



NITC/13-3(II)/2022-RO

Dated: 03 October 2023

GP B&C RECRUITMENT (01/2023) NIT CALICUT
SYLLABUS FOR STAGE 1 EXAM

- In continuation of notification NITC/13-3(II)/2022-RO dated 20 July 2023 and the scheme of exam published vide NITC/13-3(II)/2022-RO dated 14 September 2023, the scheme for stage 1 test for the posts of Technical Assistant, Junior Engineer and Library & Information Assistant is brought out in the subsequent paragraphs.
- Scheme for Stage 1 Test.** The Stage 1 test will be conducted at NIT Calicut. The indicative pattern for the test is given below: -
 - The test would be a MCQ type test which may be either CBT or OMR based. The test would have 130 multiple choice questions to be answered in a time period of 2.5 hours.
 - All questions will carry equal marks and there shall be no negative marking. The maximum marks will be 130.
 - The tests will contain Part A and Part B.
- Distribution of Questions.** The indicative distribution of questions for Part A and Part B are given below:-

Discipline	No. of questions
Part A	
General Awareness	20
Reasoning	20
Mathematics	20
Test of English	20
Computer Awareness	10
General Administration	10
Total questions	100
Part B (for following posts)	
Specialisation (30 questions) in one of the following:- <ul style="list-style-type: none">• Civil• Electrical• Electronics & Communications• Computer Science• Mechanical including Metallurgy/ Material Science• Chemistry• Chemical• Bio Technology / Biology• Physics• Architecture	30



നാഷണൽ ഇൻസ്റ്റിറ്റ്യൂട്ട് ഓഫ് ടെക്നോളജി കാലിക്കറ്റ്
राष्ट्रीय प्रौद्योगिकी संस्थान कालीकट
NATIONAL INSTITUTE OF TECHNOLOGY CALICUT

Discipline	No. of questions
<ul style="list-style-type: none">Library & Information ScienceAny other Specialisation if necessitated	

4. **Syllabus.** The syllabus for the exam is placed at **Annexure.**

Registrar



SYLLABUS OF EXAMINATION FOR NON-TEACHING POSTS

The syllabus is suggestive and indicative in nature having only broader areas for reference. The candidate is expected to have holistic and expanded knowledge of the subject/ syllabus

POST: TECHNICAL ASSISTANT, JUNIOR ENGINEER, LIBRARY & INFORMATION ASSISTANT

PART A

General Awareness: Includes questions relating to the Indian constitution, geography, economics, general policy, science & scientific research, national/ international organisations/ institutions, current events, environment etc.

Reasoning: Includes questions relating to both verbal and non-verbal types, analogies, similarities, differences, space visualization, problem solving, analysis, judgement, decision making, visual memory, discrimination, observation, relationship, concepts, arithmetic reasoning, verbal & figure classification, arithmetical number series etc.

Mathematics: Includes questions relating to simplification, decimals, fractions, LCM, HCF, ratio & proportion, percentage, average, profit & loss, discount, simple & compound interest, mensuration, time & work, time & distance, tables & graphs, solving equations

Test of English: In addition to testing of candidate's understanding of the English language, it's vocabulary, grammar, sentence structure, synonyms, antonyms and its correct usage etc would also be tested

Computer awareness: Includes questions on Operating Systems, MS Office, MS Word, MS Excel, MS Power Point, Tally, Internet, E-mail, Antivirus software and various online tools used in day-to-day office work

General Administration: Constitution of India, FR & SR, CCS Leave rules, CCS Conduct rules, CCS pension rules, New Pension Scheme, disciplinary & vigilance, office procedure, GFR-2017 & 2022, GeM Rules, delegation of financial power rules, budgeting & internal audit, HEFA/PFMS, Medical Attendance Rules & CGHS etc., NITSER act, statutes, regulations etc., board of governors and authorities of NITs, Ministry of Education etc.

PART B (BASED ON SPECIALISATION)

Civil

Surveying: Introduction, history & principles of chain survey, classification, accuracy, types of chains & tapes, direct & indirect ranging



Compass Survey: Instrument & its setting up, bearing & each included angle of close traverse, local attraction, magnetic declination & its true bearing, precaution in using prismatic compass

Levelling: Auto level, dumpy level, tilting level – introduction, definition; principle of levelling, levelling staffs, its graduation & types, temporary & permanent adjustment, procedure in setting up, level & horizontal surface, datum benchmark, focusing & parallax deduction of levels/ reduced levels, types of levelling, application of chain & levelling instrument to building construction, reciprocal levelling

Contouring: Definition, characteristics, direct & indirect methods, interpolation of contour, contour gradient, uses of contour plan & map, application of contouring for road project

Theodolite Survey: Introduction, types of theodolite, uses, methods of plotting, transit Vernier theodolite, terms of transit theodolite, fundamental line of theodolite, adjustment of theodolite

Total Station: Introduction, components, parts & accessories used

GPS: Introduction to GPS system, definition and application of remote sensing

Water Supply: Introduction, terms used in PHE, various types of water supply pipes & fittings, material specification, type of overhead & underground water tanks, tools & equipment used in water supply systems; basic concept, terminology & process used in water treatment plant

Systems of Sanitation: Systems of house drainage, plumbing, sanitary fittings etc; types of sewer appurtenance, systems of plumbing, type of sewage disposals, manholes, soak pit & septic tank; basic concept, terminology & process used in STP

Electrical

Engineering Mathematics: Progressions – AP, GP, HP; binomial expansion, matrices, elementary operations of matrices, differentiation, integration, differential equations

Engineering Physics: Units & dimensions with dimensional analysis, Simple law of electrostatics & their use to find the E & potential

Elements of Electrical Engineering: Electrical & Magnetic circuits, EMF, Kirchhoff's law and Faraday's laws, network theorems, AC circuit, RMS value; behavior of RIC elements; series & parallel circuits; series & parallel resonance circuits; transformers, introduction to single phase & three phase transformers; DC machines; Theory, construction & operation of three phase induction motors; power transmission & distribution, advantages of high voltages for transmission; comparison of 3 phase, single phase, 2 phase and three wire DC systems

Elements of Electronics Engineering: Measurements & instrumentations, errors, standards, accuracy, precision, resolution; ammeters, voltmeters, watt meters, energy meters, insulation tester, multimeter, CRO, measurement of V, I & F on CRO; low medium & high resistance measurement, AC bridges, transducers for measurement of



temperature, displacement; communication systems, types of modulation, demodulation, analog electronics, semiconductor diode circuits, Zener diode & Zener diode circuits; LED, photo diode, BJT, FET and their configuration & characteristics; biasing, small signal & large signal amplifier, OP-AMPS, oscillators, regulated power supply

Computer Literacy: Computer organization, I/O devices, digital signature

Mechanical

Engineering Materials: Crystallography; metals & alloys; heat treatment; plastics & advanced materials

Engineering Mechanics: Laws of forces, moment, friction, center of gravity and simple machines

Fluid Mechanics: Type & properties of fluids, pressure and its measurement, flow of fluids, flow through pipes

Heat Transfer: Modes of heat transfer, Fourier's law, steady state conduction, composite structures, natural and forced convection and thermal radiation

IC Engines: Working principle of 2 stroke & 4 stroke cycles, SI & CI engines, Otto cycle, Diesel cycle, Dual cycle, fuel supply & ignition systems in automobiles, cooling & lubrication of IC engines

Machine Design: Design definition, types of design, necessity of design, design terminology; stress, strain, factor of safety, stress concentration, fatigue, endurance limit, design failure, design of shaft, design of key, design of joints, design of flanged coupling, design of screwed joints

Machining and Machine Tool Operations: Cutting tools & cutting materials, Machining operations machines like lathe, boring, shaping, planning, broaching etc, jigs & fixtures, cutting fluids, pattern making, metal forming processes

Mechanics of Materials: Resilience, moment of inertia, bending moment & shearing forces, bending stresses, columns, torsion and springs

Metrology and Inspection: Linear and angular measurement, measurement of surface finish and measurements of screw threads

Refrigeration and Air Conditioning: Fundamentals of refrigeration, vapor compression system, refrigerants, vapor absorption system, refrigeration and air conditioning equipment

Theory of Machines: Simple mechanisms, friction, power transmission, flywheel, governor and balancing

Thermodynamics: Fundamental concepts, laws of perfect gases, laws of thermodynamics, ideal and real gases, properties of steam



Turbo Machinery: Introduction to turbomachines, classification, steam turbines and steam condensers, gas turbines and jet propulsion

Vibrations: Types – longitudinal, transverse and torsional vibrations, dampening of vibrations, causes of vibration in machines

Computer Integrated Manufacturing: Introduction to NC, CNC & DNC, construction and tooling, part programming, system devices

Automobile Engineering: Classification of automobiles, transmission system, steering system, braking systems, dynamo and alternator, exhaust emissions

Metallurgy: Ferrous Metallurgy, Principle of Extractive metallurgy, Sponge Iron & Ferro Alloys, Heat Transfer Fluid Flow & Furnace, Heat Treatment Technology, Foundry Technology, Non-Ferrous Metallurgy, Mechanical Metallurgy, Industrial Metallurgy

Electronics

Basic Concepts: Concepts of resistance, inductance, capacitance and factors affecting them; Concepts of current, voltage, power, energy and their units; Kirchhoff's law, simple circuit solution using network theorems, concepts of flux, mmf, reluctance; magnetic calculations for conductors of different configurations eg. Straight, circular, solenoidal etc.; electromagnetic induction, self and mutual induction; instantaneous, peak, RMS and average values of alternating waves; representation of sinusoidal wave form, simple series and parallel AC circuits consisting of RL and C resonance; tank circuit, star & delta connections, 3 phase power, DC and sinusoidal response of R-L and R-C circuits

Fundamentals of Electronics Engineering: Semi conductor diode, PN junction, basic principles of operation & VI characteristics of PN junction diode, static & dynamic resistance of a diode, applications of diodes, use of diode in rectifiers, half wave, full wave and bridge rectifier with shunt capacitor filter, Zener diode and its applications, LED, transistor – introduction to transistor, working of PNP and NPN transistor, input & output characteristics, transistor configurations

Digital Electronics: Number systems, binary addition, subtraction, multiplication & division including binary points; Logic gates & families; Concept of negative & positive logic; definition, symbols and truth tables of gates; construction of NOT, AND & OR gates from NAND & NOR gates; logic simplification; postulates of Boolean algebra, DE Morgan's theorems

Power Electronics: Thyristors & other power electronic devices, SCR – different methods of SCR triggering, different communication circuits for SCR; Construction & working principle of DIAC, TRIAC & their VI characteristics; controlled rectifiers

Electrical Machines: DC machine- construction, basis principles of DC motors & generators; 1 phase & 3 phase transformers – construction, principles of operation, equivalent circuit, tests, losses & efficiency; 3 phase induction motors- rotating magnetic field, principle of operation, equivalent circuit, torque-speed characteristics



Units and Measurement: Classification, fundamental and derived units, systems of units – FPS, CGS, MKS, etc; unit of physical quantities, symbols, conversion factors, measurements of mechanical and electrical quantities

Work, Power and Energy: Definition, work and its units, measurement of work, concept of power and its units, calculations of power

Measurement and Measuring Instruments: Measurement of 1 phase & 3 phase power (active & reactive), energy, wattmeter method of 3 phase power measurement, measurement of frequency and phase angle; Ammeter and voltmeter (moving coil and moving iron types), extension of range of wattmeter; multimeters, megger, energy meter, AC bridge; use of CRO, signal generator; CT, PT and their uses

Sensors and Industrial Instrumentation: Resistive capacity, inductive, piezometric, half effect sensors and associated signal conditioning circuits, transducers for industrial instrumentation, displacement (linear and angular)

Computer

Computer Organization, Architecture & Hardware: Binary representation, registers, instruction set, timing & control, CPU, instruction cycle, addressing modes, CISC, RISC, synchronization, interrupt & exception, privileged & non-privileged instruction, hierarchical memory organization, memory mapping, cache memory, coherence, consistency, virtual memory, interleaving, DMA, signed number, fixed & floating point numbers, control unit design, arithmetic & instruction pipelining, throughput, speedup, branch prediction, hazards; computer & networking hardware

Programming, Data Structures, Algorithms, and Theory of Computation: Programming in C/ Python, pointers, basic data structures, array, string, stack, queue, recursion, linear & non-linear data structures, searching and sorting algorithms, complexity and asymptotic analysis, Mealy and Moore machine, finite automata, determinism and non-determinism, regular expressions, minimization of deterministic finite automata PDA, regular grammar, CFG, Chomsky's hierarchy, closure properties, pumping lemma, Turing machine, halting problem

Operating System and Database Systems: Basics of popular OS (Linux & Windows), file and directory management, purpose of database systems, data models, ER model, introduction to UML, keys, integrity rules, Relational database design, normalization, null values, SQL queries, nested sub queries, joined relations, ACID properties, serializability and concurrency control, lock based concurrency control (2PL, deadlocks), time stamping methods

Computer Networks and Web Technologies: LAN, WAN, OSI reference model, TCP/IP model, sliding window protocol, channel allocation problem, Ethernet, Wireless LAN, Broadband wireless, routing algorithms, congestion control algorithms, IPv4 & IPv6, QoS, UDP, TCP, DNS, email, WWW- architectural overview, dynamic web document and http, FTP, SMTP, Telnet; Concept of Internet, applications of internet, search engines; firewalls, ACL, HTML, CSS, Java Script, Information security vulnerabilities, DoS/ DDoS attacks etc.



Chemistry

Basic Concepts: Nature of matter, properties of matter and their measurement, uncertainty in measurement, laws of chemical combinations, Dalton's atomic theory, atomic & molecular masses, Mole concept & Molar masses, percentage composition, Stoichiometry and stoichiometric calculations

Structure of Atom: Discovery of sub-atomic particles, atomic models, developments leading to the Bohr's model of atom, Bohr's model for Hydrogen atom, towards quantum mechanical model of the atom, Quantum mechanical model of atom,

Classification of Elements and Periodicity in Properties: Need to classify elements, genesis of periodic classifications, modern periodic law and the present form of the periodic table, nomenclature of elements with atomic number > 100 , electronic configurations of elements and the periodic table, s-,p-,d-,f- blocks, periodic trends in properties of elements

Chemical Bonding and Molecular Structure: Kossel-Lewis approach to chemical bonding, ionic or electrovalent bonds, bond parameters, VSEPR theory, valance bond theory, hybridization, molecular orbital theory, bonding in some homonuclear diatomic molecules, hydrogen bonding

Thermodynamics: Thermodynamic terms, applications, measurement of ΔU and ΔH , calorimetry, enthalpy change, $\Delta_r H$ of a reaction, reaction enthalpy, spontaneous Gibbs energy change and equilibrium

Equilibrium: Equilibrium in physical & chemical processes, dynamic equilibrium, law of chemical equilibrium and equilibrium constant, homogenous equilibria, heterogenous equilibria, applications of equilibrium constants, relationship between equilibrium constant K , reaction quotient Q and Gibbs energy G , factors affecting equilibria, ionic equilibrium in solution, acids, basis and salts; ionization of acids & bases; buffers solutions, solubility equilibria of sparingly soluble salts

Redox Reactions: Classical idea of redox reactions, redox reactions in terms of electron transfer reactions, oxidation number, redox reactions & electrode processes

Organic Chemistry: General introduction, tetravalence of Carbon, Organic compounds - shapes, structural representations, classification & nomenclature, isomerism, fundamental concepts in reaction mechanism, methods of purification compounds, qualitative & quantitative analysis

Hydrocarbons: Classification, alkanes, alkenes, alkynes, aromatic, carcinogenicity & toxicity

Solutions: Types, expressing concentration, solubility, vapor pressure of liquid solutions, ideal & non-ideal solutions, colligative properties & determination of Molar mass, abnormal Molar masses

Electrochemistry: Electrochemical cells, galvanic cells, Nernst equation, conductance of electrolytic solutions, electrolytic cells & electrolysis, batteries, fuel cells, corrosion

Chemical Kinetics: Rate of a chemical reaction, factors influencing rate of reaction,



integrated rate equations, temperature dependence of rate of reaction, collision theory of chemical reactions

The d- and f- block elements: Position in periodic table, electronic configurations of the d- block elements, general properties of the transition elements (d-Block), some important compounds of transition elements, The Lanthanoids, The Actinoids

Coordination Compounds: Werner's theory of coordination compounds, definitions of terms, nomenclature, Isomerism, Bonding, importance & applications, Bonding in metal carbonyls

Haloalkanes and Haloarenes: Classification, nomenclature, nature of C-X bond, methods of preparation of Haloalkanes & Haloarenes, Physical properties, chemical reactions, Polyhalogen compounds

Alcohols, Phenols and Ethers: Classification, nomenclature, structures of functional groups, Alcohols & Phenols, Commercially important alcohols, Ethers

Aldehydes, Ketones and Carboxylic Acids: Nomenclature & structure of carbonyl group, preparation of Aldehydes & ketones - physical & chemical properties, chemical reactions, uses; Nomenclature & structure of carboxyl group, Carboxylic acids – methods of preparation, physical & chemical properties, uses

Amines: Nomenclature, structure & classification, physical properties, chemical reactions; Diazonium salts – method of preparation, physical properties, chemical reactions, importance in synthesis of aromatic compounds

Biomolecules: Carbohydrates, Proteins, Enzymes, Vitamins, Nucleic acids, hormones

Bio Technology

Concepts of Biotechnology: Technology and applications of biotechnology, biomolecules, structure, function & application of monomeric & polymeric carbohydrate, protein, lipids & nucleic acid; multiple alleles, linkage & crossing over, genetic mapping, DNA replication, transcription, translation, mutations, human genetic disorders, cell structure & components, cell division, cell cycle, cell communication, nutrition, reproduction, host immune responses, tool and technology of rDNA technology, polymerase chain reaction (PCR), hybridization techniques, DNA library, DNA sequencing, site directed mutagenesis & protein engineering, comparative genomics, functional genomics, proteomics, tools & techniques in bioinformatics, microbial culture techniques, applications of cell & tissue culture, gene transfer methods in plants, transgenic plants with beneficial traits, biosafety in plant genetic engineering, animal cell culture techniques, characterization of cell lines, methods of gene delivery into cells, scale-up of animal culture process, applications of animal cell culture, stem cell technology, tissue engineering

Concepts of Chemistry: Nature of matter, laws of chemical combination, Dalton's atomic theory; concepts of elements, atoms & molecules; empirical & molecular formula; chemical reactions, stoichiometry & calculations based on stoichiometry; isotopes & isobars; Rutherford's model & its limitations; Bohr's model & its limitations; dual nature of matter and light, de Broglie's relationship, Heisenberg uncertainty principle; Aufbau



principle, Pauli's exclusion principle & Hund's rule; periodic table and the present form, periodic trends in properties of elements; Lewis's structure, valence bond theory; concepts of systems, types of systems, surroundings, work, heat, energy; Laws of thermodynamics, equilibrium in physical & chemical processes, dynamic nature of equilibrium, law of mass action, equilibrium constant, factors affecting equilibrium; Le Chatelier's principle, ionization of acids & bases, concept of pH, buffer solution, Henderson equation, concept of oxidation & reduction, redox reactions, balancing of redox reactions, applications of redox reactions; Qualitative & quantitative analysis; Organic compounds - classification and IUPAC nomenclature, physical, chemical properties (aliphatic & aromatic), carcinogenicity & toxicity

Concepts of Physics: Units of measurement, SI units, fundamental & derived units, dimensions of physical quantities, dimensional analysis & its applications; scalar & vector quantities; kinetic energy, work energy theorem, power, elasticity, stress-strain relationship, Hooke's law, Young's modulus, bulk modulus, shear modulus of rigidity, Poisson's ratio, Pascal's law & its applications, Stoke's law, Bernoulli's theorem & its simple applications, Surface energy & surface tension, specific heat capacity, Cp, Cv, calorimetry, latent heat capacity, conduction, convection, radiation, thermal conductivity; kinetic theory of gases, Avogadro's number; electric charges, conservation of charge, Coulomb's law, electric flux, potential difference; conductors & insulators, free charges & bound charges inside a conductor, dielectrics & electric polarization, capacitors & capacitance, combination of capacitors in series & parallel, energy stored in capacitor, electric current, flow of electric charges in metallic conductor, drift velocity, mobility and their relation with electric current; Ohm's law, VI characteristics (linear & non-linear), electrical energy & power, electrical resistivity & conductivity; potential difference and emf of a cell, combination of cells in series and parallel; Kirchhoff's rules, Wheatstone bridge; concept of magnetic field, Ampere's law, Bar magnet, bar magnet as an equivalent solenoid, magnetic field intensity due to a magnetic dipole, torque on a magnetic dipole, magnetic field lines, Para, dia & ferro magnetic substances, magnetization of materials, effect of temperature on magnetic properties; electromagnetic induction, Faraday's laws, induced emf & current, resonance; electromagnetic spectrum & their uses; microscopes & their magnifying powers; energy bands in conductors, semiconductors & insulators; intrinsic & extrinsic semiconductors p & n type, p-n junction, semiconductor diode I-V characteristics in forward & reverse bias, application of junction diode-diode as a rectifier

Concepts of Mathematics: Continuity & differentiability, applications of derivatives, integrals; differential equations, vectors & three-dimensional geometry, linear programming & probability

Chemical Engineering

Distance & displacement; scalar & vector quantities; speed & velocity; motion, mass & weight; momentum, impulse, laws of motion, conservation of momentum; work, power & energy; conservation of energy; laws of reflection & refraction; refraction through a glass slab & prism, Ohm's law, resistances in series & parallel, electric power

Atomic & molecular mass; Mole concept; Avogadro's number; Avogadro's law, ideal gas, gas laws, diffusion, isotopes & isobars, Bohr's theory, periodic classification of elements and gradation of properties; electrovalent, covalent & coordinate bonds; chemical kinetics, electrochemistry, surface chemistry, phase rule, distribution law, true



solution, colloids & suspension, strong & weak electrolytes, acids bases & salts, pH of a solution, rate of reaction & factors affecting the rate of reaction, oxidation & reduction, IUPAC nomenclature, aliphatic compounds, aromatic compounds, carbohydrates & polymers.

Introduction & concept of mechanical operations, particulate solids, screen analysis, size reduction, sedimentation, filtration

General introduction & concept of safety, chemical & fire hazards and their control, other hazards & occupational diseases, personal protective devices, introduction to pollution, air pollution, water pollution, solid waste disposal

Steady state heat transfer by conduction, convection & radiation; heat exchangers, evaporation, diffusion, absorption, distillation, humidification & dehumidification, drying, leaching, extraction

Physics

Units & dimensions with dimensional analysis and their limitation; motion in one & two dimensions; Newton's laws of motion; work, energy, laws of conservation of energy; properties of matter – elasticity, surface tension, viscosity in fluent motion, waves & vibration; characteristics of waves and simple harmonic motion, rotational motion, conservation of angular momentum, gravitation, Newton's law of gravitation, Kepler's law, heat & temperature, measurement of temperature, modes of heat transfer and their laws, geometric optics and simple optical instruments, simple law of electrostatics and their use to find the E and potential, capacitors and dielectric constant, LASER – principle and use; superconductivity, conventional & non-conventional energy sources, laboratory equipment in physics lab

Architecture

Architecture and Design: Visual composition in 2D & 3D; principles of art & architecture; organisation of space, architectural graphics, anthropometrics; planning & design considerations for different building types; site planning; circulation- horizontal & vertical; barrier free design; space standards; building codes; National Building Code; Elements, construction, architectural styles and examples of different periods of Indian and Western history of architecture; Vernacular and traditional architecture

Computer Awareness: Applications of computers in civil engineering; Computer graphics – concepts of CAD, BIM, 3D modelling and architectural rendition

Building Materials & Construction: Behavioral characteristics & applications of different building materials viz mud, timber, bamboo, brick, concrete, steel, glass, FRP, AAC, different polymers, composites etc.; Building construction techniques, methods; building systems & prefabrication of building elements; principles of modular coordination; estimation, specification, valuation, professional practice; construction planning and equipment

Building and Structures: Principles of strength of materials; design of structural elements in wood, steel and RCC; elastic and limit design; structural systems in RCC &



Steel; Form and structure; principles of prestressing; high rise & long span structures; principles & design of disaster resistant structures

Environmental Design: Ecosystem – natural & man made; ecological principles; concepts of EIA; environmental considerations in planning & design; thermal comfort, ventilation & air movement; principles of lighting & illumination; climate responsive design; solar architecture; principles of architectural acoustics; green building- concepts & rating; ECBC; building performance simulation & evaluation

Site planning and Landscaping: site planning; landscape design; development controls – FAR, densities & building byelaws

Building Services: Water supply – principles of water supply & sanitation systems; water treatment; water supply & distribution system; water harvesting systems; principles, planning & design of storm water drainage system; Sewerage & drainage systems; sewage disposal methods; sanitary fittings & fixtures; plumbing systems; principles of internal & external drainage system; Electrical system – principles of electrification of buildings, power supply & communication systems; air conditioning systems; firefighting systems; building safety & security systems; solid waste management; methods of solid waste management – collection, transportation & disposal; recycling & reuse of solid waste; Intelligent buildings; elevators & escalators

Library Science

Data, Information, Knowledge and Wisdom, Information Life Cycle - Generation, Collection, Storage and Dissemination, Role of Information in Planning, Management, Socio-economic, Cultural, Educational and Technological Development, Information Science – Relationship with other subjects, Information Society and Knowledge Society, Communication – Concept, Types, Theories, Models, Channels and Barriers; Trends in Scholarly Communication, Information Industry - Generators, Providers and Intermediaries, IPR and Legal Issues - Categories, Conventions, Treaties, Laws, Plagiarism: Concept and Types, Right to Information Act (RTI); Information Technology Act, National Knowledge Commission; National Mission on Libraries.

Historical Development of Libraries in India; Committees & Commissions on Libraries in India, Types of Libraries – Academic, Public, Special and National, Library Legislation & Library Acts in Indian States; The Press and Registration of Books Act; The Delivery of Books and Newspapers (Public Libraries) Act, Laws of Library Science, Library & Information Science Profession - Librarianship as a Profession, Professional Skills and Competences; Professional Ethics, Professional Associations - National – ILA, IASLIC, IATLIS; International – IFLA, ALA, CILIP, ASLIB, SLA; Role of UGC, RRRLF and UNESCO in Promotion & Development of Libraries, Library and Information Science Education in India, Library Public Relations and Extension Activities, Type of Users – User Studies, User Education, Information Literacy - Areas, Standards, Types and Models; Trends in Information Literacy.

Information Sources - Nature, Characteristics, Types & Formats, Sources of Information Primary, Secondary & Tertiary; Documentary & Non-Documentary, Primary Information Sources (Print & Electronic) - Journals, Conference Proceedings, Patents, Standards, Theses & Dissertations, Trade Literature, Secondary Information Sources (Print & Electronic) - Dictionaries, Encyclopedias, Bibliographies, Indexing & Abstracting,



Statistical sources, Handbooks & Manuals, Tertiary Information Sources (Print & Electronic)- Directories, Year Books, Almanacs, Reference Sources - Bibliographical, Biographical, Educational, Language & Geographical, Electronic Information Resources - Subject Gateways, Web Portals, Bulletin Boards, Discussion Forums /Groups, Databases: Bibliographic, Numeric, Full text, Multimedia; Open Access, Institutional & Human Resources, Evaluation of Reference Sources & Web Resources.

Community Information Services, Reference Service – Concept and Types; Referral Services, Alerting Services - CAS, SDI, Inter Library Loan and Document Delivery, Mobile based Library Services and Tools – Mobile OPAC, Mobile Databases, Mobile Library Website, Library Apps, Mobile Library Instructions, Augmented Reality, SMS Alerts, Geo-Location, Reference Enquiry, Web 2.0 and 3.0 - Library 2.0- Concept, Characteristics, Components; Instant Messaging, RSS Feeds, Podcasts, Vodcasts, Ask a Librarian, Collaborative Services- Social Networks, Academics Social Networks, Social Tagging, Social Bookmarking, Web – Scale Discovery Services National Information Systems and Networks: NISCAIR, DESIDOC, SENDOC, ENVIS, INFLIBNET, DELNET, NICNET, ERNET, National Knowledge Network (NKN), Biotechnology Information System Network, International Information Systems and Networks: INIS, AGRIS, INSPEC, MEDLARS, BIOSIS, ERIC, Patent Information System (PIS), Biotechnology Information System (BIS), Library Resource Sharing and Library Consortia – National and International.

Universe of Knowledge - Nature and Attributes; Modes of Formation of Subjects, Knowledge Organisation - Classification – Theories, Cannons, and Principles; Simple Knowledge Organisation System (SKOS), Taxonomies, Folksonomy, Trends in Classification, Mapping of Subjects in Library Classification Schemes – DDC, UDC and CC, Knowledge Organisation: Cataloguing - Cannons and Principles; Centralized and Co-operative Catalogue; Library Cataloguing Codes: CCC and AACR – II, Standards of Bibliographic Record Formats and Description – ISBD, MARC 21, CCF, RDA, FRBR, Bibframe, Standards for Bibliographic Information Interchange & Communication – ISO 2709, Z39.50, Z39.71, Metadata Standards: Dublin Core; MARC21, METS, MODES, EAD. Indexing Systems and Techniques: Assigned - Pre-coordinate; Post-Coordinate; Derived- Title-based; Vocabulary Control, Abstracting – Types and Guidelines, Information Retrieval System – Features, Components, Models and Evaluation.

Management - Principles, Functions and Schools of thought, Library and Information Centers Management - Book Selection Tools and Principles; Library Acquisition, Technical Processing, Circulation, Serial Control, Maintenance and Stock Verification; Preservation and Conservation; Hazards and Control Measures of Library Materials, Human Resource Management – Planning, Job Analysis, Job Description, Job Evaluation, Selection, Recruitment, Motivation, Training and Development, Performance Appraisal; Staff Manual, Financial Management in Libraries - Sources of Finance, Resource Mobilisation, Budgeting Methods; Cost Effective and Cost Benefit Analysis, Annual Reports & Statistics; Library Authority and Committee, Project Management - SWOT, PEST, PERT / CPM,

Total Quality Management (TQM) - Concepts, Principles and Techniques, Six Sigma; Evaluation of Services of Libraries and Information Centers, library Building, Furniture and Equipment; Green Library Building; Information Commons; Makers Space; Security and Safety, Management Information System (MIS), MBO, Change Management, Disaster Management, Crisis Management, Knowledge Management – Principles, Tools, Components and Architecture, Marketing of Library Products and Services –



Plan, Research, Strategies, Mix, Segmentation, Pricing and Advertising; Management Consultancy.

Computer Technology -Character Representation (ASCII, ISCII, Unicode); Computer Hardware, Software; Storage Devices; Input and Output Devices, Types of Software - System Software, Application Software, Programming Languages – Object Oriented, Procedural, High Level, Scripting; Web Languages, Telecommunication - Transmission Channels, Mode, and Media, ISDN, PSDN, Multiplexing, Modulation, Standards and Protocols, Wireless Communication – Media, Wi-fi, Li-fi, Satellite Communication, Mobile Communication, Computer Networks - Topologies, Types of Networks – LAN, MAN, WAN, Internet - Web browsers, WWW, E-mail; Search Engines, Meta and Entity Search engines, Internet Protocols and Standards – HTTP, FTP, SMTP, TCP/IP etc, URI, URL, Hypertext, Hypermedia, Multimedia, Video conferencing, Virtual Reality, Augmented Technologies, Data Security, Network Security, Firewalls, Cryptographic Techniques, Anti-virus software, Anti-spyware, Intrusion Detection System.

Library Automation – Areas, Planning, Selection of Hardware and Software, Implementation and Evaluation; Standards for Library Automation, Barcode, RFID, QR Code, Biometric, Smartcard: Features and Applications, Digitization – Planning, Selection of Materials, Hardware, Software, Process, Issues, Digital Library: Genesis, Characteristics, Types, Architecture; Standards, Formats and Protocols, DOI, Digital Preservation - Need, Purpose, Standards, Methods, Techniques, Projects(National and International), Digital Library Initiatives – National and International, Institutional Repositories - Need, Purpose, Types and Tools; Institutional Repositories in India; ROAR, DOAR, SHARPA-ROMIO, Content Management Systems – Architecture, Data Integration, CMS Software – Selection, Implementation and Evaluation, Application of Artificial Intelligence, Expert Systems and Robotics in Libraries; Social Mobile Analytics Cloud (SMAC); Cloud Computing, Ontology – Tools (RDF, RDFS, Potege); Semantic Web, Linked Data, Big Data, Data Mining, Data Harvesting.

Research - Concept, Purpose, Functions, Scope and Ethics; Types of Research – Basic and Applied, Interdisciplinary and Multidisciplinary, Research Methods: Historical, Descriptive, Experimental and Delphi, Research Design - Selection of Research Problem, Review of Literature; Formulation of Research Problem; Hypothesis – Formulation, Types and Testing; Sampling Techniques, Methods of Data Collection: Questionnaire, Interview, Observation, Library Records, Scales and Checklist, Data Analysis and Interpretation - Presentation of Data; Statistical Methods/Techniques, Statistical Packages – Spreadsheet, SPSS, Bibexcel, 'R' Statistics, Research Report Writing and Citation Tools – Structure, Style, Contents, Guidelines; Style Manuals; Online Citation Tools; Reference Style Management Tools; Anti-plagiarism Tools; Evaluation of Research Report, Metric Studies in LIS - Bibliometrics, Scientometric, Webometrics, Altmetrics; Impact Factors – Journal, Institutional and Authors; h-Index, g-Index, i10 Index, Trends in Library and Information Science Research.

Academic Library and Information System, Public Library and Information System, Special Library and Information System, Health Science Library and Information System, Corporate Library and Information System, Agricultural Library and Information System, Engineering and Technological Library and Information System. Archive, Museums and Oriental Libraries, Community Information System, Information Services and System for Persons with Disability, Children and Women.