राष्ट्रीय प्रौद्योगिकी संस्थान हमीरपुर
हमीरपुर (हि.प्र.) – 177 005 (भारत)
[भारत सरकार शिक्षा मंत्रालय के तहत एक राष्ट्रीय महत्व का संस्थान]
NATIONAL INSTITUTE OF TECHNOLOGY HAMIRPUR
HAMIRPUR (H.P.) - 177 005 (INDIA)
[An Institute of National Importance under Ministry of Education (Shiksha Mantralaya)]
{ OFFICE OF THE REGISTRAR }

NOTICE

Pursuant to the approval of the Competent Authority, the schedule for Written Examination of the ***provisionally eligible/shortlisted candidates (as per Notice No. NIT/HMR/Admn/Promotion-2024/2025/1394-1410 dated 17/02/2025)*** for promotion to the various non-teaching posts against notice No. No.NIT/HMR/Admn/ Promotion-2024/2524-28 dated 23/10/2024& even file No. 677 dated 20/01/2025 is hereby notified as under:

Sr. No.	Post Cadre	Date	Reporting Time	Venue
1	Officer Cadre	**11/03/2025 at 10:00 AM**	**11/03/2025 at 9:30 AM**	**Conference Hall, Admin. Block, NIT Hamirpur (HP)**
2	Ministerial Cadre Posts			
3	Technical Cadre Posts			

General Instructions & Scheme for the Written Examination

1. The Scheme for the Written Examination shall be as under:

i) There are 30 MCQ type questions in SECTION-I (MCQs) of the paper and each question is followed by four alternative answer options namely A. B. C and D out of which only one option is correct. You need to tick the correct one out of four options given.

ii) For every correct answer of MCQ in **SECTION-I (For Officer, Ministerial & Technical Higher/Lower Cadres)** of the paper two (2) marks will be awarded and there shall be no negative marking.

iii) A). In **SECTION-II (Descriptive) (For Officer, Technical Higher & Lower Cadres):** There are 20 descriptive type questions in the paper and each question carries 02 marks. You need to write answer neatly with clarity of thoughts in maximum 2 – 3 lines at the space provided below each question.

B). In **SECTION-II (Descriptive) For Officer, Ministerial Higher & Lower Cadres:** There shall be 08 Descriptive Type Questions, and each question shall carry 05 marks with a total of 40 marks.

2. The Candidates will use only **BLUE** pen to answer all the questions.
3. The Mobile Phones are strictly prohibited.
4. For rough work use the blank page given at end. No extra sheets shall be provided in any circumstances.
5. Use of Unfair means will lead to cancelation of candidature. Do not carry any loose paper.
6. Return the booklet to the Invigilator after completing the examination.

The Post-wise Syllabus for the Written Examination shall be as per Annexure-I.

REGISTRAR

No.NIT/HMR/Admn/Promotion-2024/ Dated:

Copy to:

1. Director for his kind information.
2. Prof. Ravi Kumar, Chairman (ACoNFAR) for information.
3. All Deans, Heads, Branch/Section Heads for circulation in the respective department/section for information of the concerned.
4. FI(CC) for uploading the Notice on the Institute website as floating announcement, for information all individuals.

Annexure-I

राष्ट्रीय प्रौद्योगिकी संस्थान हमीरपुर
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Syllabus for Executive Engineer (Electrical Engg., Level-10)

1. **Basic Electrical Engineering:** Electrical circuit, circuit elements resistance, inductance & capacitance, Kirchhoff's laws, voltage source & current source, Network Theorems, duality, star-delta transformation. DC Transients AC circuits, periodic function, average & r.m.s. values, steady state behaviour with sinusoidal excitation, Phase representation, reactance & impedance, power and power factor, series & parallel circuit, resonance and quality factor, Principle of electricity generation of single phase & three phase voltages, Magnetic circuits, flux, mmf, reluctance, analogy with electric circuits, Simple calculations for composite magnetic circuits. Magnetic Coupling Coefficient Measurement of electrical current, voltage and energy in ac & dc systems, power in balanced three phase ac system, Batteries, Electrical wiring systems.
2. **Measurement and Instrumentation**: Electrical and Electronic Measurements and Measuring Instruments, PMMC, moving iron, dynamometer and induction type instruments, Extension of range, measurement of voltage, current, power, energy and power factor, Bridges and potentiometers, instrument transformers, phase and frequency measurement, Q-meters, Megger, AC and DC Bridges, oscilloscopes, Measurements of active and reactive power, Energy-meter, wattmeter and power factor meter, different transducers for electrical and non-electrical quantities, operational amplifiers, microprocessors and microcontrollers with applications.

3. **Power Systems:** Elementary idea about bulk power generation, Hydro and thermal power plants and their layouts, long distance transmission and distribution, industrial and residential distribution, Overhead and underground power transmission, safety & legal standards, Basic sub-station layout, Protective Relays, Circuit Breakers, Earthlings, lightning arrestors.

4. **Electrical Machines:** Transformers, Basic principles, construction, phasor diagram for transformer under no load condition, transformer on load, equivalent circuit, open circuit & short circuit test, DC shunt and series motor – construction, principle of working and applications, need of starters, torque and speed control; Induction motors – construction, principle of working of single phase and 3-phase motors, torque- slip characteristics; Synchronous Motors and Generators.

5. **Industrial Electronics:** Intrinsic and extrinsic semiconductor, mobility, conductivity, Hall effect, Diode, its V-I characteristics, diode resistance, capacitance, Zener Diodes breakdown mechanism (Zener and avalanche), Diode Applications: Parallel and Series Diode Configuration, Half and Full Wave rectification, Clippers, Clampers, Zener diode as shunt regulator, Voltage-Multiplier Circuits. Light-Emitting Diodes, Varactor (Varicap) Diodes, Tunnel Diodes, Transistors and their characteristics, various operational configurations and applications, Basics of Amplifiers, Thyristors and their applications, Converters and inverter circuits, UPS.

6. **Control Systems:** Basic control configurations, mathematical modelling of systems, transfer function based models, concept of positive and negative feedback, stability analysis, time and frequency domain analysis, Compensator and controller design, PID controller.

7. **Digital Electronics:** Introduction to digital electronics, Number Systems, Conversion between various number systems, Basic Logic gates. Operational Amplifiers: Introduction, Differential Amplifier Circuits, Op-Amp Basic, Practical Op-Amp Circuits (Inverting Amplifier, Non-inverting Amplifier, Unit Follower, Summing Amplifier, Integrator, Differentiator), Differential and Common-Mode Operation.

8. **Overview of a Computer System**: Block diagram and major parts of a computer, history of computer development, introduction to binary, octal, & hexadecimal numbers, ASCII code, different levels of programming languages–machine language, assembly language, and high level language.

24.02.2025
Dr. B B Sharma
Member

24/2/2025
Dr. R. K. Jarial
Member

24/2/25
Prof. R. Parti
Chairman

Syllabus for Written Test for the Post of Senior Superintendent

Sr. No.	Topic	Contents
1.	**Broad Administrative structure of NIT system.**	a) Special reference to NIT Act-2007/NITSER Act-2012; Statute; Role and Function of Board, Finance Committee, Buildings and Works Committee, Senate and NITSER Council. b) Roles and Responsibilities of Chairman BOG, Director, Deputy Director, Registrar, Deans etc.
2.	**Academic Administration**	a) International Ranking, its frameworks etc. b) Broad idea about Admission, Registration, Credit System and Academic Programmes offered by Institute. c) Examination System. d) Ordinances for UG, PG and PhD programmes. e) Conduct and Discipline Rules of Students, Rules for unfair means in examination, Scholarship, Medal and Prizes for the students. f) Senate and Convocation matters g) Reservation in admissions to UG, PG, PhD programmes
3.	**Leave/Vacation:**	a) CCS (Leave) Rules b) Type of leave and terms & conditions of its grant. c) Accumulation of Leave. d) Procedure for grant of leave.
4.	**Disciplinary Procedures**	a) CCS(Conduct) Rules b) CCS(CCA) Rules c) Procedure for disciplinary actions.
5.	Pension Rules and Retirement Benefits, Gratuity, GPF, CPF, NPS, MACP, DPC	
6.	**Purchasing**	a) Purchasing Principles GFR-2017. b) Various. purchasing Systems etc. GeM Rules and Central Public Procurement Portal.
7.	TA/DA Rules, LTC Rules, Medical Rules, Joining time rules, Rules of Deputation & Lien, Reservation in appointment, Recruitment Rules in NITs for faculty and non-faculty members.	
8.	RTI Act, Various Policies of the Institute etc.	

28/02/25

28/2/25

28/02/25

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Syllabus for Written Test for the Post of Superintendent

Sr. No.	Topic	Contents
1.	**Broad Administrative structure of NIT system.**	a) Special reference to NIT Act-2007/NITSER Act-2012; Statute; Role and Function of Board, Finance Committee, Buildings and Works Committee, Senate and NITSER Council. b) Roles and Responsibilities of Chairman BOG, Director, Deputy Director, Registrar, Deans etc.
2.	**Academic Administration**	a) International Ranking, its frameworks etc. b) Broad idea about Admission, Registration, Credit System and Academic Programmes offered by Institute. c) Examination System. d) Ordinances for UG, PG and PhD programmes. e) Conduct and Discipline Rules of Students, Rules for unfair means in examination, Scholarship, Medal and Prizes for the students. f) Senate and Convocation matters g) Reservation in admissions to UG, PG, PhD programmes
3.	**Leave/Vacation:**	a) CCS (Leave) Rules b) Type of leave and terms & conditions of its grant. c) Accumulation of Leave. d) Procedure for grant of leave.
4.	**Disciplinary Procedures**	a) CCS(Conduct) Rules b) CCS(CCA) Rules c) Procedure for disciplinary actions.
5.	Pension Rules and Retirement Benefits, Gratuity, GPF, CPF, NPS, MACP, DPC	
6.	**Purchasing**	a) Purchasing Principles GFR-2017. b) Various purchasing Systems etc. GeM Rules and Central Public Procurement Portal.
7.	TA/DA Rules, LTC Rules, Medical Rules, Joining time rules, Rules of Deputation & Lien, Reservation in appointment, Recruitment Rules in NITs for faculty and non-faculty members.	
8.	RTI Act, Various Policies of the Institute etc.	

20/2/25

21/2/25

28/02/25

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HAMIRPUR (H.P.) - 177 005 (INDIA)
[An Institute of National Importance under Ministry of Education (Shiksha Mantralaya)]
{Office of Head, Electrical Engineering Department}

Syllabus for Assistant Engineer (Electrical Engg. SG-I, Level-09)

1. Fundamentals of Electrical Engineering: Concepts of resistance, inductance, capacitance and their combinations, Circuit laws, Ohm's law, KCL, KVL, node and mesh analysis, resonance, ideal current and voltage sources, Network Theorems and Circuit solution, Star Delta transformation, DC and AC circuit Analysis, Resonance in series and parallel RLC circuits, Three phase circuits.

2. Measurement and Instrumentation: Electrical and Electronic Measurements and Measuring Instruments, PMMC, moving iron, dynamometer and induction type instruments, Extension of range, measurement of voltage, current, power, energy and power factor, Bridges and potentiometers, instrument transformers, phase and frequency measurement, Q-meters, Megger, AC and DC Bridges, oscilloscopes, Measurements of active and reactive power, Energy-meter, wattmeter and power factor meter, different transducers for electrical and non-electrical quantities, operational amplifiers, microprocessors and microcontrollers with applications.

3. Electrical Power System Generation, Transmission and Distribution: Power generation concepts and schematic of Hydro, Thermal, Nuclear power plants, Diesel, Gas, Pumped storage power plants, renewable energy sources, transmission line models and performance, cable performance, insulation, corona and radio interference, different power distribution systems, symmetrical components, principles of over-current, differential and distance protection, Generator, feeder, transformer and bus-bar protection, Lightning protection, solid state relays and circuit breakers, Sub-Station Practices, Tariffs, Neutral grounding.

4. Fundamentals of Electrical Machines and Drives: Single phase transformer – equivalent circuit, phasor diagram, tests, regulation and efficiency, three phase transformer connections, parallel operation, auto-transformer, DC machines–types, windings, generator characteristics, armature reaction and commutation, starting and speed control of motors, Three phase induction motors–principles, types, performance characteristics, starting and speed control, single phase induction motors, synchronous machines-performance, regulation and parallel operation of generators, motor starting, characteristics and applications, basic concepts of electric drives, adjustable speed dc and ac drives.

5. Basics of Control Systems: LTI systems, response of LTI systems using convolution, Fourier series and Fourier transform based analysis, concept of system and its control, basic control system components, actuators, sensors, block diagram and signal flow graph description, reduction of block diagrams, transfer function based model representation using Laplace transform, open loop and closed loop (feedback) systems, time domain analysis of control systems, stability analysis of control systems using different methods.

6. Electrical Estimation and Costing: Three phase four wire distribution system, Protection of Electric Installation against over load, short circuit and Earth fault, Earthing, Indian Electricity rules, Types of loads and wiring, Service connections, Service Mains, Sub-Circuits, Location of Outlets, Control Switches, Main Board and Distribution Board, guidelines for Installation of Fittings, Load Assessment, Permissible voltage drops and sizes of wires, estimating and costing of Electrical installations, Introduction and Types of substations and the details of its equipment.

7. Industrial Electronics: Intrinsic and extrinsic semiconductor, mobility, conductivity, Hall effect, Diode, its V-I characteristics, diode resistance, capacitance, Zener Diodes breakdown mechanism (Zener and avalanche), Diode Applications: Parallel and Series Diode Configuration, Half and Full Wave rectification, Clippers, Clampers, Zener diode as shunt regulator, Voltage-Multiplier Circuits. Light-Emitting Diodes, Transistors and their characteristics, Thyristors and their applications, Converters and inverter circuits. UPS.

24.02.2025

Dr. B B Sharma
Member

24/2

Dr. R. K. Jarial
Member

24/2/25

Prof. R. Parti
Chairman

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National Institute of Technology Hamirpur (HP) 177005

Syllabus

Technical Assistant SG-I (GP-5400/Level-9)

Mechanical/Central Workshop

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1. Knowledge about workshop tools for various shops.
2. Knowledge about various machines, tools and materials used in different shops.
3. Knowledge about fixtures used in different shops.
4. Knowledge about coolants/fluids used in different machining operations.
5. Knowledge about fixing and mounting of jobs in various machines
6. Knowledge about power operated hand tools.
7. Knowledge about non-conventional machining methods and machines.
8. Welding Type of welding (Arc welding & gas welding), TIG & MiG welding, Brazing and soldering, welding defects, maintenance of tools and machines
9. Turning Basic principle of turning, description and specification of lathe machine, operations on lathe e.g. turning, taper turning, knurling, thread cutting etc.
10. Machining Metal cutting principles, cutting tools, basic principles of machining with milling and drilling, shaping machine, grinding machine etc.
11. CNC Operation Components and function of CNC operation, handling of CNC machines.
12. Metrology and Inspection, Linear and Angular Measurement, Measurement of Surface Finish, Measurements of Screw threads and Gauges.
13. SI engine, CI engine, pollution measurement and lab experiments related to them.
14. Knowledge of Kinematics/Dynamics of machines and lab experiments related to them.
15. Measurement techniques, Metrology and related lab experiments.

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(Prof. Rakesh Sehgal)

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HAMIRPUR (H.P.) - 177 005 (INDIA)
[An Institute of National Importance under Ministry of Education (Shiksha Mantralaya)]
{Office of Head, Electrical Engineering Department}

Syllabus for Technical Assistant (TA: Electrical Engg., Level-06)

1. **Fundamentals of Electrical Engineering:** Introduction to electrical circuit elements and their combinations, Circuit laws, Ohm's law, KCL, KVL, node and mesh analysis, network theorems, Simple circuit solution using different network theorems, Star Delta transformation, DC and AC circuit Analysis, Resonance in series and parallel RLC circuits, Three phase circuits, Wiring diagrams, Estimation of costing of Electrical items, Basic Electronics circuit elements, introduction to various electronic devices, diodes, transistors and their characteristics.

2. Electrical Measurement and Instrumentation: Basics of Measurement and Measuring Instruments, PMMC, moving iron, dynamometer and induction type instruments, Extension of range, measurement of voltage, current, power, energy and power factor, Bridges and potentiometers, instrument transformers, digital voltmeters and multi-meters, phase, time and frequency measurement, Megger, AC and DC Bridges, oscilloscopes, Measurements energy and power, Energy-meter, wattmeter, Transducers, different transducers, measurement of displacement, flow, pressure and temperature, operational amplifiers, microprocessors and microcontrollers with applications.

3. Fundamentals of Power System: Basic elements of a power system, Basic power generation concepts, schematic arrangement and choice of site for Hydro, Thermal, Nuclear power plants, Renewable energy sources, transmission line models and performance, insulation, corona and radio interference, different power distribution systems, power factor correction, principles of over-current, differential and distance protection, Generator, feeder, transformer and bus-bar protection, Lightning protection, relays and circuit breakers, Sub-Station Practices.

4. Electrical Machines and Drives: Basics of electrical machines and drives , Single phase transformer – equivalent circuit, phasor diagram, tests, regulation and efficiency, three phase transformer connections, parallel operation, auto-transformer, DC machines, generator characteristics, starting and speed control of motors, three phase induction motors– principles, types, starting and speed control, single phase induction motors, synchronous machines – performance, regulation and parallel operation of generators, motor starting, characteristics and applications, power electronics devices and drives, semiconductor devices, phase control rectifiers, Choppers and Inverters, dc and ac drives.

5. Control Engineering: Concept of control systems, basic control system components, block diagram and signal flow graph description, transfer function based models, time and frequency domain analysis of control systems, concept of stability compensators and controllers, PI, PD and PID controller.

24.02.2025.
Dr. B B Sharma
Member

24/2/25
Dr. R. K. Jarial
Member

24/2/25
Prof.. R. Parti
Chairman

Syllabus for: Technician (SG-II) Architecture- Diploma in Architecture Assistantship

COMMUNICATION SKILLS

1. Basics of Communication: Definition and process of communication, Types of communication - formal and informal, oral and written, verbal and non-verbal, Communications barriers and how to overcome them, Barriers to Communication, Tools of Communication
2. Application of Grammar: Parts of Speech (Noun, verb, adjective, adverb) and modals, Sentences and its types, Tenses, Active and Passive Voice, Punctuation, Direct and Indirect Speech
3. Reading Skill: Unseen passage for comprehension (one word substitution, prefixes, suffixes, antonyms, synonyms etc.
4. Writing Skill: Picture composition, Writing paragraph, Notice writing
5. Functional Grammar: Prepositions, Framing Questions, Conjunctions, Tenses
5. Reading: Unseen Passage for Comprehension (Vocabulary enhancement - Prefixes,
Suffixes, one word substitution, Synonym and Antonym).
7. Writing Skill: Correspondence: ((a) Business Letters- Floating Quotations, Placing Orders, Complaint Letters. (b) Official Letters- Letters to Government and other Offices)
Memos, Circular, Office Orders, Agenda & Minutes of Meeting, Report Writing.

APPLIED MATHEMATICS

1. Algebra: Series : AP and GP; Sum, nth term, Mean, Binomial theorem for positive, negative and fractional index (without proof). Application of Binomial theorem., Determinants : Elementary properties of determinant of order 2 and 3, Multiplication system of algebraic equation, Consistency of equation, Crammer's rule, Vector algebra : Dot and Cross product, Scaler and vector triple product. Complex number, Complex numbers, Representation, Modulus and amplitude. Demoivre theorem, its application in solving algebraic equations, Mod. function and its properties..
2. Trigonometry: Relation between sides and angles of a triangle : Statement of various
formulae showing relationship between sides and angle of a triangle, Inverse circular functions : Simple case only.
3. Differential Calculus: Functions, limits, continuity, - functions and their graphs, range and domain, elementary methods of finding limits (right and left), elementary test for continuity and differentiability. Methods of finding derivative, Trigonometric functions, exponential function, Function of a function, Logarithmic differentiation, Differentiation of Inverse trigonometric function, Differentiation of implicit functions. Higher order derivatives, Leibnitz theorem. Simple applications. Application - Finding Tangents, Normal, Points of Maxima/Minima, Increasing/Decreasing functions, Rate, Measure, velocity, Acceleration, Errors and approximation.
4. Integral Calculus: Methods of Indefinite Integration :- Integration by substitution, rational function, partial fraction, parts & special function. Meaning and properties of definite integrals, Evaluation of definite integrals. Application : Length of simple curves, Finding areas bounded by simpl curves Volume of solids of revolution, centre of mean of plane areas. Simposns 1/3rd and Simposns3/8th rule and Trapezoidal Rule : their application in simple cases. Numerical solutions of algebraic equations; Bisections method, Regula-Falsi method, Newton-Raphson's method(without proof), Numerical solutions of simultaneous equations; Gauss elimination method(without proof)
5. Co-ordinate Geometry (2D & 3D): Circle;- Equation of circle in standard form. Centre - Radius form, Diameter form, Two intercept form. Straight lines and planes in space. Distance between two points in space, direction cosine and direction ratios, Finding equation of a straight line.

APPLIED PHYSICS

1. Units and Dimensions: Need of Measurement in engineering and science, unit of a physical quantities - fundamental and derived units, systems of units (FPS, CGS and
SI units). Dimensions and dimensional formulae of physical quantities. Principle of homogeneity of dimensions. Dimensional equations and their applications, conversion of numerical values of physical quantities from one system of units into another, checking the correctness of physical equations and deriving relations among various physical quantities. Limitations of dimensional analysis. Error in measurement, accuracy and precision of instruments, random and systematic errors, absolute error, relative error, and percentage error, Estimation of probable errors in the results of measurement (combination of errors in addition, subtraction, multiplication, division and powers), rules
for representing significant figures in calculation. Application of units and dimensions in measuring length, diameter, circumference, volume, surface area etc. of metallic and non metallic blocks, wires, pipes etc (at least two each).
2. Force and Motion: Scalar and vector quantities – examples, representation of vector, types of vectors. Addition and Subtraction of Vectors, Triangle and Parallelogram law
(Statement only), Scalar and Vector Product. Resolution of Vectors and its application to lawn roller. Force, Momentum, Statement and Derivation of Conservation of linear
momentum, its applications such as recoil of gun. Impulse and its Applications. Circular motion (Uniform and Non-uniform), definition of angular displacement, angular velocity, angular acceleration, frequency, time period. Relation between linear and angular velocity, linear acceleration and angular acceleration (related numerical). Central force, Expression and Applications of Centripetal and centrifugal forces with examples such as banking of roads and bending of cyclist. Principle of centrifuge. Application of various forces in lifts, cranes, large steam engines and turbines
3. Work, Power and Energy: Work: and its units, examples of zero work, positive work and negative work, conservative and non-conservative force. Friction: modern concept, types, laws of limiting friction, Coefficient of friction and its Engineering Applications.
Work done in moving an object on horizontal and inclined plane for rough and plane surfaces with its applications. Energy and its units: Kinetic energy and potential energy with examples and their derivation, work energy theorem. Principle of conservation of mechanical energy for freely falling bodies, examples of transformation of energy. Power and its units, calculation of power in numerical problems. Application of Friction in brake system of moving vehicles, bicycle, scooter, car trains etc.
4. Rotational Motion: Concept of translator and rotator motions with examples. Definition of torque with examples. Angular momentum, Conservation of angular momentum (quantitative). Moment of inertia and its physical significance, radius of gyration for rigid body, Theorems of parallel and perpendicular axes (statements only),
Moment of inertia of rod, disc, ring and sphere (hollow and solid)
(Formulae only). Concept of Fly wheel. Rotational kinetic energy, Rolling of sphere on the slant plane. Comparison of linear motion and rotational motion. Application of rotational motions in transport vehicles, and machines.
5. Motion of planets and satellites: Gravitational force, Kepler's law of planetary motion, Acceleration due gravity and its variation, Gravitational Potential and Gravitational potential energy. Motion of satellite, orbital velocity and time period of satellite, Total energy and Binding energy of a satellite, Escape energy and escape
velocity, Types of satellites, Geo-stationary satellite, semi-synchronous, polar
satellite (concept only) and their uses in science and technology, Concept of Black Holes
6. Properties of Matter: Elasticity: definition of stress and strain, different types of modulii of elasticity, Hooke's law, significance of stress strain curve. Pressure: definition, its units, atmospheric pressure, gauge pressure,absolute pressure, Fortin's Barometer and its applications. Surface tension: concept, its units, angle of contact, Capillary action and determination of surface tension from capillary rise method, applications of
surface tension, effect of temperature and impurity on surface tension. Viscosity and coefficient of viscosity: Terminal velocity, Stoke's law and effect of temperature on viscosity, application in hydraulic systems. Concept of fluid motion, stream line and turbulent flow, Reynold's number. Equation of continuity, Bernoulli's Theorem and their applications.
7. Heat and Thermodynamics: Difference between heat and temperature
Modes of transfer of heat (Conduction, convection and radiation with examples). Different scales of temperature and their relationship. Expansion of solids, liquids and gases, coefficient of linear, surface and cubical expansions and relation amongst them. Heat conduction in a metal rod, Temperature gradient, Concept of Coefficient of thermal conductivity, Uses and effects of Heat conduction in Daily life. Isothermal and Adibatic process. Zeroth, First and second law of thermodynamics. Heat engine (concept Only), Carnot cycle. Application of various systems of thermometry in refrigeration and airconditioning etc.

APPLIED CHEMISTRY

1. Atomic Structure, Periodic Table and Chemical Bonding: Fundamental particles- mass and charges of electrons, protons and neutrons with names of the scientists who discovered these fundamental particles. Bohr's model of atom and successes and limitations of atomic theory (qualitative treatment only). Atomic number, atomic mass number isotopes and isobars. Definition of orbit and orbital, shapes of s and p orbital's only, quantum numbers and their significance, Aufbau's principle, Pauli's exclusion principle and Hund's rule electronic configuration of elements with atomic number (Z) = 30 only. (Electronic configurations of elements with atomic number greater than 30 are
excluded). Modern periodic law and periodic table, groups and periods, classification
of elements into s, p, d and f blocks (periodicity in properties - excluded). Chemical bonding and cause of bonding and types such as ionic bond in NaCl sigma (σ) and pi (π) covalent bonds in H2, HCl, Cl2, elementary idea of hybridization in BeCl2, BF3, CH4, NH3 and H2O, VSEPR, Molecular orbital Theory States of Matter: Solid, Liquid & Gas, Metallic bonding- explanation with the help of electron gas (sea) model.
2. Fuels and Lubricants: Definition of fuel, classification of fuels, characteristics of good fuel, relative merits of gaseous, liquid and solid fuels. Calorific value-higher calorific value, lower calorific value, determination of calorific value of solid or liquid fuel using Bomb calorimeter and numerical examples. Coal - types of coal and proximate analysis of coal. Fuel rating – Octane number and Cetane number, fuel-structural influence on Octane and Cetane numbers. Gaseous fuels – chemical composition, calorific value and applications of natural gas (CNG), LPG, producer gas, water gas and biogas.
Elementary ideal on – hydrogen as future fuels, nuclear fuels. Lubricants: Definition and properties, mechanism, industrial application and
its function in bearings. Synthetic lubricants and cutting fluids.
3. Water: Demonstration of water resources on Earth using pie chart. Classification of water – soft water and hard water, action of soap on hard water, types of hardness, causes of hardness, units of hardness – mg per liter (mgL-1) and part per million (ppm) and simple numerical, pH and buffer solutions and their applications. Disadvantages caused by the use of hard water in domestic and boiler feed water. Priming and foaming and caustic embrittlement in boilers. Removal of hardness -Permutit process and Ion-exchange process. Physico-Chemical methods for Water Quality Testing
a) Determination of pH using pH meter, total dissolved solids (TDS). b) Testing and Estimation of- alkalinity, indicator their types and application total hardness by EDTA method and O'Hener's Method. (chemical reaction of EDTA method are excluded).
c) Understanding of Indian Water Quality standards as per WHO. Natural water sterilization by chlorine and UV radiation and reverse osmosis. Municipality waste water treatment. Definition of B.O.D and C.O.D.
4. Electrochemistry: Redox Reaction, Electrode Potential, Nernst equation, Electrochemical cell (Galvanic and Electrolytes); Nernst equation.
5. Corrosion and its Control: Definition of corrosion and factors affecting corrosion rate.
Theories of a) Dry (chemical) corrosion- Pilling Bedworth rule, b) Wet corrosion in acidic atmosphere by hydrogen evolution mechanism. Definition of passivity and galvanic series. Corrosion control: a) Metal coatings – Cathodic protection, Cementation on Base Metal Steel –Application of Metal Zn (Sheradizing),Cr (Chromozing) and Al (Calorizing), Sacrificial protection and impressed current voltage, b) Inorganic coatings – Anodizing and phosphating, c) Organic coatings - use of paints varnishes and enamels, d) Internal corrosion preventive measures- alloying (with reference to passivating, neutralizing and inhibition) and heat treatment (quenching, annealing)
6. Organic compounds, Polymers and Plastics: Classification of organic compounds and IUPAC Nomenclature. Definition of polymer, monomer and degree of polymerization Brief introduction to addition and condensation polymers with suitable examples (PE, PS, PVC, Teflon, Nylon -66 and Bakelite). Definition of plastics, thermo plastics and thermo setting plastics with suitable examples, distinctions between thermo and thermo setting plastics.
Applications of polymers in industry and daily life

01-03-2025 01/03/25

GRAPHIC PRESENTATION AND ART

Lettering & Scale. Gaphic Presentation of solid forms through their plan, elevation and section. Development of surfaces of the above solids. Isometric & axonometric projection of simple blocks of wood & metal. Basic concepts of preparing architectural drawing involving house hold furniture for Drawing, Dining & Bed rooms, studio stools, tables.
Rendering techniques in colour & ink. Art-Theory of composition, theory of colours.

GENERAL WORKSHOP

1. Carpentry Shop: Name and use of raw materials used in carpentry shop, Details of Basic Carpentry joinary Work in Materials.
2. Painting and Polishing Shop: Introduction of paints, varnishes, Reason for surface preparation, Advantages of Painting, other method of surface coating ie. Electroplating etc.
3. Electrical Shop: Study of common electrical materials with standard ratings and specifications such as wires, cables, switches, fuses, cleats, clamps and allied items, tools and accessories.
4. Welding Shop: Introduction and importance of welding as compared to other material joining processes. Specifications and type of welding machines, classification and coding of electrodes, welding parameters, welding joints and welding positions.
Materials to be welded, safety precautions.
5. Plumbing Shop: Introduction and demonstration of tools, equipment and machines used in plumbing shop. Introduction of various pipes and pipe fittings of elbow, nipple, socket, union etc.
6. Fitting Shop: Use of personal protective equipment and safety precautions while working. Basic deburring processes. Introduction to fitting shop tools, marking and measuring devices/equipment. Identification of materials. (Iron, Copper, Stainless Steel, Aluminium etc.). Identification of various steel sections (flat, angle, channel, bar etc.). Introduction to various fitting shop operations/processes
7. Sheet Metal Shop: Introduction to sheet metal shop, use of hand tools and accessories e.g. different types of hammers, hard and soft mallet, sheet and wire gauge, necessary allowance required during job fabrication, selection of material. Introduction of hand tools used in sheet metal shop, various machines and equipment used in sheet metal shop e.g. Shearing Machine, Bar Folder, Burring Machine & various raw materials used in sheet metal shop e.g. black-plain sheet, galvanized-iron plain sheet, galvanised corrugated sheet, aluminium sheet etc. Study of various types of nuts, bolts, rivets, screws etc.
8. Mason Shop: Introduction of tools, equipment and machines used in Mason shop
9. Machine Shop: Study of lathe machine, grinders, milling machine, drilling machine and CNC machine. Plain and step turning and knurling practice.

APPLIED MECHANICS

1. Introduction: Concept of engineering mechanics definition of mechanics, statics, dynamics, application of engineering mechanics in practical fields. Definition of Applied Mechanics. Definition, basic quantities and derived quantities of basic units and derived units. Different systems of units (FPS, CGS, MKS and SI) and their conversion from one to another for density, force, pressure, work, power, velocity, acceleration. Concept of rigid body, scalar and vector quantities
2. Laws of forces: Definition of force, measurement of force in SI units, its representation, types of force: Point force/concentrated force & Uniformly distributed force, effects of force, characteristics of a force. Different force systems (coplanar and non-coplanar), principle of transmissibility of forces, law of superposition. Composition and resolution of coplanar concurrent forces, resultant force, method of composition of forces, laws of forces, triangle law of forces, polygon law of forces - graphically, analytically, resolution of forces, resolving a force into two rectangular components. Free body diagram. Equilibrant force and its determination. Lami's theorem (concept only). Type of Load, supports, Beams- analysis for simply supported, cantilever beams
3. Moment: Concept of moment, Moment of a force and units of moment, Varignon's theorem (definition only). Principle of moment and its applications (Levers – simple and compound, steel yard, safety valve, reaction at support). Parallel forces (like and unlike parallel force), calculating their resultant. Concept of couple, its properties and effects. General conditions of equilibrium of bodies under coplanar forces. Position of resultant force by moment.
4. Friction: Definition and concept of friction, types of friction, force of friction. Laws of static friction, coefficient of friction, angle of friction, angle of repose, cone of friction. Equilibrium of a body lying on a horizontal plane, equilibrium of a body lying on a rough inclined plane. Calculation of least force required to maintain equilibrium of a body on a rough inclined plane subjected to a force: a) Acting along the inclined plane Horizontally, b) At some angle with the inclined plane
5. Centre of Gravity: Concept, definition of centroid of plain figures and centre of gravity of symmetrical solid bodies. Determination of centroid of plain and composite lamina using moment method only, centroid of bodies with removed portion. Determination of center of gravity of solid bodies - cone, cylinder, hemisphere and sphere; composite bodies and bodies with portion removed.
6. Simple Machines: Definition of effort, velocity ratio, mechanical advantage and efficiency of a machine and their relationship, law of machines. Simple and compound machine (Examples). Definition of ideal machine, reversible and self locking machine. Effort lost in friction, Load lost in friction, determination of maximum mechanical advantage and maximum efficiency, System of pulleys (first, second, third system of pulleys), determination of velocity ratio, mechanical advantage and efficiency. Working principle and application of wheel and axle, Weston's Differential Pulley Block , simple screw jack, worm and worm wheel, single and double winch crab. Expression for their velocity ratio and field of their application

BASICS OF INFORMATION TECHNOLOGY

1. Introduction to Computers and Peripherals: Components of Computer, Types of Computer, CPU, RAM, ROM, Hard disk, USB, Flash drive, CD, DVD,Blue ray, Keyboard, Mouse, Monitor, LCD, Printer, Plotter, Scanner, Modem, Sound Cards, Speakers, CMOS battery, Sharing of Printers.
2. Operation System and Application Software: System Software, Application Software, Virtualization Software, Utility Software, MS Office/Open Office/ Libre office, Working with window, Desktop components, Menu bars, creating shortcut of program. Installation of Application software , Antivirus and Drivers.
3. Word Processing, Spreadsheet and Presentation: Usage and creation of word document, spreadsheets and presentation, Google Suits (Google drive, google sheet, google doc. Google presentation).
4. Internet: Basics of Networking – LAN, WAN, Wi-Fi technologies, Concept of IP Addrsses, DNS, Search Engines, e-mail, Browsing and cyber laws.

ARCHITECTURAL DESIGN

1. Basic Design: Role of an architect in the built environment as well as other professional (since history to present day), Introduction towards Architects Act-1972, C.O.A., I.I.A., NASA. Understanding the fundamentals (Spaces & Architecture): Understanding of General Design Principals and Elements of design through simple drawings and sketching of objects available in nature and surroundings. Understanding of building bye laws : Horizontal and Vertical circulations, materials restrictions, different types of area and their role i.e. Floor area ratio (FAR), Floor space index (FSI), Carpet area, Floor area, Plinth area, Built up area, Covered area, usable area, circulation area, super area, height restriction, Setbacks, Ground coverage or foot print, Width of road and right of way and other related terms/ bye laws of concern local authority.
2. Introduction to architectural design: Form and transformations, Order in architecture- Geometrical, structural, dimensional, material, spatial orders through observation of surroundings, Anthropometry- Introduction to human dimensions and functions in different posture, Structures systems- Introduction of different types of structures i.e. trabeated, arcaded, vector active, form active and tensile through showing examples.

CONSTRUCTION & MATERIALS

1. Building materials: Properties and uses of Building materials such as Brick, Stone, Lime, Cement, Concrete, Asbestos, Gypsum Product, Various types of Glass, Various types of Building Boards (Particle Board, Fiber Board, Block Board and Ply Board laminates), Plastics, Corks, Rubber, Aluminum, Steel, Various Flooring materials, Damp Proofing and Water Proofing Materials. Different types of adhesives. R.C.C. as structural material, acoustical and insulating materials, Finishing veneer's, cladding and paneling, Jali and Hollow Brick work, M.S. Grill work, Aluminium Composite Panel (ACP), Different types of adhesives Painting/ Polishing material- Lime Colour wash, Dry distemper, Oil-bound distemper, Cement paints, Acrylic emulsions, Synthetic enamels, Wall texture etc. Polishes and Varnishes.
2. Timber: Defects and decay, seasoning preservation and different varieties of Timber.
3. Construction: Elements of Building -Terminology, Nomenclature of various parts of building from foundation of roof which support to making a complete wall section from foundation of parapet. General principles of construction in brick toothing, brick on edge and brick on end etc., Bats and closers , Bonds in Brick work & different types of mortars.
4. Brick foundations & D.P.C. : Definition and purpose of foundations, Introduction to different types of foundations. Timbering to trenches for foundations. Study of simple strip foundations for load bearing walls and piers, Definition and types of D.P.C. (damp proof course), Vertical D.P.C. and Damp proofing of Basements, Water tanks, Roof top Terraces. Special damp proofing arrangements for bathroom, W.C. and kitchen
5. Floors and cavity walls: Types of floor Cement Concrete flooring, Terrazzo flooring, Timber flooring, Various types of tile flooring. Purpose of providing cavity walls, Types of cavity walls
6. Arches & lintels: Definition & terms used in Arches, construction of Arches in brick and stone. Different types of lintels.
7. Doors & windows: Introduction to joints in carpentry and various types of doors & window, construction of door / window frames. Introduction of various types of doors. Details of hardware related to these doors. Treatment of expansion joints.
8. Types of roof: Introduction to different types of roofs roof covering with their suitability to various functions. Roof coverings with thatch, slate and tile. R.C.C. and R.B. slabs, Cantilevers, portico, Projections, Balcony, purpose, slopes or Gradients.
9. Staircases and ramps: Definition and types of staircases as per staircase nomenclature, Planning and layout of staircase, Staircases of different materials; R.C.C., steel and Timber. Definition and types of ramps,
10. Temporary work: Timbering in trenches, Shoring, under pinning scaffolding, shuttering and form work for R.C.C., Centering for arches.
11. Partitions: Constructional details, Suitability and uses of Brick, Wooden, Glazed, Semi-glazed partition walls, details of false ceiling and paneling in various materials.
12. Interiors: An introduction to furniture, built-in-furniture and interior details in designing residential and commercial furnitures
13. Hardware and construction eqiupments: Hardwares-Hinges, Handles, Knobs, Bolts, L-drop, Locks, Stoppers, Stays, Silencers, Chain guards, Closers, Catchers, Knockers, etc in various materials, Patch fittings for glazed shutters. Construction Eqiupments- Electric Hand Tools : Vibrators, Pumps, Compactors/Rollers. Earth Moving and Excavation : Dozers, Scrapers, Graders, Shovels, Backactor, Dragline, Trenchers. Transportation: Lorries, Trucks, Dumpers, Hoist, Cranes (Mobile, Static, Tower), Concrete mixers and pumps for ready mix concrete.

HISTORY OF ARCHITECTURE

I. Indian Architecture: The study of the Indian Architecture with the concept of form and structure, from earliest time and to include Buddhist, Hindu and Jain Periods.Temple Architecture - Evolution of temple and its various parts. Dravidian style (Southern) General characteristics, planning, motifs and treatment of different parts, construction methods and materials. Indo Aryan Temple- Lingaraja Temple at Bhubhaneshwar, Kandariya Mahadeo at Khajuraho, Sun Temple at Modhera; These examples must be studied with reference to: Architectural form, planning components, construction methods, materials, motifs (ornamentation)

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Jain Temple- Dilwara Temple at Mount Abu, Ranakpur Temple. General architectural characteristics, construction methods, materials and ornamentation.

2. Western Architecture: The study of architectural development with the concept of form and structure, in other countries, Egyptian, West Asiatic, Greek, Roman, Early Christian, Byzantine and Renaissance periods. Early Christian Architecture- Development of church plan (Basilica), construction methods and general architectural characteristics of St. Peters, Rome Byzantine Architecture- Centralized plans and construction methods for dome of St. Sophia Church) Romanesque Architecture- General architectural characteristics, materials and construction methods for the Pisa group of buildings. Gothic Architecture- Main visual and construction vocabulary of Gothic Arch at Notre Dame Paris, and Reims Cathedral) Renaissance Architecture- Early Renaissance Architecture. General architectural characteristics (Florence cathedral). Late Renaissance architecture. General characteristics and Role of Michael Anglo & Palladio (eg. St. Peter's Rome. The Building of the Capitoline Hill Rome & Villa Capra).

3. Islamic Architecture: Introduction of Islam in India, new building types, structural system and ornamentation (Qutab Complex). Development of Indo-Islamic architectural style, the sultanate period of Lodhi's & Tughlaqs- General architectural vocabulary and construction methods/materials of Lodhi Tomb & Tomb of Ghiya-uddin Tughlag. Provincial Styles- Jaunpur and Bijapur (Jama Masjid and Gol Gumbaz) Mughal Architecture-General architectural characteristics to understand architectural vocabulary & construction methods in (Humayun's Tomb,Fatehpur Sikri, Red Fort, Taj Mahal at Agra and Jama Masjid at Delhi).

4. Modern Architecture in Europe and America: Emergence of modern architecture in Europe. Social, technological and aesthetic concerns of modern movement. New building materials (concrete, steel and glass) and their architectural expression. Philosophy and key works of Louis Sullivan, Walter Gropius, Frank Lloyd Wright, Mies Van De Rohe, Le Corbusier.

5. Contemporary/ post Independence Architecture in India: Work of Le Corbusier in India, Louis Kahn, Charles Correa, B.V. Doshi, Joseph Allen Stein and Raj Rewal. A. P. Kanvinde, etc.

BUILDING SCIENCE

1. General Introduction: Introduction to Climatology, Movement of earth around sun, Different elements of climate like: Wind, temperature, humidity, precipitation and pressure. Different climatic zones. Orientation of building with respect to above mentioned elements of climate. Effect of climate on man and shelter.

2. Relation of Climate and comfort: Macro-micro climatic effects, Concept of comfort zone and bio-climatic chart, Climatic evaluation by season

3. Sun Control and shading devices: Solar Chart (sun path diagram), Orientation for sun, Internal and external sun protection devices, Natural lighting, Introduction and objectives of Solar Passive Design, Passive solar heating and cooling

2. Public Health Engineering: Water Supply: Sources of water supply impurities of Domestic water, Domestic water supply, Waterpiping system, Average consumption of water for various activities based on Per Capita Calculation of water consumption.

Sewerage & Drainage: Internal and external drainage, Basic principles of sanitation and disposals of waste matter from the building. Plumbing of buildings. Different system of plumbing of toilets in buildings. To prepare sanitary and water disposal schemes for waste water and surface drainage. Planning of bathrooms and lavatory block in domestic buildings, standard type of sanitary fittings and fixtures, Joints, Traps, Flushing cisterns, Manholes and septic tank, Intercepting Chambers/Inspection chambers and their location, Ventilation of sewers. With detailed knowledge of various available materials of pipe.

3. Electrical/ Mechanical Services: Electrical Services: House wiring, L & F points, Electrical and Mechanical Fixtures, Simple electrical layouts showing panels, Distribution boards, Consumer units, Circuit breakers, High Resistance Circuit (HRC) various types of switches, sockets, conduits with detailed knowledge of various sizes and materials of wires. Mechanical Services: Types of Lifts, Working of lifts with details of lift section describing various parts of lifts. Escalator- types of escalators, Fundamentals of escalators, Function and working of escalators. Fire Detection, Fire Alarm and Fire Fighting: Fire detection equipments - Heat and smoke sensors, Fire alarms System. Firefighting Equipment - Ladders, Snorkel Ladder, Fire Fighting Pump and Water Storage, Hose and Hose Fitting, Dry and wet risers, Automatic sprinklers, Fire extinguisher, Fire escape, Fire doors and water curtains.

SURVEYING

1. Introduction: Basic principles and types of surveying. Concept of surveying, purpose of surveying, measurements; Linear and angular, units of measurements
- Instruments used for taking these measurement, classification of survey based on instruments. System of conversion of land measurements from traditional revenue maps/ records to MKS system.

2. Chain Survey: Different kinds of chains, Principles of chain survey, Equipment and instruments. The field book, method of keeping the field book. Obstacles in chain survey, Correction of length and areas due to error in chain length from standard length.

3. Areas: Computation of areas of regular figures. Computation of areas of irregular figures by means of formulas, Mean ordinate method, Trapezoidal rule, Simpson's rule, Area by means of planimeter.

4. Compass Surveying: Prismatic compass, its use, whole circle bearings and reduced bearing. Magnetic variation, Local attraction and its elimination. Compass Traversing, Plotting, Closing error and its adjustment by graphical and other methods.

5. Levelling: Theory of leveling, Entering the readings in level book, Computing of RL by "Line of collimation" method, "Rise & Fall" method. Curvature and Refraction, Reciprocal Leveling, Temporary and permanent adjustments of Dumpy levels, contours and their uses. Contour interval, Characteristics of contours, Methods of contouring

6. Theodolite: The use of theodolite in taking horizontal and vertical angles. Interpretation of plans from architectural point of view.

7. Plane Table Surveying: Purpose of plane table surveying, Equipment used in plane table survey, centering, leveling and orientation of plane table. Methods of plane table surveying - Radiation, Intersection, Traversing, Resection, Two point problem and Three point problems.

8. Total Station:The use of Total Station in finding the Horizontal and Vertical angles as well as finding out level in building elevation.

COMPUTER AIDED DESIGN

Introduction to AutoCAD (Latest version), Creating and Saving a new Drawing- Commands and options to create new drawings, Drawing Commands, Viewing an Existing Drawing, Modifying an Existing Drawing, Making and Inserting Blocks, Dimensioning and Text, Plotting Drawings, Rendering of CAD drawing, Fundamentals of 3-D Drafting, Making an existing 2-D plan drawing compatible to 3-D drafting,3-D Modeling, Introduction to 3D max, Corel Draw, Adobe Photoshop.

TOWN PLANNING

1. Introduction: Historical background of the modern city planning movement. Objects, importance and principles of town planning. Ancient town planning in India. Plans of old Indian cities- Mohenjo-Daro and Harappa, Taxila and Nalanda.

2. City Planning: An introduction to the fundamental principles of city planning. Planning process, site selection, site planning in relation to Physical conditions, Landscape. Land use plan, Master plan, regional plan in relation to Chandigarh, Jaipur, Zoning for houses, Social centers, Layout of roads, Surface and subsurface drainage, Community services. Slums and their improvement. Development of garden.

STRUCTURE

1. Bending Moment and Shear Force: Concept of a beam, and supports (Hinged, Roller and Fixed). Types of Beams: Simply supported, cantilever, fixed overhang and continuous beams, types of loads (distributed, point and varying). Concept of Bending Moment & Shear Force. Sign conventions. Bending moment and shear force diagrams for cantilever, simply supported and overhanging beams subjected to uniformly distributed, concentrated and uniformly varying loads. Relationship between load, shear force and bending moment. Point of maximum B.M. and contra flexure, concept of fixed and continuous beams.

2. Bending and Shear Stresses: Assumption of theory of simple bending. Derivation of the equation. M/I=F/Y=E/R. Concept of second moment of area, Radius of gyration, Theorems of parallel and perpendicular axes, Second Moment of area for sections: rectangle, triangle, circle, trapezium, angle, Tee, I, Channel and compound sections. Moment of resistance, section modulus and permissible bending stresses, Bending stresses in circular sections.

3. Combined Direct & Bending Stresses: Concentric and eccentric loads, eccentricity, effect of eccentric load on the section, middle third rule; stresses due to eccentric loads. Examples in the case of Short columns, chimneys and dams.

4. Slopes and Deflections of Beams: Definition of slope and deflection, sign convention. Circular bending. Calculation of maximum slope and deflection for the following standard cases by double integration or moment area method.

(1) Cantilever having point load at the free end. Cantilever having point load at any point of the span. Cantilever with uniformly distributed load over the entire span. Cantilever having U.D.L. over part of the span from free end. Cantilever having U.D.L. over a part of span from fixed end.

(2) Simply supported beam with point load at centre of the span. Simply supported beam with U.D.L. over entire span.

5. Columns & Struts: Definition of long column, short column and strut, slenderness ratio, equivalent length, critical load, collapse Load, end conditions of column. Application of Eular's and Rankine's formula (no derivation), simple numerical problems based on Euler's and Rankine's formulae.

6. Structural Steel and Connections: (A) Riveted Joints:
Types of rivets, permissible stresses in rivets. Types of riveted joints, Failure of riveted joints, Assumptions made in the design of riveted joints. Specification for riveted joints. Design of riveted joints for axially loaded members. (B) Welded Joints: Comparison between riveted and welded joints, types of welds, permissible stresses in welds, types of welded connections, strength of welded joint, Design of welded joints for axially loaded members.

7. Introduction To Rcc Structures: Concept of reinforced concrete structures, advantages and disadvantages. Different materials used in RCC with their properties. Load and loading standard as per IS:875. Concept of design of reinforced concrete based on working stress method and limit state method and their difference.

8. Design Based On Limit State Method: A. Fundamental of limit state method:
(i) Assumptions in the theory of simple bending for RCC beams. (ii) Flexural strength of a singly reinforced RCC beam. Position of the Neutral Axis. Resisting moment of the section, critical neutral axis, actual neutral axis, concept of balanced, under reinforced and over-reinforced sections. (iii) Shear Strength : Permissible shear stresses as per IS: 456. Development of stresses in reinforcement, development length and anchoring of bars. (iv) Bond Strength: Concept of bond, local and average, permissible bond stresses for plain and deformed bars as per IS, minimum length of embedment of bars, minimum Splice length, actual bond stress in RCC beams and slabs, bond length as per IS: 456.

B. Design of singly reinforced concrete beams as per IS: 456 from the given data such as span load and properties of materials used.

C. Design of lintel.

D. Design of a cantilever beam and slab.

E. Design of Doubly Reinforced Concrete Beams: (i) Doubly reinforced concrete beam and its necessity. (ii) Strength of a double reinforced concrete beam section. (iii) Method of design: Simple problems only. (iv) Reinforcement details of doubly reinforced concrete beam.

F. Design of RCC Slabs: (i) Structural behaviour of slab under uniformly distributed load (UDL). (ii) Types of end supports. (iii) Design of one way slab. (iv) Design of Two-way slab with the help of tables of IS: 456.(Corners not held

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down)-IS-code method. (v) Detailing of reinforcement.
G. Design of Reinforced Brick-Work: (i) Plain brick masonry, permissible stresses.
(ii) Reinforced Brick work and its use in slabs and lintels. (iii) Limitations of the use of R.B. Work. (iv) General principles of design of reinforced brick lintels and slabs.
(v) Design of R.B. slab and lintels.
H. Design of Tee Beams: (i) Structural behaviour of a beam and slab floor laid monolithically. (ii) Rules for the design of T-Beams. (iii) Economical depth of T-Beams, Strength of T-Beams. (iv) Design of Tee-Beams. (v) Detailing of reinforcement.
I. Design of Columns & Column Footings: (i) Concept of long and short columns.
(ii) I.S. specifications for main and lateral reinforcement. (iii) Behaviour of RCC column under axial load.(iv) Design of Axially loaded short and long columns with hinged ends (circular, square and rectangular as per IS specifications). (v) Concept of column footing. Design criteria. Design of square isolated column footings. (vi) Detailing of reinforcement.
3 Design Based On Working Stress Method: Introduction to Limit state design fundamentals, Design of simple problems of beams and slabs only.
4. Prestressed Concrete: Introduction to prestressed concrete.
5. Tension And Compression Members: Introduction to tension and compression members of steel roof trusses.

ESTIMATING, COSTING & SPECIFICATION

1. Introduction: Introduction to Estimating: Types of building estimates, drawings, to be attached with these estimates. Preparation of rough cost estimates.
2. Units: Units of measurement and units of payment of different items of works related to buildings. Conversion of units
3. Methods Of Taking Out Quantities: Different methods of taking out quantities: Centre line in- to-in/out-to-out methods.
4. Detailed Estimate: Introduction of a detailed estimate, Understanding of all the quantities from excavation to parapet including finishes in project, Details of measurement and abstract of cost with the help of current SOR (schedule of rates) of Local PWD. Preparation of summery of cost and form "J".
5. Analysis Of Rates: Steps in the analysis of rates for the following items of work, requirement of material, labour, sundries and contractors profit. (a) Earth work in excavation in foundation and trenches. (b) Earth work in filling in foundation, trenches and up to plinth level. (c) Plain Cement concrete in foundation. (d) Brick work in foundation. (e) Brick work in super structure. (f) Plastering and Pointing. (g) Flooring. (h R.C.C. work in foundations, columns, beams, lintels and sunshade. (i) R.C.C. work in roof slab. (j) Wood work in doors and windows frames. (k) Wood work in shutters of doors and windows. (l) White washing, distempering, waterproof cement paint on walls and ceiling. (m) Painting or polishing on doors and windows.
6. Specifications: Need, General specifications of buildings, methods of writing specifications.
7. P. H. E. Items: Preparation of estimate of P. H. E. (Public Health Engineering) items. i. Preparation of detailed estimate for laying a water supply line. ii. Preparation of detailed estimate for sanitary and water supply fittings in a domestic
building containing one set of toilet ,septic tank and soak pit.
8. Valuation: Purpose of valuation, Principles of valuation, Definitions of terms such as description sinking fund, salvage and scrap value. Valuation of a building property by replacement cost method and rental return methods. Method of calculation of standard rent.

ENERGY CONSERVATION

1. Basics of Energy: Classification of energy- primary and secondary energy, commercial and noncommercial energy, non-renewable and renewable energy with special reference to solar energy, Capacity factor of solar and wind power generators. Global fuel reserve. Energy scenario in India and state of U.P. Sector-wise energy consumption (domestic, industrial, agricultural and other sectors). Impact of energy usage on climate.
2. Energy Conservation and EC Act 2001: Introduction to energy management, energy conservation, energy efficiency and its need. Salient features of Energy Conservation Act 2001 & The Energy Conservation (Amendment) Act, 2010 and its importance. Prominent organizations at centre and state level responsible for its implementation. Standards and Labeling: Concept of star rating and its importance, Types of product available for star rating
3. Electrical Supply System and Motors: Types of electrical supply system. Single line diagram. Losses in electrical power distribution system. Understanding Electricity Bill: Transformers Tariff structure, Components of power (kW, kVA and kVAR) and power factor, improvement of power factor, Concept of sanctioned load, maximum demand, contract demand and monthly minimum charges (MMC). Transformers: Introduction, Losses in transformer, transformer Loading, Tips for energy savings in transformers. Electric Motors- Types of motors, Losses in induction motors Features and characteristics of energy efficient motors, Estimation of motor loading, Variation in efficiency and power factor with loading, Tips for energy savings in motors
4. Energy Efficiency in Electrical Utilities: Pumps: Introduction to pump and its applications, Efficient pumping system operation, Energy efficiency in agriculture pumps, Tips for energy saving in pumps. Compressed Air System: Types of air compressor and its applications, Leakage test, Energy saving opportunities in compressors. Energy Conservation in HVAC and Refrigeration System: Introduction, Concept of Energy Efficiency Ratio (EER), Energy saving opportunities in Heating, Ventilation and Air Conditioning (HVAC) and Refrigeration Systems.
5. Lighting and DG Systems: Lighting Systems: Basic definitions- Lux, lumen and efficacy, Types of different lamps and their features, Energy efficient practices in lighting. DG Systems: Introduction, Energy efficiency opportunities in DG systems, Loading estimation
6. Energy Efficiency in Thermal Utilities: Thermal Basics: Thermal energy, Energy content in fuels, Energy Units and its conversions in terms of Metric Tonne of Oil Equivalent (MTOE). Energy Conservation in boilers and furnaces : Introduction and types of boilers, Energy performance assessment of boilers, Concept of stoichiometric air and excess air for combustion, Energy conservation in boilers and furnaces, Do's and Don'ts for efficient use of boilers and furnaces. Cooling Towers: Basic concept of cooling towers, Tips for energy savings in cooling towers. Efficient Steam Utilization
7. Energy Conservation Building Code (ECBC): ECBC and its salient features. Tips for energy savings in buildings: New Buildings, Existing Buildings
8. Waste Heat Recovery and Co-Generation: Concept, classification and benefits of waste heat recovery. Concept and types of co-generation system
9. General Energy Saving Tips in: Lighting, Room Air Conditioner, Refrigerator, Water Heater, Computer, Fan, Heater, Blower and Washing Machine, Colour Television, Water Pump, Cooking, Transport.
10. Energy Audit: Types and methodology, Energy audit instruments, Energy auditing reporting format.

ENVIRONMENTAL STUDIES

1. Introduction: Basics of ecology, eco system- concept, and sustainable development, Resources renewable and non renewable.
2. Air Pollution: Source of air pollution. Effect of air pollution on human health, economy, plant, animals. Air pollution control methods.
3. Water Pollution: mpurities in water, Cause of water pollution, Source of water pollution. Effect of water pollution on human health, Concept of dissolved O2, BOD, COD. Prevention of water pollution- Water treatment processes, Sewage treatment. Water quality standard.
4. Soil Pollution: Sources of soil pollution, Types of Solid waste- House hold, Hospital, From Agriculture, Biomedical, Animal and human, excreta, sediments and E-waste, Effect of Solid waste, Disposal of Solid Waste- Solid Waste Management
5. Noise pollution: Source of noise pollution, Unit of noise, Effect of noise pollution, Acceptable noise level, Different method of minimize noise pollution.
6. Environmental Legislation: Introduction to Water (Prevention and Control of Pollution) Act 1974, Introduction to Air (Prevention and Control of Pollution) Act 1981 and Environmental Protection Act 1986, Role and Function of State Pollution Control Board and National Green Tribunal (NGT), Environmental Impact Assessment (EIA).
7. Impact of Energy Usage on Environment: Global Warming, Green House Effect, Depletion of Ozone Layer, Acid Rain. Ecofriendly Material, Recycling of Material, Concept of Green Buildings.

EARTHQUAKE ENGINEERING CONCEPT

1. Nature And Characteristics Of Ground Motion: Consequences of earthquake
- Ground rupture and Ground Failure, Liquefaction, Land slides, etc.
Ground Motion, Fire, Tsunamis
2. Engineering Seismology: Structure of the earth, Plate Tectonics, Evolution of Indian subcontinent, Waves generated by ground motion and their characteristics, Body Waves, Longitudinal waves, Transverse waves, Surface waves, Rayleigh waves, Love waves, Attenuation of waves, Distribution of earthquake Global, Indian, Measurement of earthquake, Introduction of instruments used for measuring earthquakes, Seismograph, Accelerogra Various scales of magnitude, Various scales of intensity Basic Terms- Fault line, Focus, Epicenter, Epicenter distance, Focal depth Peak ground acceleration, etc. Seismic Zoning and Micro Zoning.
3. Behaviour Of Buildings During Earthquake: Ground motion and earthquake forces; Sitting of structure, Typology and classification of buildings- Load bearing masonry walls, Brick masonry, Stone masonry, Mud, Reinforced Concrete Buildings, RC framed building, RC shear wall building, Dual system building, Steel Buildings, Dynamic characteristics of building and its relation with built form, Sym Regularity, Stiffness, Flexibility, Strength, Time period, Damping, D Material and method of construction, etc. Earthquake resistance of various forms of building, Configuration, Scale of building, Size in horizontal plane, Size in vertical plane, Building proportions, Symmetry of the building, Reentrant corners, Redundancy, etc Irregularities in Building, Horizontal plane, Vertical Plane,
Building corners- Outward corner Inward corners. Special Aspects- Torsion Appendages, Staircases, Pounding, Repair and maintenanc Construction management. Behaviour of nonstructural elements in the building during earthquake. Soil characteristics and its impact on various built forms during earthquake. Philosophy of earthquake resistant design of buildings. Earthquake resistant features and use of IS 4326 for masonry buildings. Introduction to ductile detailing of RC buildings as per IS-13920.
4. Disaster Management: Definition of disaster - Natural and Manmade, Type of disaster management, how disaster forms, Destructive power, Causes and Hazards, Case study of Tsunami Disaster, National policy- Its objective and main features, National Environment Policy, Need for central intervention, State Disaster Authority- Duties and powers, Case studies of various Disaster in the country, Meaning and benefit of vulnerability reduction, Factor promoting vulnerability reduction and mitigation, Emergency support function plan. Main feature and function of National Disaster Management Frame Work, Disaster mitigation and prevention, Legal Policy Frame Work, Early warning system, Human Resource Development and Function, Information dissemination and communication.

CONSTRUCTION MANAGEMENT, ACCOUNTS AND PROFESSIONAL PRACTICE

1. Management: Introduction, Classification of construction - Light and Heavy, Stages of construction, Construction team - Owner, Engineer and Contractor their functions and interrelationship, Resources of construction industry -Man, Material, Machine, Money. Functions of construction management, Planning, Organization and building contracts. Aquaintance with building bye-laws (R.B.O. Act), Accident and Safety.
2. Accounts: Introduction, Necessity of accounts, Cash - Definition of cash, Treasury challan and its Procedure of filling Imprest account.
3. Professional Practices: Introduction, Code of practice, Scale of charges, Code of conduct as per Architects Act1972, Council of Architects, Tender documents, Stages of payments, Settlement of disputes and arbitrations.
4. Intellectual Property Rights: Introduction to IPR (Patents, Copy Right, Trade Mark), Protection of undisclosed information, Concept and history of patents, Indian and International Patents Acts and Rules, Patentable and Non patentable invention including product versus Process. Basic terms used in land acquisition, Khasra, Khatauni, possession, allotment, free hold, Mutation (Dakhil-Kharij).

01-03-2025

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National Institute of Technology Hamirpur (HP) 177005

Syllabus

Technicians SG-II (GP-2800/Level-5)

Mechanical/Central Workshop

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1. Knowledge about workshop tools for various shops.
2. Knowledge about various machines, tools and materials used in different shops.
3. Knowledge about fixtures used in different shops.
4. Knowledge about coolants/fluids used in different machining operations.
5. Knowledge about fixing and mounting of jobs in various machines
6. Knowledge about power operated hand tools.
7. Knowledge about non-conventional machining methods and machines.
8. Welding Type of welding (Arc welding & gas welding), TIG & MiG welding, Brazing and soldering, welding defects, maintenance of tools and machines
9. Turning Basic principle of turning, description and specification of lathe machine, operations on lathe e.g. turning, taper turning, knurling, thread cutting etc.
10. Machining Metal cutting principles, cutting tools, basic principles of machining with milling and drilling, shaping machine, grinding machine etc.
11. CNC Operation Components and function of CNC operation, handling of CNC machines.
12. Metrology and Inspection, Linear and Angular Measurement, Measurement of Surface Finish, Measurements of Screw threads and Gauges.

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(Prof. Rakesh Sehgal)

(12)

Syllabus for Technician (SG-II)
Department of Civil Engineering
National Institute of Technology Hamirpur

Building Materials: Aggregates (Fine & Coarse): Grain size distribution, specific gravity, density, bulking, crushing value, impact value, and water absorption. Cement: Fineness, standard consistency, initial and final setting time, compressive strength, specific gravity, and soundness. Concrete: Workability tests (slump test, compaction factor test, Vee Bee test), cube and cylinder strength. Bricks & Stones: Compressive strength, water absorption, efflorescence, dimensional tolerance, and warpage in burnt clay bricks.

Transportation Engineering: Strength test: impact and crushing tests; Shape test; Hardness test: Abrasion test; grain size analysis of aggregates; Aggregate specific gravity and Aggregate water absorption; Consistency test; Softening tests; Ductility test; Bitumen content in a bituminous mix; Compaction tests of soil; Determination of CBR; Traffic survey on a road stretch.

Water Resources Engineering: Metacentric Height, Bernoulli's Theorem, Venturimeter, Orifice meter, Pitot Tube, Notches, Mouthpiece, Friction of pipes, Losses in Pipes, Free Vortex Flow, Forced Vortex Flow, Rotatmeter, Darcy's Law

Surveying: practical exercises on elevation determination between two points, profile leveling, and cross-sectioning of given routes. Measuring horizontal angles using reiteration and repetition methods, theodolite traversing, and error adjustment. Contour maps using radial lines and practice plane tabling through radiation and intersection methods. Total stations for topographic surveys. Curve setting techniques include offsets from the long chord, successive bisection. GPS/DGPS basic settings and survey applications are included for geospatial data collection and mapping.

Soil Mechanics: This course teaches basic soil tests used in construction. It includes checking soil type, water content, and particle size. Simple tests like compaction, permeability, shear, and soil strength are covered. Field tests like core cutter and sand replacement methods are also included.

Environmental Engineering: pH, solids (total, settleable, volatile), DO, BOD, COD, Chloride, Hardness, nitrogen forms (total, nitrite, nitrate), coliform bacteria (MPN), and metals/metalloids.

27-02-2025

27/2/25

28/02/2025

National Institute of Technology Hamirpur (HP) 177005

Syllabus

Senior Technicians (GP-2400/Level-4)

Vehicle/Transport

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1. Knowledge of Road Signs.
2. Knowledge about Manual/ Automatic Vehicles.
3. Knowledge about Lubricants for Engine and Gear-box.
4. Knowledge about Batteries of Automobiles.
5. Knowledge about Braking and Ignition system.
6. Knowledge service and Maintenance of Automobiles.
7. Knowledge Suspension and cooling system of Automobiles.
8. Knowledge about exhaust system of Automobiles.
9. Knowledge about Electric Vehicles.

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(Prof. Rakesh Sehgal)