TEACHING AND EXAMINATION SCHEME
Bachelor of Computer Applications - III Year
2020-21

	Paper Name (Theory)	Lec	Exam Hours	MARKS	
				Min	Max
bca-301	Group (I/II/II/IV/V)	3	3	18	50
bca-302	Group (I/II/II/IV/V)	3	3	18	50
bca-303	Computer Networks & Mobile Computing	3	3	18	50
bca-304	Programming in .NET with C#	3	3	18	50
bca-305	Internet Tools & Website Development	3	3	18	50
bca-306	Open Source Technology & Operating Systems	3	3	18	50
			Total of Theory Marks		**300**

	Paper Name (Practical)	Pract Hours	Exam Hours	MARKS	
				Min	Max
bca-307	.NET Programming with C#	3	3	18	50
bca-308	Web Development (JavaScript, PHP, MySQL)	3	3	18	50
bca-309	Oracle & SQL Programming	3	3	18	50
bca-310	Project	6	3	18	50
			Total of Practical Marks		**200**
			Total of Theory & Practical Marks		**500**

Group	**Choice Papers Names**	**I Year**	**II Year**	**III Year**
Group I	Physics	I	II	III
	Mathematics	I	II	III
Group II	Computer Practice	I	II	III
	Information Practice	I	II	III
Group III	Geography	I	II	III
	Sociology	I	II	III
Group IV	Accountancy	I	II	III
	Business Studies	I	II	III
Group V	Skill	I	II	III

SCHEME OF EXAMINATION
BACHELOR OF COMPUTER APPLICATIONS

Note:
Thestudent has to take any one group from among I, II, III, IV, V. The group will continue for the entire three years of BCA respectively for the first 2 papers and the student will not be allowed to change groups.

Theory:

Part A:

1. 10 Question of 1.5 mark each – 15 marks
2. Answer should not exceed more than 50 words
3. All questions are compulsory

Part B:

1. 5 Questions of 3 marks each – 15 marks
2. Answer should not exceed more than 50 words
3. All questions are compulsory

Part C:

1. 3 Questions of 7+7+6 marks each – 20 marks.
2. There will be an internal choice in each question.
3. Answer should not exceed 400 words

Practical & Projects:
Practical exams shall be conducted by one internal and one external examiner of a batch of 40 students in a day.
Duration of Practical exam is 3 hours.
A Laboratory Exercise File should be prepared by each student for each practical paper and should be submitted during practical examinations.
Practical of 50 marks distribution is as under:

a. 30 marks for practical examination exercise for 3 questions
b. 10 marks for Viva-voce
c. 10 marks for Laboratory Exercise File

Duration: 3 hours	Max Marks: 50

Group –I (Science)

bca-301 Physics

Magnetic Effects of Current and Magnetism

Concept of magnetic field, Oersted's experiment. Biot - Savart law and its application to current carrying circular loop. Ampere's law and its applications to infinitely long straight wire, straight and toroidal solenoids. Force on a moving charge in uniform magnetic and electric fields. Cyclotron. Force on a current-carrying conductor in a uniform magnetic field. Force between two parallel current carrying conductors – definition of ampere. Torque experienced by a current loop in a magnetic field; moving coil galvanometer – its current sensitivity and conversion to ammeter and voltmeter. Current loop as a magnetic dipole and its magnetic dipole moment. Magnetic dipole moment of a revolving electron. Magnetic field intensity due to a magnetic dipole (bar magnet) along its axis and perpendicular to its axis. Torque on a magnetic dipole (bar magnet) in a uniform magnetic field; bar magnet as an equivalent solenoid, magnetic field lines; Earth's magnetic field and magnetic elements. Para-, dia- and ferro - magnetic substances, with examples. Electromagnets and factors affecting their strengths. Permanent magnets.

Electromagnetic Induction and Alternating Currents

Electromagnetic induction; Faraday's law, induced emf and current; Lenz's Law, Eddy currents. Self and mutual inductance. Alternating currents, peak and rms value of alternating current/ voltage; reactance and impedance; LC oscillations (qualitative treatment only), LCR series circuit, resonance; power in AC circuits, wattles current. AC generator and transformer.

Electromagnetic Waves

Need for displacement current. Electromagnetic waves and their characteristics (qualitative ideas only). Transverse nature of electromagnetic waves. Electromagnetic spectrum (radio waves, microwaves, infrared, visible, ultraviolet, x-rays, gamma rays) including elementary facts about their uses.

Optics

Reflection of light, spherical mirrors, mirror formula. Refraction of light, total internal reflection and its applications, optical fibres, refraction at spherical surfaces, lenses, thin lens formula, lens-maker's formula. Magnification, power of a lens, combination of thin lenses in contact combination of a lens and a mirror. Refraction and dispersion of light through a prism.

Scattering of light – blue colour of the sky and reddish appearance of the sun at sunrise and sunset. Optical instruments: Human eye, image formation and accommodation, correction of eye defects (myopia and hypermetropia) using lenses. Microscopes and astronomical telescopes (reflecting and refracting) and their magnifying powers. Wave optics: Wavefront and Huygens' principle, reflection and refraction of plane wave at a plane surface using wavefronts. Proof of laws of reflection and refraction using Huygens' principle. Interference, Young's double hole experiment and expression for fringe width, coherent sources and sustained interference of light.

Diffraction due to a single slit, width of central maximum. Resolving power of microscopes and astronomical telescopes. Polarisation, plane polarised light; Brewster's law, uses of plane polarised light and Polaroids.

Dual Nature of Matter and Radiation

Photoelectric effect, Hertz and Lenard's observations; Einstein's photoelectric equation – particle nature of light. Matter waves – wave nature of particles, de Broglie relation. Davisson-Germer experiment (experimental details should be omitted; only conclusion should be explained.)

Atoms and Nuclei

Alpha - particle scattering experiment; Rutherford's model of atom; Bohr model, energy levels, hydrogen spectrum. Composition and size of nucleus, atomic masses, isotopes, isobars; isotones. Radioactivity – alpha, beta and gamma particles/rays and their properties; radioactive decay law. Mass-energy relation, mass defect; binding energy per nucleon and its variation with mass number; nuclear fission and fusion.

Electronic Devices

Energy bands in solids (qualitative ideas only), conductors, insulators and semiconductors;
semiconductor diode – I-V characteristics in forward and reverse bias, diode as a rectifier; I-V characteristics of LED, photodiode, solar cell, and Zener diode; Zener diode as a voltage regulator. Junction transistor, transistor action, characteristics of a transistor; transistor as an amplifier (common emitter configuration) and oscillator. Logic gates (OR, AND, NOT, NAND and NOR). Transistor as a switch.

Communication Systems

Elements of a communication system (block diagram only); bandwidth of signals (speech, TV and digital data); bandwidth of transmission medium. Propagation of electromagnetic waves in the atmosphere, sky and space wave propagation. Need for modulation. Production and detection of an amplitude-modulated wave

Duration: 3 hours	Max Marks: 50

Group –II (Computer)

bca-301 Computer Practices

Electronic Commerce Framework, electronic and media convergence, traditional vs electronic business applications, the anatomy of E-commerce applications, overview of mobile computing technology, mobile data internet and mobile computing applications

Networks – Security and firewalls, client – server network security threads, firewalls and network security, data message security, encrypted documents and electronic mail.

Architectural Framework for electronic commerce, World Wide Web as architecture, consumer oriented e-commerce, electronic data interchange (EDI), EDI Applications in business, EDI security document management and digital libraries.

Consumer oriented applications, mercantile process models, mercantile models from the consumer's perspective, mercantile models from the merchant's perspective

Duration: 3 hours	Max Marks: 50

Group –III (Arts)

bca-301Geography

Human Settlements

Rural settlements - types and distribution.Urban settlements - types, distribution and functional classification.

Resources and Development

Land resources - general land use; agricultural land use, Geographical conditions and distribution of major crops (Wheat, Rice, Tea, Coffee, Cotton, Jute, Sugarcane and Rubber), agricultural development and problems. Water resources - availability and utilization-irrigation, domestic, industrial and other uses; scarcity of water and conservation methods -rain water harvesting and watershed management. Mineral and energy resources - distribution of metallic (Iron ore, Copper, Bauxite, Manganese); non-metallic (Mica, Salt) minerals; conventional (Coal, Petroleum, Natural gas and Hydroelectricity) and non-conventional energy sources (solar, wind, biogas) and conservation. Industries - types, factors of industrial location; distribution and changing pattern of selected industries-iron and steel, cotton textiles, sugar, petrochemicals, and knowledge based industries; impact of liberalization, privatisation and globalisation on industrial location; industrial clusters. Planning in India - target group area planning (case study); idea of sustainable development (case study).

Transport, Communication and International Trade

Transport and communication-roads, railways, waterways and airways: oil and gas pipelines; Geographical information and communication networks. International trade - changing pattern of India's foreign trade; sea ports and their hinterland and airports.

Geographical Perspective on selected issues and problems

Environmental pollution; urban - waste disposal.Urbanisation, rural-urban migration; problems of slums. Land degradation

Duration: 3 hours	Max Marks: 50

Group –IV (Commerce)

bca-301Accountancy

Accounting for Partnership
Nature of Partnership Firm : Partnership Deed -Meaning, Impact. Special Aspects of Final Accounts of Partnership : Fixed v/s Fluctuating Capital, Division of Profit among partners, Past adjustments and Guarantee of Profits, Accounting for joint life policy.

Reconstitution of Partnership, Change in Profit Sharing Ratio among the existing partners -Sacrificing Ratio and Gaining Ratio, Accounting for Revaluation of Assets and Liabilities and Distribution of Reserves and Accumulated Profits. Goodwill: Nature, Factors affecting and Methods of valuation: average profit, super profit, capitalization, accounting treatment of goodwill. Admission of a Partner: Effect of Admission of Partner, Change in Profit Sharing Ratio -Sacrificing Ratio, accounting Treatment of Goodwill, Accounting Treatment for Re- valuation of Assets and Liabilities. Accounting Treatment of Reserves and Accumulated Profits, Adjustment of Capital Accounts. Retirement/Death of a Partner: Change in Profit Sharing Ratio -Gaining Ratio, Accounting Treatment of Goodwill. Accounting Treatment for the Revaluation of Assets and Liabilities.Adjustment of Accumulated Profits and Reserves, Adjustment of Joint LifePolicy and Capital Accounts.

Dissolution of Partnership Firm, Meaning, Settlement of Accounts: Preparation of Realization account and related accounts (excluding piecemeal distribution, sale to a company and insolvency of a partner).

Accounting for Share Capital
Share and Share Capital: Meaning, Nature and Types. Accounting for Share Capital: Issue and Allotment of Shares. Private Placement of shares : Meaning of employee stock option plan and Public Subscription of share capital. Over subscription and Under subscription, Issue at par, premium and at discount, Calls in advance, Calls in arrears, Interest on Calls in advance and arrears and Issue of Shares for consideration other than cash. Forfeiture of Shares: Accounting Treatment, Re-Issue of Forfeited Shares. Disclosure of Share Capital in company's balance sheet.

Accounting for Debentures
Issue of Debentures: Meaning of Debentures. Types of Debentures, Trust Deed concept, Issue of Debentures at par and at a premium, Issue of Debentures for consideration other than cash.Debentures as a collateral security. Redemption of Debentures: Meaning, Sources of funds for redemption of debentures : from the proceeds of fresh issue of share capital and debentures, Out of accumulated profits and Sinking Fund. Methods of redemption of debentures In lump-sum at the end of stipulated period, By draw of lots, By purchasing in the open market, By conversion into new debentures or shares.

Analysis of Financial Statement
Financial Statements of a Company: Balance Sheet of a Company in the prescribed form with major headings only (Schedule VI). Financial Analysis: Meaning, Significance and Purpose, Limitations. Tools for Financial Analysis: Comparative Statements, Common Size Statements.
Accounting Ratios: Meaning and Objectives, Types of Ratios, Liquidity Ratios: Current Ratio, Liquid Ratio. Solvency Ratio: Debt to equity, Total Assets to Debt, Proprietary Ratio. Activity Ratio, Inventory Turnover, Debtors Turnover, Working Capital Turnover, Profitability Ratio: Gross Profit, Operating Ratio.

Duration: 3 hours	Max Marks: 50

Group –V (Skill 1)

bca-301Retail Communication

Communicating with the retail customer, communication process, promotion mix element of advertising, objectives of advertising, functions of advertising, advantages of retailor, advantages to customer, advantages to society, characteristics of good advertisement. Objections of advertisement, advertising Media, factors governing selection of the media types of media, kinds of press advertisement, kinds of magazines, advertising agency, promotions & definition of promotion, importance of promotional activities, purpose of promotion, kinds of promotion, approaches to promotion, types of sales promotion programmes, retail selling process, qualitative & quantitative objectives.

Globalization & Retailing

Globalization & Retailing- Meaning advantages, retail evolution, changing retail formats, product developments, environment and experience, factors underlying modernization in retailing, changes in government policies, retail Industry trends, increased Investment in retailing, emerging new face of retailing, changing retail model , E-retailing, e-commerce, global entry strategy & new customized formats, classification of retail stores, types of franchising, role of retiling in industry. Understanding of Global market scenario, Changing international scenario and trading terms and their policies. Global retail business in the shadow of World Wide Web and it's comparison with the traditional retailing business.

Duration: 3 hours	Max Marks: 50

Group –I (Science)

bca-302Mathematics

CALCULUS

Continuity and Differentiability, derivative of composite functions, chain rule, derivatives of inverse trigonometric functions, derivative of implicit function. Concepts of exponential, logarithmic functions. Derivatives of loge x and ex . Logarithmic differentiation. Derivative of functions expressed in parametric forms. Second order derivatives. Rolle's and Lagrange's Mean Value Theorems (without proof) and their geometric interpretations.

Applications of Derivatives: Rate of change, increasing/decreasing functions, tangents and normals, approximation, maxima and minima (first derivative test motivated geometrically and second derivative test given as a provable tool). Simple problems (that illustrate basic principles and understanding of the subject as well as real-life situations).

Integrals: Integration as inverse process of differentiation. Integration of a variety of functions by substitution, by partial fractions and by parts, only simple integrals to be evaluated.Definite integrals as a limit of a sum. Fundamental Theorem of Calculus (without proof). Basic properties of definite integrals and evaluation of definite integrals.

Applications of the Integrals: Applications in finding the area under simple curves, especially lines, arcs of circles/ parabolas / ellipses (in standard form only), area between the two above said curves (the region should be clearly identifiable).

Differential Equations: Definition, order and degree, general and particular solutions of a differential equation. Formation of differential equation whose general solution is given.Solution of differential equations by method of separation of variables, homogeneous differential equations of first order and first degree.

VECTORS AND THREE-DIMENSIONAL GEOMETRY

Vectorsand scalars, magnitude and direction of a vector.Direction cosines/ratios of vectors. Types of vectors (equal, unit, zero, parallel and collinear vectors), position vector of a point, negative of a vector, components of a vector, addition of vectors, multiplication of a vector by a scalar, position vector of a point dividing a line segment in a given ratio. Scalar (dot) product of vectors, projection of a vector on a line. Vector (cross) product of vectors, scalar triple product.

Three-dimensional Geometry: Direction cosines/ratios of a line joining two points. Cartesian and vector equation of a line, coplanar and skew lines, shortest distance between two lines.Cartesian and vector equation of a plane.Angle between (i) two lines, (ii) two planes, (iii) a line and a plane.Distance of a point from a plane.

Linear Programming: Introduction, related terminology such as constraints, objective function, optimization, different types of linear programming (L.P.) problems, mathematical formulation of L.P. problems, graphical method of solution for problems in two variables, feasible and infeasible regions, feasible and infeasible solutions, optimal feasible solutions (up to three non-trivial constrains).

ProbabilityMultiplications theorem on probability.Conditional probability, independent events, total probability, Baye's theorem.Random variable and its probability distribution, mean and variance of haphazard variable. Repeated independent (Bernoulli) trials and Binomial distribution

STATISTICS AND PROBABILITY
Statistics Measure of dispersion; mean deviation, variance and standard deviation of ungrouped/grouped data.Analysis of frequency distributions with equal means but different variances.

Probability, Random experiments: outcomes, sample spaces (set representation). Events: Occurrence ofevents, 'not', 'and' & 'or' events, exhaustive events, mutually exclusive events. Axiomatic (set theoretic) probability, connections with the theories of earlier classes. Probability of an event, probability of 'not', 'and', & 'or' events.

Duration: 3 hours	Max Marks: 50

Group –II (Computer)

bca-302 Information Practices

Overview of JavaScript, object orientation and JavaScript, syntactic characteristics, primitives, operations, and expressions, screen output and keyboard input, control statements, object creation and modification, arrays, functions, constructors, pattern matching using regular expressions, errors in scripts.

JavaScript execution environment, the Document Object Model, elements access in JavaScript, events and event handling, handling events from body elements, handling events from text box and password elements, the DOM2 event model, the navigator object, DOM tree traversal and modification, positioning elements, moving elements, element visibility, changing colors and fonts, dynamic content, stacking elements, locating the mouse cursor, reacting to a mouse click, slow movement of elements, dragging and dropping elements.

Duration: 3 hours	Max Marks: 50

Group –III (Arts)

bca-302Sociology

Structural Change
Colonialism, Industrialization, Urbanization

Cultural Change
Modernization, Westernization, Sanskritisation, Secularization, Social Reform Movements and Laws

The Story of Democracy
The Constitution as an instrument of Social Change, Parties, Pressure Groups and Democratic Politics, Panchayati Raj and the Challenges of Social Transformation

Change and Development in Rural Society
Land Reforms, Green Revolution and Agrarian Society

Change and Development in Industrial Society
From Planned Industrialization to Liberalization, Changes in the Class Structure

Globalisation and Social Change, Mass Media and Communication Process

Social Movements
Class-Based Movements: Workers, Peasants
Caste-Based Movements: Dalit Movement, Backward Castes, Trends in Upper Caste, Responses, Women's Movements in Independent India, Tribal Movements, Environmental Movements

Duration: 3 hours	Max Marks: 50

Group –IV (Commerce)

bca-302Business Studies

Organising: Concept and importance.Organizing Process.Structure of organization - functional and divisional.Formal and informal organization. Delegation: concept, elements and importance.
Decentralization: concept and importance.

Staffing: Concept and importance of staffing Staffing as a part of Human Resource Management
Staffing process: Recruitment - sources; Selection – process Training and Development - Concept and importance.Methods of training- on the job and off the job- Induction training, vestibule training, apprenticeship training and internship training.

Directing: Concept and importance, Elements of Directing: - Supervision - concept, functions of a supervisor. Motivation - Concept, Maslow's hierarchy of needs; Financial and non-financial incentives. Leadership - concept, styles - authoritative, democratic and laissen faire. Communication - concept, formal and informal communication; barriers to effective communication, how to overcome the barriers.

Controlling: Concept, nature and importance, Relationship between planning and controlling, Steps in the process of control

Financial Management
Concept and objectives of financial management. Financial decisions : investment, financing and dividend and factors affecting. Financial planning - concept and importance.
Capital Structure - concept and factors affecting. Fixed and Working Capital - concept and factors affecting their requirements.

Financial Markets
Concept and types.Money market and its instruments. Capital market and its types (primary and secondary). Stock Exchange - functions and training procedure. Depository Services and D'mat Account. Securities and Exchange Board of India (SEBI) - objectives and functions.

Marketing Management
Marketing - concept and functions. Marketing management philosophies.Marketing Mix – concept Product - concept, branding, labeling and packaging. Price - factors determining price. Physical distribution- concept, channels of distribution: types, choice of channels.
Promotion -concept and elements; advertising- concept, role, objections against advertising, personal selling - concept and qualities of a good salesman, sales promotion - concept and techniques, public relations - concept and role.

Consumer Protection
Concept and importance of consumer protection. Consumer Protection Act 1986, Meaning of consumer and consumer protection, Rights and responsibilities of consumers, Who can file a complaint and against whom, Redressal machinery, Remedies available.Consumer awareness - Role of consumer organizations and Non-Governmental Organizations (NGOs)

Duration: 3 hours	Max Marks: 50

Group –V (Skill 2)

bca-302Core Skills/Generic Skills / Professional Skills

Communication: Processing role of Business Communication, Listening, and Qualities of a good listener essentials of good communication. Promotions; controlling of people & staff, Relationship between morale productivity & objectives.

Types of communication: Formal; Informal, inter-personal intra personal Verbal; on- Verbal; Individual and Group communication network.
Business letter; Memo; Reports Presentations, Legal oriented –proposals, agreements; manuals; forms, notices; telecommunications; Negotiations.

Duration: 3 hours	Max Marks: 50

bca-303Computer Networks & Mobile Computing

OSI Model, significance of layer model, network, topology, network classification, switching and components.

Introduction to Ethernet, token ring, basic working and cable, bridges, routers, gateways, private and public networks

FDMA, TDMA, CDMA, personal communications system architecture, cordless telephony, digital enhanced cordless telecommunication.

Wireless technology: Land mobile vs satellite vs inbuilding communication system, cellular telephony, personal communication system/networks.

Wireless architecture for mobile computing, wireless LANs, end user devices, MAC protocols, IEEE 802.11, mobile IP, wireless TCP, hand of adhoc networks, unicast and multicast communication, blue tooth.

Duration: 3 hours	Max Marks: 50

bca-304Programming in .NET with C#

Introduction to .NET, .NET Framework features & architecture, CLR, Common Type System, MSIL, Assemblies and class libraries. Introduction to visual studio, Project basics, types of project in .Net, IDE of VB.NET- Menu bar, Toolbar, Solution Explorer, Toolbox, Properties Window, Form Designer, Output Window, Object Browser. The environment: Editor tab, format tab, general tab, docking tab. visual development.

Variables -Declaring variables, Data Types, Forcing variables declarations, Scope & lifetime of a variable, Control flow statements: conditional statement, loop statement. Constants, Arrays, types of arrays, Collections.

Subroutines, Functions, Passing variable number of arguments,Optional Arguments, Returning value from function, Msgbox&Inputbox.Class, overloading,constructor,inheritance,overriding, interfaces

Working with Forms : Loading, showing and hiding forms, controlling one form within another.Textbox, Label, Button, Listbox, Combobox, Checkbox,PictureBox, RadioButton, Panel, scroll bar, Timer, ListView, TreeView, toolbar, StatusBar.. OpenFileDialog, SaveFileDialog, FontDialog, ColorDialog, PrintDialog.LinkLabel.Designingmenus :ContextMenu, access &shorcut keys.

Database programming with ADO.NET – Overview of ADO, from ADO to ADO.NET, Accessing Data using Server Explorer. Creating Connection, Command, Data Adapter and Data Set with OLEDB and SQLDB. Display Data on data bound controls, display data on data grid.Generating reports using CrystalReportViewer

Introduction to C#, variables, constants, identifiers, data types, expressions and operators, flow control and exception handling, control structures, properties, indexes, namespace, classes, objects, structures

Object oriented programming C#, pointers, delegates and events

Duration: 3 hours	Max Marks: 50

bca-305Internet Tools & Website Development

Internet – current state, hardware and software requirement, ISP, an internet account, web home page, URL, browser, security on web, searching tools, search engines, FTP, Gopher, Telnet, emails, TFTP

Web browser architecture, web page and multimedia, static dynamic and active web page, simple mail transfer protocol, simple network management protocol, hyper text transfer protocol

Basics of PHP: Introduction to PHP, what does PHP do? ,history of PHP , language basics ,data types , variables , expressions and operators , flow control statements , including code , embedding PHP in web pages.

Functions & Strings: Calling a function, defining a function, variable scope, function parameters, return values, variable functions, anonymous functions. Strings: Accessing individual characters, cleaning strings, encoding and escaping, comparing strings, manipulating and searching strings, regular expressions.

Arrays & Objects: Indexed Vs associative arrays, identifying elements of an array, storing data in arrays, multidimensional arrays, extracting multiple values, converting between arrays and variables, traversing arrays, sorting. Objects: Creating an object, accessing properties and methods, declaring a class, introspection.

MySQL Overview: Introduction, connecting to and disconnecting from the server , Entering queries , Creating and using a database , Creating and selecting a database , creating a table , loading data into a table , Retrieving information from a table , selecting all data , selecting particular rows , selecting particular columns , sorting rows , date calculations , working with NULL values , pattern matching , counting rows , using more than one tables.

MySQL databases in PHP: Introduction, connecting to a MySQL database, querying the database, Retrieving and displaying the results, modifying data, deleting data.

Duration: 3 hours	Max Marks: 50

bca-306Open Source Technology & Operating Systems

Introduction to Operating Systems, goals of OS, operation of OS, resource allocater and related functions, classes of OS, batch processing, multi-processing, time sharing, distributed, real time systems

System calls, system programs, structure of OS, layer design of DOS, Unix, virtual machine OS, kernel based OS, micro-kernel based OS, architecture of Window 2000.

Process concept, interacting process, threads, process in Unix, process and thread in Windows 2000, process scheduling, fundamental of scheduling, scheduling criteria, long medium short term scheduling, scheduling algorithms upto multi-processor scheduling, algorithm evaluation.

Structure of concurrent system, critical section, critical region, inter-process communication, monitor and semaphores, implementation and uses.

Linux: History, programmer interface, file manipulation, process control, kernel, signals, file system, block and inodes, stream editor, character transliteration, ed, vi editor and there commands.

Shell script, variables, file name expansion, shell commands, looping and making decisions, array, subprogram, C interface with Linux, simple shell programs.