Reality.

UNIT-VII

Geometric Modeling: Virtual Object Shape, Object Visual Appearance. Kinematics Modeling: Object Position, Transformation Invariants, Object Hierarchies, Physical Modeling: Collision Detection, Surface Deformation, Force Computation. Behavior Modeling.

UNIT-VIII

Programming through VRML : Defining and Using Nodes and Shapes , VRML Browsers , Java 3D :Visual Object Definition by Shape 3D instances , Defining personal visual object class, Color Cube Class, Geometric – Utility Classes, Geometry Classes , Attributes.

TEXTBOOKS

1. Donald Hearn and M. Pauline Baker, “Computer Graphics”, Pearson Education.
2. R. K Maurya, “Computer Graphics with Virtual Reality”, Wiley India.

Reference Books:

1. Grigore Burdea, Philippe Coiffet, “Virtual Reality Technology”, Wiley.
2. Steven Harrington, “Computer Graphics”, McGraw Hill.
3. Vince, “Virtual Reality Systems”, Pearson Education.
4.F.S. Hill , Stephen M. Kelley , “Computer Graphics using Open GL” Prentice Hall

Course Name: Operating System
Subject Code:ITB402
Credits:3
Marks:100

Course Outcome:

CO1: Understand Functions, Services and structure of Operating Systems.
CO2: Analyse various issues related to inter process communication like process scheduling, resource management and deadlocks.
CO3: Interpret the issues and challenges of memory management.
CO4: Synthesize the concepts of I/O management, file system implementation and problems related to security and protection.

Contents

Unit 1: Introduction: Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services, System Calls, Structure of an OS - Layered, Monolithic, Microkernel Operating Systems, Concept of Virtual Machine. Case study on UNIX and WINDOWS Operating System.
Unit 2: Processes: Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching Thread: Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads, Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non pre-emptive, FCFS, SJF, RR; Multiprocessor scheduling: Real Time scheduling: RM and EDF.
Unit 3: Inter-process Communication: Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Strict Alternation, Peterson's Solution, The Producer\ Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem etc.
Unit 4: Deadlocks: Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.
Unit 5: Memory Management: Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation – Fixed and variable partition– Internal and External fragmentation and Compaction; Paging: Principle of operation – Page allocation – Hardware support for paging, Protection and sharing, Disadvantages of paging. Virtual Memory: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page fault , Working Set , Dirty page/Dirty bit – Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU).
Unit 6: I/O Hardware: I/O devices, Device controllers, Direct memory access Principles of I/O Software: Goals of Interrupt handlers, Device drivers, Device independent I/O software, Secondary-Storage Structure: Disk structure, Disk scheduling algorithms File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance. Disk Management: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks.

Textbooks:
1. Operating System Concepts Essentials, 9th Edition by AviSilberschatz, Peter Galvin, Greg Gagne, Wiley Asia.
2. Operating Systems: Internals and Design Principles, 5th Edition, William Stallings, Prentice Hall of India.

Reference books:

1. Operating System: A Design-oriented Approach, 1st Edition by Charles Crowley, Irwin Publishing
2. Operating Systems: A Modern Perspective, 2nd Edition by Gary J. Nutt, Addison-Wesley
3. Design of the Unix Operating Systems, 8th Edition by Maurice Bach, Prentice-Hall of India
4. Understanding the Linux Kernel, 3rd Edition, Daniel P. Bovet, Marco Cesati, O'Reilly and Associates

Course Name: Algorithm Analysis and Design
Subject Code:ITB403
Credits:3
Marks:100

Course Outcome:

CO1: Able to understand correctness of algorithms using inductive proofs and Analyse worst-case running times of algorithms using asymptotic analysis.
CO2: Able to explain important algorithmic design paradigms.
CO3: Explain the major graph algorithms and Employ graphs to model engineering problems.
CO4: Able to Describe the classes P, NP, and NP -Complete and be able to prove that a certain problem is NP-Complete.

Contents

Unit 1: Introduction: Characteristics of algorithm. Analysis of algorithm: Asymptotic analysis of complexity bounds – best, average and worst-case behavior; Performance measurements of Algorithm, Time and space trade-offs, Analysis of recursive algorithms through recurrence relations: Substitution method, Recursion tree method and Masters' theorem.
Unit 2: Fundamental Algorithmic Strategies: Brute-Force, Greedy,Dynamic Programming, Branchand-Bound and Backtracking methodologies for the design of algorithms; Illustrations of these techniques for Problem-Solving , Bin Packing, Knap Sack TSP. Heuristics –characteristics and their application domains.
Unit 3: Graph and Tree Algorithms: Traversal algorithms: Depth First Search (DFS) and Breadth First Search (BFS); Shortest path algorithms, Transitive closure, Minimum Spanning Tree,Topological sorting, Network Flow Algorithm.
Unit 4: Tractable and Intractable Problems: Computability of Algorithms, Computability classes – P, NP, NP-complete and NP-hard. Cook's theorem, Standard NP-complete problems and Reduction techniques.
Unit 5: Advanced Topics: Approximation algorithms, Randomized algorithms, Class of problems beyond NP – P SPACE .

Textbooks:

1. Introduction to Algorithms, 4TH Edition, Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, MIT Press/McGraw-Hill.
2. Fundamentals of Algorithms – E. Horowitz et al.

Course Name: Formal Language & Automata Theory
Subject Code:ITB404
Credits:3
Marks:100

Course Outcome:

CO1: Understand the fundamental concepts of Formal Languages and Automata.
CO2: Apply the knowledge of Automata Theory, Grammar and regular Expressions to solve various problems.
CO3: Apply different Turing machine techniques to solve problems.

Contents

Unit 1: Introduction: Alphabet, languages and grammars, productions and derivation, Chomsky hierarchy of languages.
Unit 2: Regular languages and finite automata: Regular expressions and languages, deterministic finite automata (DFA) and equivalence with regular expressions, nondeterministic finite automata (NFA) and equivalence with DFA, regular grammars and equivalence with finite automata, properties of regular languages, pumping lemma for regular languages, minimization of finite automata.
Unit 3: Context-free languages and pushdown automata: Context-free grammars (CFG) and languages (CFL), Chomsky and Greibach normal forms, nondeterministic pushdown automata (PDA) and equivalence with CFG, parse trees, ambiguity in CFG, pumping lemma for context-free languages, deterministic pushdown automata, closure properties of CFLs.
Unit 4: Context-sensitive languages: Context-sensitive grammars (CSG) and languages, linear bounded automata and equivalence with CSG.
Unit 5: Turing machines: The basic model for Turing machines (TM), Turingrecognizable (recursively enumerable) and Turing-decidable (recursive) languages and their closure properties, variants of Turing machines, nondeterministic TMs and equivalence with deterministic TMs, unrestricted grammars and equivalence with Turing machines, TMs as enumerators.
Unit 6: Undecidability: Church-Turing thesis, universal Turing machine, the universal and diagonalization languages, reduction between languages and Rice s theorem, undecidable problems about languages.

Text books

1. John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman, Introduction to Automata Theory, Languages, and Computation, Pearson Education Asia.

Reference books:

1. Harry R. Lewis and Christos H. Papadimitriou, Elements of the Theory of Computation, Pearson Education Asia.
2. Dexter C. Kozen, Automata and Computability, Undergraduate Texts in Computer Science, Springer.
3. Michael Sipser, Introduction to the Theory of Computation, PWS Publishing.
4. John Martin, Introduction to Languages and The Theory of Computation, Tata McGraw Hill.

Course Name: Algorithm Analysis and Design Lab
Subject Code: ITB411
Credits:1.5

Marks:100

Course Outcome:

CO1: Develop the ability to solve complex problems by breaking them down into smaller, manageable steps and designing algorithms to solve them.
CO2: Proficiency in analysingalgorithms' time and space complexity to understand their efficiency and performance characteristics.
CO3: Understanding and implementation of graph algorithms, including depth-first search (DFS), breadth-first search (BFS), and Dijkstra's algorithm.
CO4: Experience developing larger-scale software projects involving algorithm design and analysis.

Books:

1."Introduction to Algorithms,Second Edition 2nd Edition" by Charles E. Leiserson, Ronald L. Rivest, Clifford Stein,Thomas H. Cormen.
2.Algorithms 4th Edition by Robert Sedgewick (Author), Kevin Wayne
3.The Algorithm Design Manual 2nd Edition by Steve S. Skiena.

Course Name: Operating System Lab
Subject Code: ITB412
Credits:1.5
Marks:100

Course Outcome:

CO1: Proficiency in installing and configuring different operating systems, including Linux and Windows, in virtualized environments or on physical hardware.
CO2: Understanding how the operating system creates, manages, and schedules processes. Proficiency in writing and executing simple OS-procedures and shell-scripts.
CO3: Developing troubleshooting skills to diagnose and resolve common operating system issues and errors.

Books:
1."Linux for Beginners: An Introduction to the Linux Operating System and Command Line", by Jason Cannon.
2.Linux Command Line and Shell Scripting Bible by Richard Blum, Christine Bresnahan.
3. Linux Pocket Guide: Essential Commands 3rd Edition by Daniel J. Barrett.

Course Name: Computer Graphics Lab
Subject Code: ITB413
Credits:1.5
Marks:100

Course Outcome:

CO1: Develop a solid understanding of the fundamental principles and concepts of computer graphics, including rasterization, rendering, and geometric transformations.
CO2: Proficiency in 2D graphics programming, including drawing basic shapes (lines, circles, rectangles), color manipulation, and text rendering.
CO3: Understanding of animation techniques, including keyframing, interpolation, and skeletal animation, to create dynamic graphics.

Books:

1. **"**Fundamentals of Computer Graphics International Student Edition" by Steve Marschner, Peter Shirley.

2."Computer Graphics Implementation and Explanation" by Jules Bloomenthal.

SEMESTER 5				
THEORY				
1	MAT5T1	Numerical Analysis & Probability	4	100
2	ITB501	Computer Networks	3	100
3	ITB502	Database Management Systems	3	100
4	ITB503	Compiler Design	3	100
5	ITBEL20	Elective I (Software Quality Assurance)	3	100
Total Credits (Theory)			16	500
PRACTICAL				
1	ITB511	Database Management Systems Lab	1.5	100
2	ITB512	Compiler Design Lab	1.5	100
3	ITB513	Network Lab	1.5	100
Total Credits (Practical)			4.5	300
Total Credits			20.5	800

Course Name: Numerical Analysis & Probability
Subject Code:MAT5T1
Credits:4
Marks:100

Course Outcome:

CO1: Understand the basic importance of numerical methods to tackle problems that cannot be solved analytically.
CO2: Able to compute the distribution of measure of difficulty by the distribution on the set of problems.
CO3: Able to compute probability distribution on the set of problems.

Contents

Unit 1: Basic Probability: Probability spaces, conditional probability, independence; Discrete random variables,
Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality
Continuous Probability Distributions: Continuous random variables and their properties, distribution functions and densities, normal, exponential and gamma densities.
Unit 2: Bivariate Distributions: Bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes' rule.
Unit 3: Introduction: Numbers and their accuracy, Computer Arithmetic, Mathematical preliminaries, errors and their computation, General error formula, Error in series approximation.
Solution of Algebraic and Transcendental Equation:
Bisection Method, Iteration method, Method of false position, Newton-Raphson method, Methods of finding complex roots, Muller's method, Rate of convergence of Iterative methods, polynomial Equations.
Unit 4: Interpolation: Finite Differences, Difference Tables
Polynomial Interpolation: Newton's forward and backward formula.
Cental Difference Formulae: Gauss forward and backward formula, Stirling's, Bessel's, Everett's formula.
Interpolation with unequal intervals: Langrange's Interpolation, Newton Divided difference formula, Hermite's Interpolation.
Unit 5: Numerical Integration and Differentiation: Introduction, Numerical differentiation Numerical Integration: Trapezoidal rule, Simpson's 1/3 and 3/8 rule, Boole's rule, Waddle's rule.
Unit 6: Solution of differential equations: Picard's Method, Euler's Method, Taylor's Method, Runge-Kutta Methods, Predictor Corrector Methods, Automatic Error Monitoring and Stability of solution.
Unit 7: Statistical Computation : Frequency chart, Curve fitting by method by least squares fitting of straight lines, polynomials, exponential curves etc, Data fitting with Cubic splines, Regression Analysis, Linear and Non linear Regression, Multiple regression, statistical Quality Control methods.

Textbooks/References books:
1. P. Kandasamy, K. Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company, 2nd Edition, Reprint 2012.
2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.
3. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
4. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint).
5. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.

Course Name: Computer Networks
Subject Code:ITB501
Credits:3
Marks:100

Course Outcome:

CO1: Describe, analyse and evaluate a number of datalink, network, and transport layer protocols.
CO2: Understanding of Program network communication services for client/server and other application layouts.
CO3: Design, analyse, and evaluate networks and services for homes, data centres, IoT/IoE, LANs and WANs.

Contents

Unit 1: Data communication Components: Representation of data and its flow Networks, Various Connection Topology, Protocols and Standards, OSI model, Transmission Media, LAN: Wired LAN, Wireless LANs, Connecting LAN and Virtual LAN, Techniques for Bandwidth utilization: Multiplexing - Frequency division, Time division and Wave division, Concepts on spread spectrum.
Unit 2: Data Link Layer and Medium Access Sub Layer: Error Detection and Error Correction - Fundamentals, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go back – N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, Multiple access protocols -Pure ALOHA, Slotted ALOHA, CSMA/CD,CDMA/CA
Unit 3: Network Layer: Switching, Logical addressing – IPV4, IPV6; Address mapping – ARP, RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols.
Unit 4: Transport Layer: Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm.
Unit 5: Application Layer: Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls, Basic concepts of Cryptography

Textbooks:
1. Data Communication and Networking, 4th Edition, Behrouz A. Forouzan, McGraw-Hill.
2. Data and Computer Communication, 8th Edition, William Stallings, Pearson Prentice Hall India.
Reference books:
1. Computer Networks, 8th Edition, Andrew S. Tanenbaum, Pearson New International Edition.
2. Internetworking with TCP/IP, Volume 1, 6th Edition Douglas Comer, Prentice Hall of India.
3. TCP/IP Illustrated, Volume 1, W. Richard Stevens, Addison-Wesley, United States of America.

Course Name: Database Management Systems
Subject Code:ITB502
Credits:3
Marks:100

Course Outcomes:
CO1: Establish the relationship between entities using relational database management system.
CO2: Gain knowledge on how to identify data models for project implementation.

CO3: Able to design and formulate SQL query language on data.

Contents

UNIT I

Introduction to database system, components of DBMS, DBMS architecture, three schema architecture of a database, Data model, overview of hierarchical network andrelational DBMS

UNIT II

ER-model, EER-model: specialization, generalization, aggregation

UNIT III

Relational data model: concepts 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. Tuplerelation calculus, domain relational calculus, converting the database specification.

UNIT IV

Dependencies and Normal forms: Importance of a good schema design, problemsencounter with bad schema design, motivation for normal forms, functionaldependencies, Armstrong's axioms for FD's, closure of a set of FD's, minimal covers,definitions of 1NF, 2NF, 3NF, and BCNF, decompositions and desirable properties ofthem, algorithm for 3NF and BCNF normalization, multi-valued dependencies and4NF, join dependencies and definition 5NF.

UNIT V

Data Storage and Indexes- file organizations, primary, secondary index structures,various index structures-hash based, dynamic hashing techniques, multi-level indexes,B+ trees

UNIT VI

Transaction and Error recovery- concepts of transaction processing, ACID properties,concurrency control, locking based protocols for concurrency control, error recovery and logging, undo, redo, undo-redo logging and recovery methods.

TEXT BOOKS:

1. Korth, Silberschatz, " Database system concepts ", 4th Ed., TMH, 2003.
2. Steve Bobrowski, " Oracle 8 architecture", TMH,2000.
3. Raghu Ramakrishnan," Database Management System," WCB/McGraw Hill

REFERENCES BOOKS:

1. C.J.Date, " An introduction to database systems", 7th Ed., Narosa publishing,2004.
2. Elmasri and Navathe, " Fundamentals of database systems ", 4th Ed., A.Wesley, 2004.
3. J.D. Ullman, " Principles of database systems", 2nd Ed., Galgotia publications,1999.

Course Name: Compiler Design
Subject Code:ITB503
Credits:3
Marks:100

Course Outcomes:

CO1: Knowledge and ability to devise, select, and use modern techniques and tools needed to design and implement compilers.
CO2: Able to identify and select suitable parsing strategies for a compiler for problems.
CO3: Understand the typical compilation model which help them to become distinct programmer.

Contents

Unit 1: Introduction: Phases of compilation and overview. Lexical Analysis (scanner): Regular languages, finite automata, regular expressions, from regular expressions to finite automata, scanner generator (lex, flex).

Syntax

Unit 2: Analysis (Parser): Context-free languages and grammars, push-down automata, LL(1) grammars and top-down parsing, operator grammars, LR(O), SLR(1), LR(1), LALR(1) grammars and bottom-up parsing, ambiguity and LR parsing, LALR(1) parser generator (YACC, Bison)

Unit 3: Semantic Analysis: Attribute grammars, syntax-directed definition, evaluation and flow of attributes in a syntax tree. Symbol Table: Its structure, symbol attributes and management. Run-time environment: Procedure activation, parameter passing, value return, memory allocation, and scope.

Unit 4: Intermediate Code Generation: Translation of different languages features different types of intermediate forms. Code Improvement (optimization):

Unit 5: Analysis: control-flow, data-flow dependence etc.; Code improvement local optimization, global optimization, loop optimization, peep-hole optimization etc. Architecture dependent code improvement: instruction scheduling (for pipeline), loop optimization (for cache memory) etc. Register allocation and target code generation

Unit 6: Advanced topics: Type systems, data abstraction, compilation of Object Oriented features and non-imperative programming languages.

Textbooks:

1. Tremblay, et al., "The Theory and practice of compiler Writing", McGraw Hill, New York,1985.
2. A. Holub, "Compiler Design in C",PHI, 2004.
3. Aho, Ullman & Ravi Sethi, " Principles of Compiler Design", Pearson Education, 2002.

Reference books:

1. Andrew L. Appel, " Modern Compiler Implementation in C", Delhi, Foundation Books,2000.
2. Dick Grune et. Al., " Modern Compiler Design ", Wiley Dreamtech, 2000.

Course Name: Elective I (Software Quality Assurance)
Subject Code:ITB504
Credits:3
Marks:100

Course Outcomes:

CO1: Students will learn the software engineering testing process.
CO2: Gain knowledge ofthe quality assurance process and its role in software development.
CO3: Will have proficiency in managing a software project for customer requirements.

Contents

UNIT I

Introduction-Uniqueness of software quality assurance, Environment for which SQA methods aredeveloped, Classification of the causes of software errors, SQA and software engineering, Productoperation, revision, Transition software quality Factors.

UNIT II

Quality components-SQA system and architecture, Contract review process and stages, Implementation of contract review, Development plan and quality plan objectives, Elements of qualityand development plan,Pre-maintenance software quality components,

and Maintenance software qualityassurance tools.

UNIT III

Software Quality infrastructure components-Objectives of training and certifications and its process.Corrective and preventive actions and their process, Development of solutions and implementation,Software configuration, Its items and its management tasks and organization, and Software change control.

UNIT IV

Management components of software quality-Components of project progress control, Classification ofsoftwarequality metric, Product and process metrics, Limitations of software metrics, Objectives of cost qualitymetrics, Classic and extended model of cost quality metrics.

UNIT V

Standards, certification and assessment 90001 and ISO 9000-3, CMM and CMMI, BootstrapMethodology, IEEE/EIA std 12207, IEEE Std 1012,Project management responsibilities for qualityassurance.

Text Book:

1. Daniel galin, Software Quality Assurance, 1st ed., Pearson Education.

Reference Books:

1. Milind Limaye, Software Quality Assurance, Tata McGraw-Hill.
2. G. Gordon Schulmeyer,Handbook of Software Quality Assurance,4rd ed.

Course Name: Database Management Systems Lab
Subject Code:ITB511
Credits:1.5
Marks:100

Course Outcomes:

CO1: Develop a solid understanding of fundamental database concepts, including data models, schemas, tables, records, and relationships.
CO2: Proficiency in designing a database schema, including defining tables, keys, constraints, and relationships, while adhering to normalization principles.
CO3: Ability to create and manage databases using the chosen DBMS software, including database creation, modification, and deletion.

Books:

1."Database System Concepts" by Abraham Silberschatz and S Sudarshan.
2."Database Systems : A Practical Approach to Design, Implementation and Management" by CONNOLLY.
3.“SQL Cookbook” by Anthony Molinaro.

Course Name: Compiler Design Lab
Subject Code:ITB512
Credits:1.5
Marks:100

Course Outcomes:

CO1: Acquire knowledge about programming languages and grammar, especially the Backus-Naur Form (BNF) or Extended Backus-Naur Form (EBNF) notation.
CO2: Acquire knowledge about programming languages and grammar, especially the Backus-Naur Form (BNF) or Extended Backus-Naur Form (EBNF) notation.
CO3: Create intermediate representations (e.g., three-address code) of the input program to facilitate further analysis and optimization.

CO4: Enable them to complete a compiler project that involves designing, implementing, and testing a compiler for a specific programming language or subset**.**

Books:

1. "Compilers: Principles, Techniques, & Tools 2nd Edition" by Alfred V Aho and Ravi Sethi .

2."Linux System Programming, 2nd Edition" by Robert Love

Course Name: Network Lab
Subject Code:ITB513
Credits:1.5
Marks:100

Course Outcomes:

CO1: Skills in diagnosing and resolving network issues, including connectivity problems, packet loss, and performance optimization.
CO2: Proficiency in using network monitoring tools and protocols to assess network health and performance.
CO3: Completing individual or group network projects that involve designing, implementing, and testing a functional network solution.

Books:
1. "The Linux Programming Interface: A Linux and UNIX System Programming"by Michael Kerrisk.
2. "How Linux Works, 2nd Edition: What Every Superuser Should Know", Second Edition by Brian Ward.
3. The Linux Command Line: A Complete Introduction 1st Edition by William E. Shotts Jr.

SEMESTER 6				
THEORY				
1	ITB601	Industrial Economics & Principles of Management	3	100
2	ITB602	Web Technology	3	100
3	ITB603	Software Engineering	3	100
4	ITBEL11	Elective II (System Analysis and Design)	3	100
Total Credits (Theory)			12	400
PRACTICAL				
1	ITB611	System Programming Lab	2.5	100
2	ITB612	Web Technology Lab	1.5	100
3	ITBPJ1	Project (Minor)	6	100
Total Credits (Practical)			7	300
Total Credits			19	700

Course Name: Industrial Economics & Principles of Management
Subject Code:ITB601
Credits:3
Marks:100

Course Outcomes:

CO1: Acquire knowledge ofthe process of economic decision-making.
CO2: Develop the skills to analyse financial statements.
CO3: Acquire knowledge ofmanagement and organisation structure of an industry.
CO4: Acquire knowledge ofEntrepreneurship and project management.

Contents

UNIT I
Introduction: Nature and Scope of economics, micro and microeconomics; Problems in industrial economics; A framework of industrial economics.

UNIT II
Demand and supply, elasticity concept, indifference curve analysis, consumer's equilibrium, marginal utility concept, pricing techniques, price effect, income effect, substitution effect.

UNIT III
Money and Banking: Value and function of money, inflation, quantity theory of money, functions of banking system: commercial banking system and central banking system, business fluctuation.

UNIT IV
Management: Definition, nature and significance of management, evaluation of management thought, contribution of Max Weber and Taylor and Fayol. Different functions of management: planning, organizing, staffing, directing and controlling.

UNIT V
Human Behavior: Factors of human behaviour, perception, learning and personality development, inter-personal relationship and group behaviour.

TEXTBOOKS:
1. Dewett, KK,"Modern economic theory", s chand and co".
2·Luthers Fred," Organisational Behaviour".
3. Prashad L M ,"Principles of management" .
4. AW Stonier and DC Horgne,"A textbook of economic theory", Oxford publishing house pvt.Ltd.

Course Name: Web Technology
Subject Code:ITB602
Credits:3
Marks:100

Course Outcomes:

CO1: Able to design dynamic web pages with the latest technologies
CO2: Develop skills in analysing the usability of a website.
CO3: Develop skills in handling digital imaging

Contents

UNIT-I
The Internet, Client-Server communication, TCP/IP, UDP, DNS, WWW. Hypertext Transfer Protocol – HTTP Request and Response Message, Browser and server functions, Uniform Resource Locator, Server Cache control.

UNIT-II
Markup languages – HTML and XHTML, HTML tags, Document Structure, headings, images, lists, tables, frames, forms, links, element attributes, and event handlers.

UNIT-III

Cascading Style Sheets – syntax, importing CSS to HTML documents, CSS box model, Responsive layouts. JavaScript Fundamentals – Variables and Data Types, statements, operators, functions, objects, built-in objects, events and event handlers, strings, and Arrays.

UNIT-IV

Extensible Markup Language – Namespace, Document Type Definition, XML Schema, Document Object Model, creating XML documents, Javascript and XML:AJAX, DOM-based XML processing, Event oriented parsing:SAX, introduction to XSL, XPath, XSLT.

UNIT-V

Server-side programming with PHP – Adding PHP to HTML, Syntax and Variables, Passing
information between pages, Strings, Arrays, Functions, Numbers, Basic PHP errors/problems. PHP/MySQL Functions, displaying queries in tables, Building Forms from queries, String and Regular Expressions, Sessions, Cookies and HTTP, Type and Type Conversions.

TEXT BOOKS

1. Jeffrey C.Jackson, "Web Technologies--A Computer Science Perspective",
Pearson Education.
2. PHP : The Complete Reference By Steven Holzner, Tata McGrawHill.

REFERENCES:

1. Web Design The complete Reference, Thomas Powell, Tata McGrawHill.
2. HTML and XHTML The complete Reference, Thomas Powell, Tata
McGrawHill.
3. www.w3schools.com for online reference

Course Name: Software Engineering
Subject Code:ITB603
Credits:3
Marks:100

Course Outcomes:

CO1: Students will be able to decompose the given project in various phases of a lifecycle.
CO2: Students can choose an appropriate process model depending on the user requirements.
CO3: Students will be able to perform various life cycle activities like Analysis, Design, Implementation, Testing and Maintenance.
CO4: Students will be able to know various processes used in all the phases of the product.
CO5: Students can apply the knowledge, techniques, and skills in the development of a software product.

Contents

UNIT-1: Introduction : Software crisis, software processes & characteristics, software life cycle models, waterfall, prototype, evolutionary and spiral models.
Software project planning : size estimation like lines of code & function count, cost estimation models, COCOMO, COCOMO-II, Putnam resource allocation model, risk management.
UNIT-2: Requirements Engineering: Requirements Engineering, Initiating the process, Eliciting Requirements, Building the Requirements Model, Negotiating, Validating requirements, Requirements Analysis, Scenario-Based Analysis, Requirements Modeling

strategies, Flow-Oriented Modeling, Class based modeling, requirement analysis using DFD, Data dictionaries & ER diagrams, requirements documentation SRS, , nature of SRS, characteristics & organization of SRS.

UNIT-3: Design Process, Design Concepts, The Design Model: Data Design, Architectural, interface Design Elements.

Architectural Design: Software Architecture, Architectural Styles, Architectural Design, User Interface Design: Rules, User Interface Analysis and Design, Applying Interface Design Steps, Issues, Web App Interface Design Principles

UNIT-4: Software testing : Testing process, design of test cases, functional testing: Boundary value analysis, equivalence class testing, decision table testing, cause effect graphing, structural testing, path testing, data flow and mutation testing, unit testing, integration and system testing, debugging, alpha & beta testing, testing tools & standards.

UNIT-5: Software metrics: software measurements: What & Why , token count , halstead software science measures, design metrics, data structure metrics, information flow metrics.

Software reliability: importance, hardware reliability & software reliability, failure and faults, reliability models, basic model, logarithmic poisson model, software quality models, CMM & ISO 9001.

UNIT-6: Software maintenance: Management of maintenance, maintenance process, maintenance models, regression testing, reverse engineering, software re-engineering, configuration management, documentation.

Textbooks:

1. K.K.Aggarwal & Yogesh Singh, " Software engineering ", 2nd Ed. , New age international,2005.

2. R.S. Pressman, " Software engineering- A practioner's approach ", 5th Ed., Mcgraw Hill Int. Ed., 2001.

Course Name: Elective II (System Analysis and Design)

Subject Code:ITBEL11

Credits:3

Marks:100

Course Outcomes:

CO1: Understand the life cycle of a systems development project..

CO2: Understand the analysis and development techniques required as a medium-scale information systems development project team member.

Co3: Learn the effect of the internet and technology on business strategies.

CO4: Understand the importance of business communications.

CO5: An understanding of the object-oriented methods models as covered by the Unified Modelling Language.

Contents

Unit I

Fundamentals of System:System definition and concepts- Characteristics and types of system,Manual andautomated systems, Real-life Business sub-systems- Production, Marketing, Personal,Material, Finance,Systems models types of models- Systems environment and boundaries, real-time and distributed systems, Basic principles of successful systems.

Unit II

Systems analyst and System Development cycle:Role and need of systems analyst ,Qualifications and responsibilities ,Systems Analyst as an agent of change,system,SDLC,Various phases of development :Analysis, Design, Development,Implementation, Maintenance.

Unit III

Systems documentation considerations and System Planning :Principles of systems documentation,Types of documentation and their importance,Enforcing documentation discipline in an organization .System Planning:Data and fact gathering techniques: Interviews, Group communication,Presentations, Site visits.Feasibility study and its importance,Types of feasibility reports,System,Selection,plan and proposal,Prototyping.

Unit IV

Systems Design and modeling :Process modeling, Logical and physical design, Design representation,Systemsflowcharts and structured charts , Data flow diagrams , Common diagrammingconventions and guidelines using DFD and ERD diagrams. Data Modeling andsystems analysis , Designing the internals:Program and Process design,Designing Distributed Systems .Classification of forms,Input/output forms design, User-interface design, Graphical

interfaces.Modular and structured design-Module specifications ,Module coupling and cohesion ,Top-down and bottom-updesign .

Unit V

System Implementation and Maintenance:Planning considerations, Conversion methods, producers and controls, Systemacceptance Criteria, System evaluation and performance, Testing and validation,Systems qualify Control and assurance, Maintenance activities and issues.

Unit VI

System Audit and Security :Computer system as an expensive resource-Data and Strong mediaProcedures and norms for utilization of computer equipment, Audit of computer system usage, Audit trails,Types of threats to computer system and control measures-Threat to computersystem and control measures, Disaster recovery and contingency planning

Unit VII

Object Oriented Analysis and design:Introduction to Object Oriented Analysis and design life cycle, object modeling: ClassDiagrams, Dynamic modeling: state diagram,sequence diagramming.

Unit VIII

Cost-Benefit and analysis and Case study:Tools and techniques of Cost-Benefit and analysis.Casestudy:InventoryControl,Railway Reservation System,University Management System,Hospital management System.

Text Book:

1. Elias M.Awad,System analysis and design

Reference Books:

1. Perry Edwards, System analysis and design, McGraw Hill international edition, 1993.
2. James A.Senn ,Analysis and design of information systems, McGraw-Hill, 1989.

Course Name: System Programming Lab
Subject Code:ITB611

Credits:1.5
Marks:100

Course Outcomes:

CO1: Develop a strong understanding of system software, including the operating system, its components, and system libraries.
CO2:Ability to write shell scripts for automating system administration tasks and customizing the shell environment.
CO3: Completing individual or group system programming projects that involve designing, implementing, and testing a system-level software solution.

Books:
1.Linux System Programming by Robert Love Released September 2007 Publisher(s): O'Reilly Media, Inc.ISBN: 9780596009588.
2.UNIX and Linux System Administration Handbook, 4th Edition 4th Edition by Evi Nemeth,Garth Snyder,Trent R. Hein,Ben Whaley, Terry Morreale, Prentice Hall,ISBN-13 : 978-0131480056

Course Name: Web Technology Lab
Subject Code:ITB612
Credits:1.5
Marks:100

Course Outcomes:

CO1: Proficiency in creating well-structured HTML documents, including the use of semantic HTML tags for content presentation.
CO2: Proficiency in creating well-structured HTML documents, including the use of semantic HTML tags for content presentation.
CO3: Completing individual or group web development projects that involve designing, implementing, and testing a web-based application or website.

Books:
1.Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics by Jennifer Robbins,O'Reilly Media; 5th edition,ISBN-13 : 978-1491960202
2.HTML and CSS: Design and Build Websites by Jon Duckett,John Wiley & Sons; First Edition,ISBN-13 : 978-1118008188.

Course Name: Project (Minor)
Subject Code:ITBPJ1
Credits:6
Marks:100

Course Outcomes:

CO1: Students will be able to practice acquired knowledge within the chosen area of technology for project development.
CO2: Identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach.
CO3: Reproduce, improve and refine technical aspects for engineering projects.
CO4: Work as an individual or in a team in development of technical projects.
CO5: Communicate and report effectively project related activities and findings.

SEMESTER 7				
THEORY				
1	ITB701	Machine Learning	3	100
2	ITBEL12	Elective III(Decision Support System)	3	100
3	EC8T01	Elective IV (Digital Image Processing)	3	100
4	ITBOE5	Open Elective I (Data Mining & Data Warehousing)	3	100
Total Credits (Theory)			12	400
PRACTICAL				
1	ITBCQ1	Colloquium*	0	100
2	ITBPJ2	Project (Major) #	6	100
Total Credits (Practical)			6	200
Total Credits			18	600

Course Name: Machine Learning
Subject Code:ITB701
Credits:3
Marks:100

Course Outcomes:

CO1: Understand how to evaluate models generated from data.
CO2: Apply the algorithms to a real problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models.
CO3: Characterize the machine learning algorithms as supervised learning and unsupervised learning and apply and analyze the various algorithms of supervised and unsupervised learning
CO4: Analyse the concept of neural networks for learning linear and non-linear activation functions.
CO5: Learn the concepts in Bayesian analysis from probability models and methods
CO6: Understand the fundamental concepts of Genetic Algorithms and Analyse and design the genetic algorithms for optimization engineering problems

Contents

Unit I

Introduction:Definition of learning systems,Goals and applications of machine learning, Aspects of developing a learning system:- training data, concept representation, function approximation.
Supervised Learning (Regression/Classification): Basic methods:-Distance-based methods, Nearest-Neighbours, Decision Trees, Naive Bayes. Linear models: - Linear Regression, Logistic Regression, Generalized Linear Models Support Vector Machines, Nonlinearity and Kernel Methods,Beyond Binary Classification: -Multi-class/Structured Outputs, Ranking.

Unit II

Unsupervised Learning: Clustering: - K-means/Kernel K-means,Dimensionality Reduction:- PCA and kernel PCA ,Matrix Factorization and Matrix Completion ,Generative Models (mixture models and latent factor models).

Unit III

Evaluating Machine Learning algorithms and Model Selection, Introduction to Statistical Learning Theory, Ensemble Methods (Boosting, Bagging, Random Forests).

Unit IV
Sparse Modeling and Estimation, Modeling Sequence/Time-Series Data, Deep Learning and Feature Representation Learning.
Unit V
Scalable Machine Learning (Online and Distributed Learning) A selection from some other advanced topics, e.g., Semi-supervised Learning, Active Learning, Reinforcement Learning, Inference in Graphical Models, Introduction to Bayesian Learning and Inference.
Unit VI
Recent trends in various learning techniques of machine learning and classification methods for IOT applications. Various models for IOT applications.

Text Book:
1. ,Tom M Mitchell,"Machine Learning".
References:
1. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012
2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer 2009 (freely available online)
3. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007.

Course Name: Elective III(Decision Support System)
Subject Code:ITBEL12
Credits:3
Marks:100

Course Outcomes:

CO1: Perceive the characteristics of the decision model in real life.
CO2: Know basic principles, methodologies and features in decision models.
CO3: Understand the features on the basis of Big data management.

Contents

Unit I
A Framework for Decision Support, The Concept of Decision Support Systems; Group Support Systems; Enterprise Information Systems.
Unit II
Decision-Making Systems: Introduction and Definitions; Systems; Models; Phases of the Decision Making Process; The Intelligence Phase; Decision-Making: The Design Phase; The Choice Phase; The Implementation Phase; How Decisions Are Supported; Personality Types, Gender, Human Cognition, and Decision Styles; The Decision-Makers
Unit
Decision Support Systems: DSS Configurations; What Is a DSS?; Characteristics and Capabilities of DSS; Components of DSS; The Data Management Subsystem; The Model Management Subsystem; The User Interface (Dialog) Subsystem; The Knowledge-Based Management Subsystem; The User; DSS Hardware; DSS Classifications;
Unit IV
Modeling and Analysis: MSS Modeling; Static and Dynamic Models; Certainty, Uncertainty, and Risk; Influence Diagrams; MSS Modeling with Spreadsheets; Decision Analysis of a Few Alternatives; The Structure of MSS Mathematical Models; Mathematical Programming Optimization; Multiple Goals, Sensitivity Analysis, What-If, and Goal Seeking; Problem-Solving Search Methods; Heuristic Programming; Simulation;

Visual Interactive Modeling and Visual Interactive Simulation; Quantitative Software Packages; Model Base Management.

Unit V

Business Intelligence: Data Collection, Problems, and Quality; The Web/Internet and Commercial Database Services; Database Management Systems in Decision Support Systems/ Business Intelligence; Database Organization and Structures; Data Warehousing; Data Marts; Business Intelligence/Business Analytics; Online Analytical Processing (OLAP); Data Mining; Data Visualization, Multidimensionality, and Real-Time Analytics; Geographic Information Systems; Business Intelligence and the Web: Web Intelligence/Web Analytics.

Unit VI

Intelligent Decision Support Systems: Knowledge-Based Systems, Knowledge Acquisition, Representation, and Reasoning.

Text Book:

1. Decision Support Systems and Intelligent Systems, Seventh Edition, Efraim Turban, Jay E. Aronson, Richard V. McCarthy, Prentice-Hall of India, 2007

Reference Book:

1. Decision Support Systems, A Knowledge-Based Approach, Clyde W. Holsapple and Andrew B. Whinston
2. Decision Support Systems For Business Intelligence by Vicki L. Sauter.

Course Name: Elective IV (Digital Image Processing)
Subject Code:EC8T01
Credits:3
Marks:100

Course Outcomes:

CO1: Students will learn fundamental digital image concepts.
CO2: Gain knowledge of digital image processing methods and techniques.
CO3: Develop and design a model to manipulate images to solve problems in medical diagnosis, agriculture face detection, traffic sensing, etc.

Contents

Unit I

Introduction :Digital Image representation, fundamental steps in image processing, Elements ofdigital image processing systems.

Unit II

Digital Image Fundamentals, Elements of Visual perception, A simple Model, Image Sensing and Acquisition,Image Sampling and quantization, some basic relationships between pixels.

Unit III

Image Transformation and enhancement ,Some basic Intensity Transformation functions, Histogram Processing, Smoothingand Sharpening Spatial Filters, Smoothing and Sharpening using FrequencyDomain Filters.

Unit IV

Image Restoration,Degradation Model, Noise Models, Restoration in the presence of Noise

– SpatialFiltering, Periodic Noise Reduction by Frequency Domain Filtering, InverseFiltering, Minimum Mean square error filter.

Unit V

Image Segmentation ,Point Detection, Line Detection, Edge Detection, Thresholding, Region – BasedSegmentation, Color Image Processing.

Textbooks:

1. Digital Image Processing - Rafael C Gonzalez - Addison Wesley

References:

1. Digital Image Processing - Richard E Woods -'" Addison Wesley
2. Fundamentals of Digital Image Processing - A.K Jain – PHI.

Course Name: Open Elective I (Data Mining & Data Warehousing)
Subject Code:ITBOE5
Credits:3
Marks:100

Course Outcomes:

CO1: Understand the various data mining and warehousing components' functionality.
CO2: Understand methodologies used in data mining and data warehousing.
CO3: Appreciate various data mining and warehousing models' strengths and limitations.

Contents

Unit I

Introduction to Data Warehousing; Data Mining: Mining frequent patterns, association and correlations; Sequential Pattern Mining concepts, primitives, scalable methods.

Unit II

Classification and prediction; Cluster Analysis – Types of Data in Cluster Analysis, Partitioning methods, Hierarchical Methods; Transactional Patterns and other temporal based frequent patterns.

Unit III

Mining Time series Data, Periodicity Analysis for time related sequence data, Trend analysis, Similarity search in Time-series analysis.

Unit IV

Mining Data Streams, Methodologies for stream data processing and stream data systems, Frequent pattern mining in stream data, Sequential Pattern Mining in Data Streams, Classification of dynamic data streams, Class Imbalance Problem; Graph Mining; Social Network Analysis.

Unit V

Web Mining, Mining the web page layout structure, mining web link structure, mining multimedia data on the web, Automatic classification of web documents and web usage mining; Distributed Data Mining.

Unit VI

Recent trends in Distributed Warehousing and Data Mining, Class Imbalance Problem; Graph Mining; Social Network Analysis.

Books/References:

1. Jiawei Han and Micheline Kamber, 'Data Mining: Concepts and Techniques, Morgan Kaufmann, India.
2. A K Pujari, 'Data Mining Techniques, University Press, India

3. Han, Manilla and Smyth, 'Principles of Data Mining', PHI, India.

Course Name: Colloquium
Subject Code:ITBCQ1
Credits:0
Marks:100

Course Outcomes:

Co1: Gain practical experience by working on real engineering projects and tasks within an industrial environment.
Co2:Enhance problem-solving abilities by addressing real-world engineering challenges and troubleshooting issues that arise during the internship.
CO3: Develop professionalism in work ethics, time management, and conduct in a professional setting.
CO4:Conduct research, data analysis, and experimentation to support engineering projects and decision-making.
CO5: Explore entrepreneurial opportunities, innovation, and business practices relevant to the industry.

Course Name: Project (Minor)
Subject Code:ITBPJ2
Credits:12
Marks:100

Course Outcomes:

CO1: Evaluate the project's success and effectiveness in achieving its goals and objectives, considering both technical and non-technical aspects.
CO2: Foster innovation and creative thinking by exploring new approaches and solutions to engineering problems.
CO3: Enhance presentation skills by delivering project presentations to peers, faculty, and evaluators, effectively communicating project findings, methodology, and outcomes.
CO4: Collaborate effectively with project team members, mentors, advisors, and promoting teamwork and interpersonal skills.
CO5: Create comprehensive project documentation, including project reports, technical documentation, design specifications, and progress reports.

SEMESTER 8				
THEORY				
1	ITBEL15	Elective V (Natural Language Processing)	3	100
2	ITBOE2	Open Elective II (Internet-of-Things)	3	100
3	G8T01	Constitution of India (Mandatory Course)	0	100
Total Credits (Theory)			6	300

PRACTICAL				
1	ITB811	Communication Skills Lab	1.5	100
2	ITBPJ3	Project (Major) **	10	100
Total Credits (Practical)			11.5	200
Total Credits			17.5	500

Course Name: Elective V (Natural Language Processing)
Subject Code:ITBEL15
Credits:3
Marks:100

Course Outcomes:

CO1: Have the knowledge to analyse, design and develop animation movies involving computer graphics and video analytics using advanced techniques and tools.
CO2: Innovate ideas and smart solutions for game development,sound engineering and production of short films.

Contents

Unit I
Introduction: Human languages, models, ambiguity, processing paradigms; Phases in natural language processing, applications. Text representation in computers, encoding schemes.

Unit II
Linguistics resources: Introduction to corpus, elements in balanced corpus, TreeBank, PropBank, WordNet, VerbNet etc. Resource management with XML, Management of linguistic data with the help of GATE, NLTK. Regular expressions, Finite State Automata, word recognition, lexicon. Morphology, acquisition models, Finite State Transducer. N-grams, smoothing, entropy, HMM, ME, SVM, CRF.

Unit III
Part of Speech tagging- Stochastic POS tagging, HMM, Transformation based tagging (TBL), Handling of unknown words, named entities, multi word expressions. A survey on natural language grammars, lexeme, phonemes, phrases and idioms, word order, agreement, tense, aspect and mood and agreement, Context Free Grammar, spoken language syntax.

Unit IV
Parsing- Unification, probabilistic parsing, TreeBank. Semantics- Meaning representation, semantic analysis, lexical semantics, WordNet.

Unit V
Word Sense Disambiguation- Selectional restriction, machine learning approaches, dictionary based approaches. Discourse- Reference resolution, constraints on co-reference, algorithm for pronoun resolution, text coherence, discourse structure. Applications of NLP- Spell-checking, Summarization.

Unit VI
Information Retrieval- Vector space model, term weighting, homonymy, polysemy, synonymy, improving user queries. Machine Translation– Overview.

Books/References:
1. Daniel Jurafsky and James H Martin. Speech and Language Processing, 2e, Pearson Education, 2009.

2. James A.. Natural language Understanding 2e, Pearson Education, 1994.
3. Bharati A., Sangal R., Chaitanya V.. Natural language processing: a Paninian perspective, PHI, 2000.
4. Siddiqui T., Tiwary U. S. Natural language processing and Information retrieval, OUP, 2008.

Course Name: Open Elective II (Internet-of-Things)
Subject Code:ITBOE2
Credits:3
Marks:100

Course Outcomes:

CO1: Students will able to design IoT system with Arduino/ Raspberry Pi.
CO2: Able to transmit data wirelessly between different devices.
CO3: Be able to upload/download sensor data on cloud and server.

Contents

Unit I
Environmental Parameters Measurement and Monitoring: Why measurement and monitoring are important, effects of adverse parameters for the living being for IOT.

Unit II
Sensors: Working Principles: Different types; Selection of Sensors for Practical Applications Introduction of Different Types of Sensors such as Capacitive, Resistive, Surface Acoustic Wave for Temperature, Pressure, Humidity, Toxic Gas etc.

Unit III
Important Characteristics of Sensors: Determination of the Characteristics Fractional order element: Constant Phase Impedance for sensing applications such as humidity, water quality, milk quality Impedance Spectroscopy: Equivalent circuit of Sensors and Modelling of Sensors Importance and Adoption of Smart Sensors.

Unit IV
Architecture of Smart Sensors: Important components, their features Fabrication of Sensor and Smart Sensor: Electrode fabrication: Screen printing, Photolithography, Electroplating Sensing film deposition: Physical and chemical Vapor, Anodization, Sol-gel.

Unit V
Interface Electronic Circuit for Smart Sensors and Challenges for Interfacing the Smart Sensor, Usefulness of Silicon Technology in Smart Sensor And Future scope of research in smart sensor

Unit VI
Recent trends in smart sensor for day to day life, evolving sensors and their architecture.

Books/References:

1. "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press)
2. "Internet of Things: A Hands-on Approach", by Arshdeep Bahga and Vijay Madisetti (Universities Press)

Course Name: Constitution of India (Mandatory Course)
Subject Code:G8T01
Credits:3
Marks:100

Course Outcomes:

CO1: Able to understand the significance of the constitution of India.
CO2: Understand the importance of fundamental rights aswell as fundamental duties.
CO3: Have knowledge ofprocedure and effects of emergency, composition andactivities of the election commission and amendment procedure.

Contents

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India
3. Salient features and characteristics of the Constitution of India
4. Scheme of the fundamental rights
5. The scheme of the Fundamental Duties and its legal status
6. The Directive Principles of State Policy – Its importance and implementation
7. Federal structure and distribution of legislative and financial powers between the Union and the States
8. Parliamentary Form of Government in India – The constitution powers and status of the President of India
9. Amendment of the Constitutional Powers and Procedure
10. The historical perspectives of the constitutional amendments in India
11. Emergency Provisions : National Emergency, President Rule, Financial Emergency
12. Local Self Government – Constitutional Scheme in India
13. Scheme of the Fundamental Right to Equality
14. Scheme of the Fundamental Right to certain Freedom under Article 19
15. Scope of the Right to Life and Personal Liberty under Article 21.

Textbooks:

1. Introduction of Constitution by Durga Das Basu
2. The Indian Constitution: Cornerstone of A Nation by Austin Granville

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Course Name: Communication Skills Lab
Subject Code:ITB811
Credits:3
Marks:100

Course Outcomes:

CO1: Develop the ability to speak clearly, confidently, and effectively in various situations, including formal presentations, group discussions, and everyday conversations**.**
CO2: Improve active listening skills to understand and respond thoughtfully to others, whether in academic discussions, workplace meetings, or personal interactions.
CO3: Gain confidence in public speaking by delivering speeches, presentations, or debates with poise and clarity.
CO4: Enhance presentation skills, including structuring content, using visual aids, and engaging the audience effectively.
CO5: Learn to use non-verbal communication cues, such as gestures, posture, and facial expressions, to convey messages accurately and confidently.
CO6: Understand the importance of ethical communication, including honesty, respect, and integrity in all interactions.

Course Name: Project (Major)
Subject Code:ITBPJ3

Credits:20
Marks:100

Course Outcomes:

CO1: Evaluate the project's success and effectiveness in achieving its goals and objectives, considering both technical and non-technical aspects.
CO2: Foster innovation and creative thinking by exploring new approaches and solutions to engineering problems.
CO3: Enhance presentation skills by delivering project presentations to peers, faculty, and evaluators, effectively communicating project findings, methodology, and outcomes.
CO4: Collaborate effectively with project team members, mentors, and advisors and promote teamwork and interpersonal skills.
CO5: Create comprehensive project documentation, including project reports, technical documentation, design specifications, and progress reports.