

UNIVERSITY OF RAJSHAHI



Faculty of Engineering

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Syllabus for B.Sc. Engineering Session: 2012–2013

(North Block, 4th Science Building)

Tel: 0721-711103

Fax: 0721-750064

E-mail: cse@ru.ac.bd

Web Site: <http://www.ru.ac.bd/cse>

Syllabus for B.Sc. Engineering Session: 2012–2013

Distribution of Courses: According to the Academic Ordinance

Course type	Marks	% of Marks	Credits
Mathematics and Basic Sciences with Lab	600– 900	15 – 22.5	24 –36
Humanities	100– 300	2.5 – 7.5	4–12
Basic and Major Engineering	2800-3200	70 – 80	112-128
(i) Basic Engineering with Lab.	100-300	2.5-7.5	4–12
(ii) Major Engineering			
(a) Theoretical	1500-2400	37.5 – 60	60-96
(b) Laboratory	700-1200	17.5 – 30	28 -48
(c) Board viva-voce	50 – 200	1.25 – 5	2-8
Total	4000	100%	160

Distribution of Courses

Course Type	Marks	% of Marks	Credits
Mathematics and Basic Sciences	625	15.63	25
(a) Mathematics	375	9.38	15
(b) Statistics	100	2.50	4
(c) Physics	75	1.88	3
(d) Chemistry	75	1.88	3
Humanities	200	5.00	8
(a) Economics	50	1.25	2
(b) Accounting	50	1.25	2
(c) English	50	1.25	2
(d) Law	50	1.25	2
Basic and Major Engineering	3175	79.38	127
(i) Basic Engineering with Lab	200	5.00	8
(ii) Major Engineering	2975	74.38	119
(a) Theoretical	2100	52.50	84
(b) Laboratory	825	20.63	33
(c) Board viva-voce	50	1.25	2
Total	4000	100.00	160

Part-I, Odd Semester

Code	Course Title	Marks	Credit
ENG1111	Technical English	50	2
MATH1111	Algebra, Trigonometry and Vector	75	3
CHEM1111	Physical and Inorganic Chemistry	75	3
APEE1131	Electrical Circuit and Electronics	75	3
APEE1132	Electrical Circuit and Electronics Lab	25	1
CSE1111	Computer Fundamentals	75	3
CSE1112	Computer Maintenance and Engineering Drawings Lab	25	1
CSE1121	Computer Programming with C	75	3
CSE1122	Computer Programming with C Lab	50	2
Total		525	21

Part-I, Even Semester

Code	Course Title	Marks	Credit
ECON1211	Economics	50	2
STAT1211	Statistics for Engineers	50	2
MATH1211	Differential and Integral Calculus	75	3
PHY1221	Applied Electricity and Magnetism	75	3
CSE1211	Introduction to Digital Electronics	75	3
CSE1212	Introduction to Digital Electronics Lab	25	1
CSE1221	Object Oriented Programming with C++	75	3
CSE1222	Object Oriented Programming with C++ Lab	50	2
Total		475	19

Part-II, Odd Semester

Code	Course Title	Marks	Credit
ACCO2111	Industrial Management and Accountancy	50	2
STAT2111	Theory of Statistics	50	2
MATH2111	Matrices and Differential Equations	75	3
CSE2111	Digital System Design	75	3
CSE2112	Digital System Design Lab	25	1
CSE2121	Data Structure	75	3
CSE2122	Data Structure Lab	25	1
CSE2131	Discrete Mathematics	75	3
CSE2142	Software Development Lab I	25	1
Total		475	19

Part-II, Even Semester

Code	Course Title	Marks	Credit
LAW2211	Cyber and Intellectual Property Law	50	2
MATH2231	Numerical Methods	50	2
MATH2232	Numerical Methods Lab	25	1
MATH2241	Linear Algebra	75	3
CSE2211	Object Oriented Design and Design Patterns Using Java	75	3
CSE2212	Object Oriented Design and Design Patterns Using Java Lab	25	1
CSE2221	Design and Analysis of Algorithms	75	3
CSE2222	Design and Analysis of Algorithms Lab	25	1
CSE2231	Computer Architecture and Organization	75	3
CSE2232	Computer Architecture and Organization Lab	25	1
CSE2242	Software Development Lab II	25	1
Total		525	21

Part-III, Odd Semester

Code	Course Title	Marks	Credit
CSE3111	System Analysis and Design	75	3
CSE3121	Database Management Systems	75	3
CSE3122	Database Management Systems Lab	25	1
CSE3131	Digital Signal Processing	75	3
CSE3132	Digital Signal Processing Lab	25	1
CSE3141	Compiler Design	75	3
CSE3142	Compiler Design Lab	25	1
CSE3151	Computer Networks	75	3
CSE3152	Computer Networks Lab	25	1
CSE3162	Software Development Lab III	25	1
Total		500	20

Part-III, Even Semester

Code	Course Title	Marks	Credit
CSE3211	Software Engineering	75	3
CSE3212	Software Engineering Lab	25	1
CSE3221	Computer Graphics	75	3
CSE3222	Computer Graphics Lab	25	1
CSE3231	Microprocessor and Assembly Language	75	3
CSE3232	Microprocessor and Assembly Language Lab	25	1
CSE3241	Operating System and System Programming	75	3
CSE3242	Operating System and System Programming Lab	25	1
ICE3261	Communication Engineering	75	3
ICE3262	Communication Engineering Lab	25	1
Total		500	20

Part-IV, Odd Semester

Code	Course Title	Marks	Credit
CSE4111	Parallel Processing and Distributed System	75	3
CSE4112	Parallel Processing and Distributed System Lab	25	1
CSE4121	Theory of Computation	75	3
CSE4131	Computer Simulation and Modeling	75	3
CSE4132	Computer Simulation and Modeling Lab	25	1
CSE4141	Computer Peripherals and Interfacing	75	3
CSE4142	Computer Peripherals and Interfacing Lab	25	1
Option I (T)	Theory: Should be selected from Table-I	75	3
Option I (L)	Lab course based on Option-I (T)	25	1
CSE4192	Project (Part I)	25	1
Total		500	20

Table-I: Option I

Code	Course Title	Marks	Credit
CSE4151	Design of VLSI Circuits and Systems	75	3
CSE4152	Design of VLSI Circuits and Systems Lab	25	1
CSE4161	Management Information System	75	3
CSE4162	Management Information System Lab	25	1
CSE4171	Computational Geometry	75	3
CSE4172	Computational Geometry Lab	25	1
CSE4181	Digital Image Processing	75	3
CSE4182	Digital Image Processing Lab	25	1

Part-IV, Even Semester

Code	Course Title	Marks	Credit
CSE4211	Artificial Intelligence	75	3
CSE4212	Artificial Intelligence Lab	25	1
CSE4221	E-Commerce	75	3
CSE4222	E-Commerce Lab	25	1
CSE4231	Cryptography and Network Security	75	3
CSE4232	Cryptography and Network Security Lab	25	1
Option II (T)	Theory: Should be selected from Table-II	75	3
Option II (L)	Lab course based on Option-II (T)	25	1
CSE4280	Board viva-voce	50	2
CSE4292	Project (Part II)	50	2
Total		500	20

Table-II: Option II

Code	Course Title	Marks	Credit
CSE4241	Wireless Communication	75	3
CSE4242	Wireless Communication Lab	25	1
CSE4251	Multimedia System	75	3
CSE4252	Multimedia System Lab	25	1
CSE4261	Distributed Database Management System	75	3
CSE4262	Distributed Database Management System Lab	25	1
CSE4271	Advance Database Management System	75	3
CSE4272	Advance Database Management System Lab	25	1

DETAIL DESCRIPTION OF THE COURSES

ENG1111: Technical English

**50 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
2 Credits, 22 Contact hours, Exam. Time: 3 hours**

Grammar: Grammatical principles, modals, phrases & idioms, prefixes & suffixes, sentence structures, WH & yes/ no questions, conditional sentences.

Vocabulary: Technical & scientific vocabulary, defining terms.

Spoken English: Introduction to phonetic symbols, dialogue, responding to particular situations, extempore speech.

Reading: Comprehension of technical & non-technical materials-skimming, scanning, inferring & responding to context.

Technical Writing: Paragraph & composition writing on scientific & other themes, report writing, research paper writing, library references.

Professional communication: Business letter, job application, memos, quotations, tender notice.

Books Recommended:

1. A. J. Thomson & A. V. Martinet : **A Practical English Grammar**, Oxford University Press
2. John M. Lannon : **Technical Writing**, Scott Foresman & Co.
3. A. Ashley : **Oxford Handbook of Commercial Correspondence**, Oxford University Press
4. John Swales : **Writing Scientific English**, Cengage Learning Australia
5. Robert J. Dixon : **Complete Course in English**, Prentice Hall
6. Rajendra Pal & J. S. Korlahalli : **Essentials of Business Communications**, Sultan Chand & Sons

MATH1111: Algebra, Trigonometry and Vector

**75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
3 Credits, 33 Contact hours, Exam. Time: 4 hours**

Algebra of sets, De Morgan's rule, relation & function. Determinants: Properties and Cramer's rule.

Theory of Equations: Theorem, and relation between roots and coefficients. Solution of cubic equations.

De Moivre's theorem. Deduction from De Moivre's theorem.

Functions of complex arguments. Gregory's series. Summation of series. Hyperbolic functions.

Vector Addition, Multiplication & Differentiation.

Definitions of line, surface and volume integral. Gradient of scalar function, Divergence and curl of vector function. Physical significance of gradient, divergence and curl. Integral forms of gradient, divergence and curl, Divergence Theorem, Stoke's theorem, Green's theorem and Gauss's theorem.

Books Recommended:

1. H. S. Hall and S. R. Knight : **Higher Algebra**, MacMillan Publications, Arihant Publishers
2. B. C. Das and B. N. Mukherjee : **Higher Trigonometry**, U. N. Dhur and Sons
3. M. R. Spiegel, S. Lipschutz, and D. Spellman : **Vector Analysis and An Introduction to Tensor Analysis**, McGraw-Hill
4. W. S. Burnside and A. W. Panton : **Theory of Equations**, Nabu Press
5. Samuel Barnard and James M. Child : **Higher Algebra**, MacMillan Publications

CHEM1111: Physical and Inorganic Chemistry

**75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
3 Credits, 33 Contact hours, Exam. Time: 4 hours**

Electrochemistry: Conductors, Electrolytes and Electrolysis; Faradays Laws of Electrolysis and their significance. Ohm's law and electrolytic conductances; Theories for electrolytic conductance (Arrhenius & Debye-Hückel). Ionic mobility, Kohlrausch's law, Transference Number and its determination; Activities, activity coefficient and Debye-Hückel limiting law. Electrochemical cells (Electrolytic and Galvanic/Voltaic): Electrode reaction and potentials. Reference electrodes; Reversible and concentration cells, Storage Batteries (or accumulators).

Chemical Equilibrium and Kinetics: Equilibrium and Equilibrium constants, K_c , K_p , K_x . Rate of reaction and rate constants; Le Chatelier principle and its application. Order and molecularity of a reaction; integrated rate expressions & half-lives of zeroth, first and second order reactions. Determination of order & temperature dependence of a reaction; energy of activation and Arrhenius equation. Transition-state theory of reaction rates. Characteristics of catalysis, promoters and inhibitors.

Surface Chemistry and Colloids: Adsorption and sorption; Characteristics of physical and chemical adsorptions. Freundlich, Langmuir and Gibb's Adsorption isotherms; The BET equation. Crystalloids, Colloids and their classification, preparation, properties (kinetic, colligative, optical & electrical) and importance, =. Original pf charge and stability of colloids (sols), Gold number; colloidal electrolytes. Elementary idea about emulsions and gels.

Atomic structure and Periodic Table: Modern concept of atomic structure and Periodic Table; related principles and Laws. Constitution and Periodic properties of elements (ionization potential, electronegativity, electron affinity, atomic and ionic radii). Grouping of elements, their properties and uses. Isotopes and radioactivity.

Electronic Theory of Valency and Chemical Bonding: Different types of bonds (ionic, covalent, co-ordinate, hydrogen and metallic) Classification of solids on the basis of bonding and their properties. Atomic orbitals and their hybridization; valency bond and Molecular orbital theories.

Chemistry of Transition Elements, Lanthanides and Actinides: Definitions, electronic configurations, preparations (nuclear transformations), general properties and uses.

Books Recommended:

1. R. D. Madan : **Modern Inorganic Chemistry**, *S. Chand Publishers*
2. M. M. Haque and M. A. Nawab : **Principles of Physical Chemistry**, *Nawab Publications*
3. Esmarch S. Gilreath : **Fundamental Concepts in Inorganic Chemistry**, *McGraw-Hill*
4. G. M. Barrow : **Physical Chemistry**, *McGraw-Hill*
5. W. J. Moore : **Physical Chemistry**, *Orient Blackswan Pvt Ltd.*
6. Keith J. Laidler, John H. Meiser : **Physical Chemistry**, *Houghton Mifflin Company.*
7. S. R. Palit : **Elementary Physical Chemistry**, *Book Syndicate Pvt. Ltd.*
8. S. Z. Haider : **Modern Inorganic Chemistry**, *Friends International.*
9. Audrey L. Companion : **Chemical Bonding**, *McGraw-Hill*
10. F. Albert Cotton, Geoffrey Wilkinson, Paul L. Gaus : **Basic Inorganic Chemistry**, *Wiley*
11. Donald K. Sebera : **Electronic Structure and Chemical Bonding**, *Wiley*

APEE1131: Electrical Circuit and Electronics **75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]** **3 Credits, 33 Contact hours, Exam. Time: 4 hours**

Networks Analysis: Kirchhoff's laws; Wheatstone bridge, Superposition theorem; Millman's theorem; Reciprocity theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Mesh and Node circuit analysis, Reduction of complicated networks, T and p-section network.

Filters: Properties of symmetrical networks, Characteristics impedance, Filter fundamentals, Different types of filters, high pass, low pass, band pass and band elimination filter, Active Filters.

Semiconductor Diodes: Semiconductor, n-and p-type semiconductors, p-n junction as a diodes and their V-I characteristics, Zener diode, half-and full wave rectifiers, voltage regulation using Zener diodes.

Transistor: Transistor action, transistor biasing, DC characteristics of CE, CB and CC configurations.

Transistor Amplifiers and Oscillators: CE, CB and CC amplifiers, current, voltage and power gains, frequency responses, principles of feedback, positive and negative feedback, oscillators and multivibrators, astable and monostable multivibrator.

Operational Amplifier: Difference amplifier, CMRR, Ideal operational amplifier, Inverting amplifier, Non-inverting amplifier, General purpose IC operational amplifier, Integrator, Differentiator, Linear and non-linear applications of operational amplifier, Comparator and Converter.

Optoelectronic Devices: PN photodiode, Phototransistor, Solar cell, Photoconductive cell, Photovoltaic, Sensors, LED, LCD, Alphanumeric display, Photo couplers, Photodiode, LDR.

Instrumentation: Avometer, signal generator, oscilloscope.

Books Recommended:

1. Jacob Millman and Christos C. Halkias : **Electronic Devices and Circuits**, McGraw-Hill Inc.
2. Albert D. Helfrick and William David Cooper : **Modern Electronics Instrumentation and Measurement Techniques**, Prentice Hall
3. A.K. Sowhney : **A Course in Electrical and Electronic Measurements and Instrumentation**, Dhanpat Rai and Co.
4. Albert Paul Malvino : **Electronic Principles**, Career Education
5. John D. Ryder : **Networks, Lines and Fields**, Prentice Hall.

APEE1132: Electrical Circuit and Electronics Lab
25 Marks [60% Practical, 30% Quizzes/Viva-voce, 10% Attendance]
1 Credit, 22 Contact hours

Laboratory works based on APEE1131

CSE1111: Computer Fundamentals
75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
3 Credits, 33 Contact hours, Exam. Time: 4 hours

Computer Basics: Introduction to Studying Computers, History and development of Computers, Generation of Computers, Types of Computers.

Computer Hardware and Peripherals: Basic Units of Computer Hardware, Keyboard, Mouse, Internal structure of CPU, Functions of RAM, ROM and Cache memory, Basic functional mechanism of HDD and CD-ROM, Different types of Monitors, Impact and Non-impact Printers, Scanner, Plotter, Typical Computer specifications.

Software: Classifications, System software, Operating system concepts and importance, components and basic functions of DOS, Windows operating system, Application software's and Utility programs, Computer Virus.

Data Processing: Concepts of Data, Information, and Database, Traditional File Processing, and DBMS.

Computer Networks: Computer networks and its goals, Basic concepts on LAN, MAN, WAN and Internet systems, Internet services, Functions of Modem in Internet.

Books Recommended:

1. Peter Norton : Introduction to Computer, McGraw-hill Publishers
2. J. Stanley Warford : Computer Systems, Jones & Bartlett Publishers
3. P. Norton : Inside the PC, Sam Publishers
4. L. Rosch : Hardware Bible, Braddy Publishing, Indianapolis
5. Subramanian : Introduction to Computers, McGraw-hill Inc.
6. V. K. Jain : Switching Theory and Digital Electronics, Khanna Publishers

CSE1112: Computer Maintenance and Engineering Drawing Lab
25 Marks [60% Practical, 30% Quizzes/Viva-voce, 10% Attendance]
1 Credit, 22 Contact hours

Laboratory works based on CSE1111

CSE1121: Computer Programming with C
75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
3 Credits, 33 Contact hours, Exam. Time: 4 hours

Introduction: Programming languages, basic concepts of compiler, interpreter, algorithm and flowchart.

Simple C: Program structure in C, Program creating, compiling, debugging and running, Basic I/O functions, Identifiers and keywords, Simple data types, variables, constants, operators, Bitwise operators, comments, Decision making statements with if and switch, Looping structures with for, while, do-while.

More Data Types: Array, Structures, Union, Pointers, Strings, Dynamic allocation, Static, global, external and registrar, User defined data types

Functions: C Functions and user defined function, Function types, parameters, prototypes, Recursive function.

File Handling: Concepts, Character and File I/O, Basics of simple File I/O, ANSI Standard Libraries.

Others: Pre-processor with define, include, macro, ifdef, Uses of graphics functions.

Books Recommended:

1. Kernighan and Ritchie : **The C Programming Language**, Prentice Hall
2. Gotfreid : **Programming with C**, Schaum's Outline Series, Tata McGraw Hill
3. D.E. Knuth : **The Art of Computer Programming**, Addison-Wesley Professional
4. E. Balagurusamy : **Programming with ANSI C**, Tata McGraw Hill
5. H. Schildt : **Teach yourself C**, McGraw-Hill Publishers

CSE1122: Computer Programming with C Lab
25 Marks [60% Practical, 30% Quizzes/Viva-voce, 10% Attendance]
1 Credit, 22 Contact hours

Laboratory works based on **CSE1121**

ECON1211: Economics
50 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
2 Credits, 22 Contact hours, Exam. Time: 3 hours

Basic Concepts of Economics: Definition and subject matter of Economics; Microeconomics vs macroeconomics; Law of Economics; Central economic problems of every society; Different economic systems; Economics and Engineering.

Theory of Demand, Supply and Consumer Behavior: Law of Demand; Demand schedule and demand curve; Supply law, Supply schedule and supply curve; Shift in demand and supply; Equilibrium in the market; Elasticity of demand and supply

Production and Costs and Theory of the Firm: Meaning of production; Factors of production; Concepts of total, average and marginal costs, fixed and variable costs.

Theory of the Firm: Perfect competition and monopoly; Total, average and marginal revenue of a firm; Average and marginal revenue under perfect competition and monopoly; Firm's Equilibrium; Equilibrium of firm under perfect competition and monopoly.

The Input-Output Analysis: Meaning of input-output analysis; Input-output analysis model; balance equation; coefficient matrix; Determination of final demand vector.

Basic Concepts of Macroeconomics: Growth; Unemployment; Inflation; Philips Curve, Business cycle; Circular flow of economics; Two, three and four sector economics.

National Income accounting and determination: Concepts of GNP, GDP and national income; Methods of national income accounting; Problems of national income accounting; Keynesian model of national income determination; The multiplier; Effect of fiscal policy in the Keynesian model.

Budgets of Bangladesh: The revenue at the capital budget; Income, expenditure of the government; direct and indirect taxes.

Development Planning in Bangladesh: Need for planning in Bangladesh; Various five year plans in Bangladesh; Development strategies in the five year plans of Bangladesh.

Books Recommended:

1. K. K. Dewett : **Modern Economic Theory**, S. Chand Publishers
2. H.L. Ahuja : **Advanced Economic Theory**, S. Chand Publishers
3. A. Asimakopulos : **An Introduction To Economic Theory: Microeconomics**, Oxford University Press
4. A. Koutsoyiannis : **Modern Microeconomics**, Palgrave Macmillan

STAT1211: Statistics for Engineers
50 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
2 Credits, 22 Contact hours, Exam. Time: 3 hours

Descriptive statistical data: Meaning and scope of statistics, Sources and type of statistical data, Representation of statistical data, Location, Dispersion and their measures. Skewness, Kurtosis and their measures. Moment and Cumulants and Practical examples.

Probability: Concept of probability. Sample Space, Events union and Intersection of Events. Probability of events. Laws of probability, Conditional probabilities, Bayes' Theorem, Chebyshev's Inequality and Practical examples.

Random variables and probability Distribution: Basic concepts, Discrete and continuous random variables, Density and distributional functions, Mathematical expectation and variance, Joint marginal and conditional

density functions, Conditional Expectation and conditional variance, Moments and Cumulant generating functions. Characteristic function. Study of Binomial, Poisson, Normal and Bivariate Normal distribution and Practical examples.

Linear Regression and Correlation: Correlation, Rank correlation, Partial and Multiple correlations. Linear Regression for two variables. Principle of Least Squares Method. Lines of best fit Residual Analysis and examples.

Test of Significance: Basic ideas of Null hypothesis. Alternative hypothesis. Type-I error, Type-II error, level of significance, Degree of freedom, Rejection region and Acceptance region. Test of Single mean, Single variance, Two sample means and variances. Test for 2x2 contingency tables. Independence test and practical examples.

Books Recommended:

1. A. J. B. Anderson : **Interpreting Data.** Chapman and Hall, London
2. H. Cramer : **The Elements of Probability Theory.** Wiley, N. Y
3. P. Hoel, : **Introductory Statistics,** Wiley and Sons, N. Y.
4. D. V. Lindley : **Introduction to Probability and Statistics.** Vol-1 C. U. P. London
5. S. Lipschutz : **Probability,** McGraw-Hill, N. Y.
6. Mosteller, Rourke and Thomas : **Probability With Statistical Applications,** Addison- Wesley
7. F. L. Wolf : **Elements of Probability and Statistics,** McGraw-Hill, N. Y.
8. T. H. Wonnacot and R. J. Wonnacot : **Introductory Statistics,** Wiley and Sons. N. Y.
9. G. U. Yule, and M. G. Kendall : **An Introduction to the Theory of Statistics,** Charles Griffin, London

MATH1211: Differential and Integral Calculus

**75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
3 Credits, 33 Contact hours, Exam. Time: 4 hours**

Functions: Domain, Range, Inverse function and graphs of functions, Composition of function, Limits, Continuity, Indeterminate form.

Ordinary Differentiation: Differentiability, Differentiation, Successive differentiation and Leibnitz theorem.

Expansions of functions: Rolle's theorem, Mean value theorem, Taylor's and Maclaurin's formulae.

Maximum and minimum of functions of one variable.

Partial Differentiation: Euler's theorem, Tangents and normal.

Asymptotes.

Indefinite Integrals: Method of substitution, Integration by parts, Special trigonometric functions and rational fractions.

Definite Integrals: Fundamental theorem, General properties, Evaluations of definite integrals and reduction formulas.

Multiple Integrals: Determination of lengths, Areas and Volumes.

Books Recommended:

1. B. C. Das and B.N.Mukherjee : **Differential Calculus,** U. N. Dhur & Sons
2. B. C. Das and B.N.Mukherjee : **Integral Calculus,** U. N. Dhur & Sons
3. F. Ayres and Elliot Mendelson : **Calculus (Schaum's Outline Series),** McGraw-Hill
4. Joseph Edwards : **Differential Calculus,** Kessinger Publishing
5. Md. Abdul Latif and S. Bhattacharjee : **Differential Calculus,** Chandaapure, Chittagong
6. Md. Abdul Latif and S. Bhattacharjee : **Differential Calculus,** Chandaapure, Chittagong

PHY1221: Applied Electricity and Magnetism

**75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
3 Credits, 33 Contact hours, Exam. Time: 4 hours**

Electrostatics: Electric dipole; electric field due to a dipole; dipole on external electric field; Gauss's Law and its applications.

Capacitors: Parallel plate capacitors with dielectric; dielectrics and Gauss's Law; susceptibility, permeability, and dielectric constant; energy stored in an electric field.

Electric Current: Electron theory of conductivity; conductor, semiconductors and insulators; superconductors, current and current density; Kirchhoffs Law and its applications.

Electromagnetic Induction: Faraday's experiment; Faraday's law; Ampere's law, motional e.m.f.; self and mutual inductance galvanometers-moving coil, ballistic and deadbeat types.

Thermoelectricity: Thermal e.m.f; Seebeck, Peltier and Thomson Effects; laws of addition of thermal e.m.f., thermoelectric power.

DC and AC Circuits: D.C. circuits with LR, RC, and LCR in series; A.C. circuits with LR, RC, LC, and LCR in series.

Books Recommended:

1. Leigh Page and Norman Ilsley Adams : **Principles of Electricity**, *D Van Nosrand Co.*
2. David Halliday, Robert Resnick and Kenneth S. Krane : **Physics (Part-I & II)**, *Wiley*
3. Arthur Frederic Kip : **Fundamentals of Electricity and Magnetism**, *McGraw-Hill Inc.*
4. M. S. Huq : **Concepts of Electricity and Magnetism**, *Students' Publications*

CSE1211: Introduction to Digital Electronics

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]

3 Credits, 33 Contact hours, Exam. Time: 4 hours

Fundamentals of Digital Logic System: Number Systems, weighted and non-weighted codes, error detection code, Binary addition and subtraction, 2's complement methods.

Logic Gates and Boolean Algebra, Logic Circuit Design, Adder, Subtractor, Minimization Techniques: Algebraic Simplification, Karnaugh Map Method, Quine-McCluskey method, Consensus method.

Switching Devices, switching characteristics of diodes, transistor and FETs. Integrated Circuit Logic Families: DTL & TTL logic family, standard TTL series characteristics, other TTL series, TTL loading rules, TTL open-collector outputs, tristate TTL. The ECL family. Digital MOSFET circuits, characteristics, CMOS circuits, CMOS tristate logic, TTL driving CMOS, CMOS driving TTL.

Flip-Flops (FF) and related devices: Transistor Latch, NAND gate latch, NOR gate latch, D latch. Clock signals and Clocked FFs: Clocked SR, JK and D Flip-Flops, Master/Slave JK FF, timing diagram of different FFs, Edge-triggered and level-triggered timing diagrams.

555 Timer: Architecture of 555 Timer, different application of 555 timer, 555 as monostable, bistable and astable Multivibrators

A/D And D/A Converters: Sample and hold circuit, weighted resistor and R - 2 R ladder D/A Converters, specifications for D/A converters. A/D converters : Quantization, parallel -comparator, successive approximation, counting type, dual-slope ADC, specifications of ADCs.

Books Recommended:

1. Ronald J. Tocci : **Digital Systems: Principles and Applications**, *Prentice Hall*
2. V. K. Jain : **An Introduction to Switching Theory and Digital Electronics**, *Khanna Publishers, New Delhi*
3. M. Morris Mano : **Digital Logic and Computer Design**, *Prentice Hall*
4. William H. Gothmann : **Digital Electronics**, *Prentice Hall*
5. A. Mottershead : **Electronic Devices and Circuits: An Introduction**, *Goodyear Pub*
6. Mehta, Rohit, V K Mehta : **Principles of Electronics**, *S. Chand Group*

CSE1212: Introduction to Digital Electronics Lab

25 Marks [60% Practical, 30% Quizzes/Viva-voce, 10% Attendance]

1 Credit, 22 Contact hours

Laboratory works based on CSE1211

CSE1221: Object Oriented Programming with C++

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]

3 Credits, 33 Contact hours, Exam. Time: 4 hours

Introduction: Object oriented programming and procedural oriented programming, encapsulation, inheritance, polymorphism, data abstraction, data binding, static and dynamic binding, message passing.

C++ as an object oriented language: Declaration and constants, expression and statements, data types, operator, Functions.

Classes: structure of classless. public, private and protected members, array of object, argumented member function, and non-augmented objects, nested member class and their object, pointer objects and pointer members, object a argument of function, static class member and static class. Friend function, friend class,.

Inheritance: mode of inheritance, classifications of inheritance, virtual inheritance.

Array of objects of derived class.

Constructor and destructors: default constructor, argumented constructor, copy constructor, dynamic constructor, constructor function for derived class and their order of execution, destructor.

Operator and function overloading, unary and binary operator overloading, run-time and compile time polymorphism, object pointer and pointer to an object, virtual function, dynamic binding.

C++ data file: C++ file stream classes, input and output file, mode of files, file pointer, random file accessing,

Template and Exception handling: function template and class template, Exception Handling

Books Recommended:

1. H. Schidt : **C++: A Beginner's Guide, McGraw Hill**
1. H. Schidt : **C++: The Complete Reference, McGraw Hill**
2. N. Barkakati : **Object Oriented Programming with C++, Prentice Hall India**
3. B. Stroustrup : **The C++ Pr**

**CSE1222: Object Oriented Programming
with C++ Lab**

**25 Marks [60% Practical, 30% Quizzes/Viva-voce, 10% Attendance]
1 Credit, 22 Contact hours**

Laboratory works based on **CSE1221**

ACCO2111: Industrial Management and Accountancy

**50 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
2 Credits, 22 Contact hours, Exam. Time: 3 hours**

Industry: Commerce-Industry: Meaning & Characteristics of Industry, Types of Industry; Business: Meaning & Objectives of Business, Types of Business: Sole Proprietorship, Partnership, Joint Stock Company, State Enterprise and Cooperative Society.

Fundamentals of Management: Meaning of Management, Principles of Management, Functions of Management, Levels of Management, Roles of Management, Scientific Management and Core Management skills.

Factory Location and Plant Layout: Factors Determining Location of Factory, Steps in Location, Factors Influencing Layout, Types of Layout, Problems of Layout.

Work-Environment and Plant Utility: Meaning, Importance, Factors Affecting Work Environment, Plant Utility, Lighting, Ventilation, Air-conditioning, Sanitation and Noise Control.

Sole Proprietorships: Features, Advantages, Disadvantages of Sole Proprietorship, Sustainability of Sole proprietorships.

Man Power Planning & Motivation: Need, Objectives, Manpower Planning Process, Recruitment, Selection and Training, Issue in Managing People, Maslow's Need Hierarchy, Social Needs and Productivity, Hygiene and Motivators.

Conflict & Union Management Perspective: Meaning, Process of Conflict, Types of Conflict, Industrial Conflict Resolution Methods, Negotiation Skills, Growth of Trade Unions, Functions, Structure, Leadership and Management in the Trade Union, Collective Bargaining.

Accountings: History, Scope and Nature of Accounting, Purpose of Accounting, Information and Uses

Transaction: Meaning and Features, Accounting Equation, Meaning and Classification of Account, Double entry System, Rules for Determining Debit and Credit, Accounting cycle.

Journal, Ledger and Trial Balance: Meaning, Features, Necessity, Rules, Double and Triple Column Cash Book and Practical Problems.

Work Sheet: Meaning, Purpose, Adjustment Entries and 10 Columns Work Sheet.

Cost Terms Concepts and Classification: Meaning of Cost, Manufacturing and Non Manufacturing Costs, Period and Product Costs, Variable and Fixed Costs, Direct and Indirect Costs, Differential, Opportunity and Sunk Costs, Schedule of Cost of Goods Manufactured, Schedule of Cost of Goods Sold and Income Statement.

Cost-Volume-Profit Relationship: Contribution Margin and Ratio, Break-even Analysis, CVP relationship in Graphical Form and Target Net Profit Analysis.

Books Recommended:

1. M. C. Shukla : **Business Organization and Management**, S. Chand Publisher.
2. Harold Koontz and Heinz Weihrich : **Management**, Tata McGraw-Hill.
3. Krajewski and Ritzman : **Operation Management**, Addison-Wesley Publishing Company
4. David A. Decenzo and Stephen P. Robbins : **Human Resource Management**, John Wiley & Sons publisher.
5. Hermanson Etar : **Accounting Principles**, Business Publications
6. Ray H. Garrison : **Managerial Accounting**, Irwin Professional Publishing

STAT2111: Theory of Statistics

**50 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
2 Credits, 22 Contact hours, Exam. Time: 3 hours**

Sampling Distributing: Fisher's Lemma. Study of χ^2 Distribution, T-Distribution and F-Distribution, Properties, uses & Applications. Distribution of sample correlation coefficient in the null case. Sampling Distribution of the Medians and Range.

Elements of Point Estimations: Basic Concepts. consistent estimates. Unbiased estimates. Mean and variance of estimates. Ideas of Efficiency. Principle of Maximum Likelihood. Illustration from Binomial, poisson & Normal Distributions.

Test of Significance: Basic ideas of Null hypothesis. Alternative hypothesis. Type-I error, Type-II error, level of significance, Degree of freedom, Rejection region and Acceptance region. Test of Single mean, Single variance, Two sample means and variances. Test for 2x2 contingency tables. Independence test and practical examples.

Decision Rules: Statistical decisions; Statistical hypothesis; Critical region, Best critical region; Two types of errors; procedure of Test of hypothesis; Most powerful test, standard Errors.

Test of Significance: Test of single mean & single variance. Comparison of two sample Means, proportions and Variances. Bartlett's test for homogeneity of variances. Test for correlation and Regression coefficients. Exact test for 2*2 tables. Test for r*c tables. Three-Way contingency tables. Large Sample

Test of Significance. Non-parametric Test, One Sample and two Sample Sign Test. Run Test and Rank Sum Test.

Recommended Books:

1. R. L. Anderson, T. A. Bancroft : **Statistical Theory in Research**, McGraw-Hill N. Y. Bancroft, T.
2. G. Beaumont : **Intermediate Mathematical Statistics**, Chapman and Hill, London
3. Gutman, Wilks and Hunter : **Introductory Engineering Statistics**, John Wiley and Sons.
4. P. G. Hoel : **Introduction to Mathematical Statistics**, John Wiley and Sons, N. Y.
5. R. V. Hogg. and A. T. Graig : **Introduction to Mathematical Statistics**, Collier Macmilan, N. LY.
6. M. G. Kendall and A. Stuart A. : **The Advanced Theory of Statistics** Vol. 1, Charles Griffin and Co. London.
7. B. W. Lindgren : **Statistical Theory**, Collier-Macmillan Co; N. Y.
8. Mood, Graybill and Boes : **Introduction to the Theory of Statistics**, McGraw-Hill, N. Y.
9. G. B. Weatheril : **Intermediate Statistics Methods**, Chapman and Hall, London

MATH2111: Matrices and Differential Equations

**75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
3 Credits, 33 Contact hours, Exam. Time: 4 hours**

Algebra of Matrices: Adjoint, Inverse and rank of matrix-definition, Properties and evaluation, Determinant Property and Crammer's Rule.

Elementary Transformations: Echelon: Canonical and normal forms, Solution of system of linear equations, Consistency and solution of homogeneous and nonhomogeneous systems by matrix method, and reduction to equivalent system.

Characteristic Equation: Eigenvalues, Eigenvectors and Caley-Hamilton theorem, Similar matrices and diagonalization.

Solutions of first order and first degree and first-order and higher degree equations with variable coefficients.

Solution of Higher-Order linear differential equations.

Differential Equations: Series solution of linear differential equation, Series solution of second order equation with variable coefficients, Solutions of partial differential equation, Laplace's equation and transformation, Poisson's equation,

Helmholtz's equation, Diffusion equation, Green's function solution, Integral equation.

Books Recommended:

1. M. L. Khanna : **Matrices**, Jai Prakash Nath and Co.
2. Shepley L. Ross : **Introduction to Ordinary Differential Equations**, Wiley.
3. Jr. Frank Ayres : **Theory and Problems of Matrices**, Schaum's Outline Series, McGraw-Hill
4. Frank Ayres : **Differential Equations**, McGraw-Hill
5. B. D. Sharma : **Differential Equations**, Kedar Nath Ram Nath.
6. Louis Albert Pipes : **Applied Mathematics for Engineers and Physicist**, McGraw-Hill
7. Ivar Stephen Sokolnikoff and Raymond M. Redheffer : **Mathematics of Physics and Modern Engineering**, McGraw-Hill.

CSE2111: Digital System Design

**75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
3 Credits, 33 Contact hours, Exam. Time: 4 hours**

Combinational Logic: Code converters, advanced arithmetic circuits, carry-look-ahead adder, binary parallel adder, BCD adder. magnitude comparator.

MSI logic circuits: Encoders, decoders, multiplexers, demultiplexers, application of decoder and multiplexer: realizing for min-terms and max-terms, Binary Multiplier Parity generator and checker.

Sequential Circuits: Latches, flip flops (FF), analysis of clocked sequential circuits, state reduction and assignments.

Registers and Counters: Registers, shift registers, parallel loading of shift register, counters, synchronous and asynchronous counter, up and down counter, ripple counter, counters using SR and JK FF, design of sequential counter, application of counter: parallel to serial communication, other types of counters.

Memory and Programmable Logic: Random access memory (RAM), memory addressing, Programmable Array Logic (PAL), Programmable Logic Array (PLA), Introduction to CPLDs, FPGAs

Introduction to hardware description language (HDL), Verilog HDL/VHDL, Syntax and program structure of HDL (Verilog HDL/VHDL).

Application of HDL: Description and simulation of common combinational circuits using HDL: Adder, decoder, multiplexer etc. Description and simulation of sequential circuits, registers, counters.

Books Recommended:

1. Ronald J. Tocci : **Digital Systems: Principles and Applications**, Prentice Hall
2. V. K. Jain : **An Introduction to Switching Theory and Digital Electronics**, Khanna Publishers, New Delhi
3. M. Morris Mano : **Digital Logic and Computer Design**, Prentice Hall
4. William H. Gothmann : **Digital Electronics**, Prentice Hall
5. A. Mottershead : **Electronic Devices and Circuits: An Introduction**, Goodyear Pub
6. Mehta, Rohit, V K Mehta : **Principles of Electronics**, S. Chand Group

CSE2112: Digital System Design Lab

**25 Marks [60% Practical, 30% Quizzes/Viva-voce, 10% Attendance]
1 Credit, 22 Contact hours**

Laboratory works based on CSE2111

CSE2121: Data Structure

**75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
3 Credits, 33 Contact hours, Exam. Time: 4 hours**

Arrays: Maximization, ordered lists, sparse matrices, representation of arrays.

Stacks, Queues and Recursion: Different types of stacks and queues: Circular, dequeues, etc; evaluation of expressions, multiple stacks and queues;

Recursion: Direct and indirect recursion, depth of recursion; Simulation of Recursion, Removal of recursion; Towers of Hanoi.

Links Lists: singly linked lists, linked stacks and queues, the storage pool, polynomial addition, equivalence relations, sparse matrices, doubly linked lists and dynamic storage management, generalized lists, garbage collection and compaction.

Trees: Basic terminology, binary trees, binary tree representations, binary tree traversal; Extended binary trees: 2-trees, internal and external path lengths, Huffman

codes/algorithms; threaded binary trees, binary tree representation of trees; Application of Trees: Set representation, decision trees, games trees: Counting binary trees.

Graphs: Introduction, definitions and terminology, graph representations, traversals, connected components and spanning trees, shortest path and transitive closure, activity networks, topological sort and critical paths, enumerating all paths.

Symbol Tables: static tree tables, dynamic tree tables; Hash Tables: Hashing functions overflow handling, theoretical evaluation of overflow techniques.

Files: file, queries and sequential organizations: Indexing Techniques: Cylinder-surface indexing hashed indexes, tree indexing-B-trees; Tree indexing.

Books Recommended:

1. E. Horowitz and S. Sahni : **Fundamentals of Data Structures**, *Galgotia*.
2. Edward M. Reingold & Wilfred J. Hansen : **Data Structures**, *Addison Wesley Publishers*
3. Niklaus Wirth : **Algorithms + Data Structures = Programs**, *Prentice Hall*
4. Robert L. Kruse : **Data Structures and Program Design**, *Prentice Hall*
5. Seymour Lipshultz : **Data Structures (Schaum's Outline Series)**, *Tata McGraw-Hill*
6. E. Horowitz and S. Sahni : **Computer Algorithms**, *Galgotia*.
7. Seymour E. Goodman & S. T. Hedetniemi : **Introduction to Design and Analysis of Algorithms**, *McGraw-Hill*.

CSE2122: Data Structure Lab

**25 Marks [60% Practical, 30% Quizzes/Viva-voce, 10% Attendance]
1 Credit, 22 Contact hours**

Laboratory works based on CSE2211

CSE2131: Discrete Mathematics

**75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
3 Credits, 33 Contact hours, Exam. Time: 3 hours**

Mathematical Logic: Connectives, Normal Forms, theory of inference for proposition calculus, predicate calculus, inference theory of predicate calculus, method of proof, mathematical induction.

Counting: Basic principles, sequences, Fibonacci, Eulerian, Bernoulli numbers, permutation, and Pascal's triangle.

Relation and ordering: Relations, properties of Binary relation in a set, composition of binary relation, relation matrix and graph of a relation, partial ordering, path in relation and di-graph.

Ordered relation and structure: Partially ordered set, external element of P.O. set, Lattice, finite Boolean algebra, function on Boolean algebra, Boolean function as Boolean polynomial.

Graph: Introduction to graph, graph terminology, representing graph and graph isomorphism, paths, reachability, connectivity, Euler and Hamilton path, shortest path problems, graph colouring, matrix representation of graph.

Trees: Introduction of trees, application of trees, tree traversal, labeling trees, trees and sorting, spanning trees, minimal spanning tree, and undirected trees.

Algebraic structure: Algebraic system, general properties, some simple algebraic system, ring, semiring, module, semi-module, Homomorphism of semigroups and monoid, Grammars and languages, Formal definition of a language, Definition and examples, homomorphism, product and quotients of group.

Books Recommended:

1. Kenneth H. Rosen : **Discrete Mathematics and Its Applications**, *McGraw-Hill*.
2. J. P. Tremblay and R. Manohar : **Discrete Mathematics structures with applications to Computer Science**, *Mc-Graw Hill*
3. C.L. Liu : **Elements of Discrete Mathematics**, *McGraw-Hill*.
4. Seymour Lipschutz : **Theory and Problems of Discrete Mathematics**, *Schaum's Outline Series, McGraw-Hill*
5. Bernard Kolman, Robert Busby, Sharon C. Ross : **Discrete Mathematical Structures**, *Prentice Hall*

CSE2142: Software Development Lab I
25 Marks [60% Practical, 30% Quizzes/Viva-voce, 10% Attendance]
1 Credit, 22 Contact hours

LAW 2211: Cyber and Intellectual Property Law
50 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
2 Credits, 22 Contact hours, Exam. Time: 3 hours

Cyber Law

Cyber Law: Definition Nature, Scope, Utility of Cyber Law, Origin and Development of Cyber Law and Internet

ICT Policy in Bangladesh; Internet Service Providers (ISP)- Domain Name, Present Legal Basis of ISP in Bangladesh; e-Readiness in Bangladesh- e-Commerce in Bangladesh, e-Governance in Bangladesh, e-Learning/Education in Bangladesh, e-Journal in Bangladesh, e-Voting in Bangladesh; Electronic Evidence- Digital Signature, The Evidence Act of 1872 Vs. ICT Act-2006, Electronic Evidence in Bangladesh, Legal Effects of Electronic Evidence, UNCITRAL Model Law on Electronic Evidence;

Cyber Crime: Jurisdiction and Cyber Crime, Criminal Justice in Bangladesh and Implications on Cyber Crime; Cyber vandalism, Hacking, Malicious Spreading in Viruses, Password fraud, Cheating, Cyber Pornography, Child Pornography, Protection of Copyrights and Intellectual Property right. Invasion of Privacy, Constitutional basis of Privacy, Unsolicited e-Mail, Defamation, Harassment and e-Mail Abuse, Present Legal Protection;

Human Rights Violation and Internet; The Information and Communication Technology Act, 2006- Objectives, Strengths & Weaknesses of the ICT Law, Regulation of Cryptography;

International Cyber Law- India, Sri Lanka, Japan, Malaysia, Australia and the USA, International Conventions on Cyber Law & Crime

Electronic Commerce- Electronic Money, Online Credit card Payments and Electronic Bills of Lading, UNCITRAL Model Law on Electronic Commerce.

Intellectual Property Law

Intellectual Property Law: Basic Concepts of IP Law, Nature of IPR, Computer-related intellectual property rights; Copyright- Original and

development of copyright law, subject matter of copyright protection, Rights protected by copyright, Neighbouring rights, Limitations of Copyright protecting, Piracy and infringement, Remedies, Computer Program, New technology and copyright, Software Patents Vs. Copyright, International Convention on Copyright

Patent- Patents and technological development, Requirements for patentability and ownership of patents, Scope of exclusive rights and duration of protection, Patents infringement, defences and remedies, Legal arrangement for the transfer of technology, Types of intellectual Property licenses

Trademarks- Reasons for the protection of trademarks, Acquisition of trademark right, Registration procedure, Duration of protection and renewal, Termination, Trademarks in Cyberspace; Domain Name and Meta-tag Controversies.

Books Recommended:

1. Vivck Sood : **Cyber Law Simplified**, Tata McGraw Hill Publications.
2. V. D. Dudej : **Information Technology & Cyber Laws**, Commonwealth Publishers.
3. Arpad Bogisch : **Universal Copyright Convention: An Analysis and Commentary**, Bowker
4. Alan Daubeny Russell : **Copyright in Industrial Designs**, Sweet and M.

MATH2231: Numerical Methods
50 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
2 Credits, 22 Contact hours, Exam. Time: 3 hours

Floating-point arithmetic: Floating-point representations, General properties, IEEE-754, 32-bit and 64-bit formats, Denormalized numbers, NaNs and other special values, Floating-point exception handling, CRAY, Rounding methods, Floating-point operations (+, -, X, /), Catastrophic cancellation due to subtraction; introduction to the concept of condition number

Approximations and Errors: Accuracy and Precision, Error Definitions, Round-Off Errors, Truncation Errors.

Roots of Equations: Graphical Methods, The Bisection Method, The False-Position Method, Simple One-Point Iteration, The Newton-Raphson Method, The Secant Method.

Systems of linear algebraic equations: Gauss Elimination, Solving Small Numbers of Equations, Naive Gauss Elimination, Pitfalls of Elimination Methods, Matrix Inversion and Gauss-Seidel, The Matrix Inverse, Error Analysis and System Condition.

Curve Fitting: Linear Regression, Polynomial Regression, Multiple Linear Regression, Newton's Divided-Difference Interpolating Polynomials, Lagrange Interpolating Polynomials, Coefficients of an Interpolating Polynomials, Curve Fitting with sinusoidal Functions.

Numerical Differentiation and Integration : The Trapezoidal Rule, Simpson's Rules, Integration with Unequal Segments, Romberg Integration, Gauss Quadrature, High-Accuracy Differentiation Formulas, Richardson Extrapolation, Derivatives of Unequally Spaced Data.

Finite-difference methods for ordinary differential equations: Solution of linear, homogeneous difference equations with constant coefficients, Survey of methods for deriving finite-difference algorithms, Stability analysis of finite-difference methods: Euler, backward Euler, Midpoint, Trapezoidal, Midpoint-trapezoidal predictor-corrector, Runge-Kutta methods, Adams-Moulton methods, Adams-Bashforth methods. Methods for stiff equations: Backward Euler, Gear's methods. Methods for linear systems of ODEs in which the coefficient matrix has purely imaginary eigenvalues, Finite-difference methods as digital filters: Transfer-function analysis, Boundary-value problems for ODEs

Numerical Solutions of Ordinary Differential Equations: Euler's Method, Modifications and Improvements of Euler's Methods, Runge-Kutta Methods, Adaptive Runge-Kutta Methods.

Pseudorandom-number generators, the FFT.

Recommended Books:

1. Steven C. Chapra, : **Numerical Methods for Engineers**, McGraw-Hill
Raymond P. Canale
2. S. S. Kuo : **Computer Applications of Numerical Methods**, Addison-Wesley
3. S. S. Sastry : **Introductory Methods of Numerical Analysis**, Prentice-Hall of India Pvt. Ltd.
4. Cantrell : **Modern Mathematical Methods for Physicists and Engineers**, Cambridge University Press.
5. Press, Teukolsky, : **Numerical Recipes in C: The Art of Scientific Computing**, Cambridge University Press.
Vetterling and Flannery

CSE2232: Numerical Methods Lab

**25 Marks [60% Practical, 30% Quizzes/Viva-voce, 10% Attendance]
1 Credit, 22 Contact hours**

Laboratory works based on CSE2231

MATH2241: Linear Algebra

**75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
3 Credits, 33 Contact hours, Exam. Time: 4 hours**

Vector space, subspace, sum and direct sum, Hilbert space, normed space, Banach space.

Linear dependence and independence basis and dimension.

Linear transformation: range, kernel, nullity, rank, singular and non-singular transformations.

Matrices and linear operators: Matrix representation of a linear operator. Change of basis, similarity, Matrices and linear mapping.

Characteristic roots and vectors of linear transformations, theorems and problems; characteristic and minimum polynomials of square matrices.

Linear functionals and dual vector spaces, Annihilators.

Norms and inner products, Orthogonal complements, orthonormal sets, Gram-schmidt orthogonalization process.

Recommended Books:

1. Seymour Lipschutz, : **Linear Algebra, Schaum's Outline Series**,
Marc Lipson McGraw-Hill
2. I. N. Herstein : **Topics in Algebra**, Wiley

CSE2211: Object Oriented Design and Design Patterns using Java
75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
3 Credits, 33 Contact hours, Exam. Time: 4 hours

OOP Concepts: Modularity, reusability, functional decomposition, object-based decomposition, abstract data types. Classes and uniform type system, objects and references, memory management, inheritance techniques, generic classes and templates, exception handling.

Software Design with UML: Introduction to UML. Overview of the design process using UML Rational Unified Process. Structured description of system usage and function, requirements capture techniques, identification of scenarios and UML use case diagrams. Description of scenario elements in terms of CRC models - classes, responsibilities and collaborators. Systematic definition of classes, data and system structure. Abstraction, modularisation and UML class diagrams. Combining top-down refinement with bottom-up construction. Object interaction, behaviour and state. Different varieties of UML interaction diagram. Recognising coupling between modules and responsibility-driven design. Structuring source code as a design model. Recognition of variable roles. Defensive programming methods including recognition of pre- and post-conditions, invariants, composition and assertions. Rapid and agile prototyping strategies, optimisation and debugging techniques.

Design Patterns: Introduction, creational patterns - abstract factory, builder, factory method, prototype, singleton; structural patterns - adapter, bridge, composite, decoder, proxy, facade, flyweight; behavioral patterns-chain, command, interpreter, iterator, mediator, memento, observer, state, strategy, visitor, template method.

Books Recommended:

1. Deitel & Deitel : **Java How To Program, Prentice Hall**
2. Flanagan : Java in a nutshell : a desktop quick reference
3. H. Schildt : Java 2: Complete Reference
4. McConnell : Code complete: a practical handbook of software construction
5. E. Gamma : Design Patterns: Elements of Reusable OO Software
6. Allan Shallway : Design Patterns Explained
7. Fowler : UML distilled
8. Craig Larman: Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development

CSE2212: Object Oriented Design and Design Patterns using Java
Lab
25 Marks [60% Practical, 30% Quizzes/Viva-voce, 10% Attendance]
1 Credit, 22 Contact hours

Laboratory works based on CSE2211
 Students will develop software using C/C++/Java with proper documentation as assigned by Lab teachers.

CSE2221: Design and Analysis of Algorithms
75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
3 Credits, 33 Contact hours, Exam. Time: 4 hours

Basics of Algorithm: Algorithms as a technology, Analyzing algorithms, Designing algorithms, Time and space analysis of algorithms, Average, best and worst case analysis, different notations.

Sorting: Insertion sort, Heapsort, Quicksort, Counting sort, Radix sort, Bucket sort.

Dynamic programming: Assembly-line scheduling, Matrix-chain multiplication, Longest common subsequence, Optimal binary search trees.

Greedy method: An activity-selection problem, Elements of the greedy strategy, Huffman codes.

Graph algorithms: Depth-first search, Breadth-first search, Topological sort, Minimum spanning tree, Kruskal's and Prim's algorithm, Bellman-Ford algorithm, Dijkstra's algorithm, Floyd-Warshall algorithm, Johnson's algorithm for sparse graphs, Ford-Fulkerson method.

Computational Geometry: Line-segment properties, Determining whether any pair of segments intersects, Finding the convex hull, Finding the closest pair of points.

Backtracking: 8 queens problem, Sum of subsets, Graph coloring problem, Hamilton cycles.

Branch and bound: Lest cost search, 15-puzzle problem, Knapsack problem, Traveling salesman problem.

NP-Completeness: Polynomial time, Polynomial-time verification, NP-completeness and reducibility, NP-complete problems.

Recommended Books:

1. Thomas H. Kormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein : **Introduction to Algorithms, The MIT Press**
2. D. E. Knuth : **The Art of Computer Programming, Vol. 1, 2, 3, Addison-Wesley.**
5. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran : **Fundamentals of Computer Algorithms, Galgotia Publications**

CSE2222: Design and Analysis of Algorithms Lab
25 Marks [60% Practical, 30% Quizzes/Viva-voce, 10% Attendance]
1 Credit, 22 Contact hours

Laboratory works based on CSE2221

CSE2231: Computer Architecture and Organization
75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
3 Credits, 33 Contact hours, Exam. Time: 4 hours

Concepts and Terminology: Digital computer components Hardware & Software and their dual nature, recent development, Role of Operating Systems (OS).

Processor Design: Introduction: Processor organization, information representation, number formats; Fixed Point Arithmetic: Addition, subtraction, multiplication, division; ALU Design: Basic ALU organization, floating point arithmetic.

Control Design: Hardwired control: Design methods, multiplier control unit, CPU control unit; Basic concept of Micro programmed Control, Control memory optimization.

Memory Devices and its Organization: Different types of semiconductor memory, magnetic memory, optical memory, virtual memory, memory hierarchies; High-speed Memories: Interleaved memories, caches, associative memories.

System Organization: Communications: Introduction, bus control; IO Systems: Programmed IO, DMA and interrupts, IO processors.

Application HDL for microcomputer design: Description of Adder, ALU

by using HDL, implementation of a simple microcomputer system using HDL.

Books Recommended:

1. John P. Hayes : **Computer Architecture and Organization, McGraw-Hill.**
2. Carl Hamacher, Zvonko Vranesic and Safwat Zaky : **Computer Organization, McGraw-Hill.**
3. Kai Hwang and Faye A. Briggs : **Computer Architecture and Parallel Processing, McGraw-Hill.**
4. William Stallings : **Computer Organization and Architecture: Designing for Performance, Prentice Hall.**

CSE2232: Computer Architecture and Organization Lab
25 Marks [60% Practical, 30% Quizzes/Viva-voce, 10% Attendance]
1 Credit, 22 Contact hours

Laboratory works based on CSE2231

CSE2242: Software Development Lab II
50 Marks [60% Practical, 30% Quizzes/Viva-voce, 10% Attendance]
2 credits, 52 Contact hours

Students will develop software with proper documentation as assigned by Lab teachers based on CSE2211.

CSE3111: Software Engineering

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]

3 Credits, 33 Contact hours, Exam. Time: 4 hours

Introduction: Introduction to software engineering, Importance of software, The Software evolution, Software characteristics, Software components, Software applications, Crisis-Problem and causes.

Software development life-cycle: Requirement analysis, software design, coding, testing and maintenance etc.

Software requirement Specification: Water fall model, prototyping interactive enhancement, spiral model role of management in software development, role of matrices and measurement, Problem analysis, requirement specification, validation, matrices, monitoring and control.

System Design: Problem partitioning, abstraction, top down and bottom up – design, structured approach, functional versus object oriented approach, design specification and verification matrices, monitoring and control, Cohesiveness, coupling, 4 GL. Visio, DFD, Rational Rose, Visio, VS architectural design.

Coding: TOP-DOWN and BOTTOM-UP structure programming, information hiding, programming style, and internal documentation, verification, metrics, monitoring and control, Subversion, Team System, Source Safe

Testing: levels of testing, functional testing, structural testing, test plane, test class specification, reliability assessment, Software testing strategies, Verification and validation, Unit, Integration Testing, Top down and bottom up integration testing, Alpha and Beta testing, System testing and debugging. NUnit for unit testing, Selenium, WebLoad

Software project Management: Cost estimation, project scheduling, staffing, software configuration management, structured Vs unstructured maintenance, quality assurance, project monitoring, risk management. Agile-XP, scrum, Rally, Version One, Bugzilla, Visual Studio Team System, Agile project management, comparison with traditional process, Next generation software engineering

Function oriented and object oriented Software design: Overview of SA/SD Methodology, structured analysis, data flow diagrams, extending DFD to real time systems, Object oriented design, Graphical representation of OOD, Generic OO development paradigm.

Software Reliability and Quality Assurance: Reliability issues, Reliability metrics, reliability growth modeling, Software quality, ISO 9000 certification