MASTER LEVEL ENTRANCE EXAMINATION

CURRICULUM

FACULTY OF SCIENCE AND TECHNOLOGY

POKHARA UNIVERSITY

Pokhara University

Faculty of Science and Technology

Central Entrance Examination Curriculum

Master of Science in Transportation Engineering and Management / Master of Science in Structural Engineering / Master of Science in Sanitary Engineering / Master of Science in Hydropower Engineering / Master of Science in Public Health and Disaster Engineering

Total marks: 150 Qualifying marks: 75 (Paying)/53(Scholarship)

Time: 3 hrs

Entrance curriculum mainly covers common topics of all streams covering Fundamental of Mathematics, Transportation Engineering, Structural Engineering, Water Resources Engineering, Environmental Engineering content related to Bachelor of Civil Engineering and equivalent with some general knowledge.Entrance curriculum mainly covers common topics of all streams covering related subject contents of bachelor in Civil Engineering and euivalent.

Section	Course	Weightage (%)
A	Fundamental of Mathematics	10
B	Transportation Engineering	10
C	Geotechnical Engineering	15
D	Structural Engineering (Applied Mechanics, Strength of Materials, Structural Analysis, Design of Steel and Timber, Design of RCC structures, Concrete Technology and Masonry Structures)	30
E	Water Resources Engineering (Fluid Mechanics, Hydraulics, Hydrology, Irrigation, Hydropower)	20
F	Environmental Engineering (Water Supply and Sanitation)	15
	Total	**100**

Section A: Fundamental of Mathematics

1. Basic of Set, Basic of Differential and Integral Calculus, Vector Algebra and Calculus:

Set and functions, limit, continuity and differentiability of functions, Curvature, Integration by using different integration techniques, Application of derivative and Antiderivative, Ordinary Differential Equations, Vectors and scalars, resolution of vectors, scalar and vector product of two and more vectors.

2. Linear Algebra, Analytic Geometry and series:

Definition and basic properties of matrices and determinants Rank of matrix, system of linear equations, inverse of a matrix, Conic Section, Parabola, Fourier series on the functions of period 2π.

3. Introduction of Descriptive Statistics and Numerical Methods:

Presentation and classification data frequency distribution, histogram, measures of central tendency: mean, median, mode, quartiles and percentiles, measures of dispersion (variability).

Section B: Transportation Engineering

1. *Traffic Engineering:*

Traffic volume, parking, speed, accident study, Traffic characteristics, Traffic control devices, Highway capacity, Street lighting, intersection design

2. *Highway Design:*

Geometric design of highways: design criteria, Design of cross-sections, vertical and horizontal alignment, Hill roads

3. *Pavement design and construction:*

Traffic consideration, Design procedures for Flexible and rigid pavement, Road Construction activities: Preparations of sub-grade for cut and fill embankment section, Construction of flexible pavement, Construction of rigid pavement

Section C: Geotechnical Engineering

Soil Mechanics:

- Introduction, phase relations and index properties of soil and soil identification and its classification
- Principle of effective stress, capillarity and permeability on soil :- total stress, pore water pressure and effective stress; capillary phenomenon in soils, capillary head and capillary pressure; quick sand condition; total pressure and elevation heads; permeability of soil and its determination
- Compaction, compressibility and consolidation of soil:- process of compaction and compaction theories, moisture density relationship and degree of compaction, effect of compaction on engineering behavior of soils; Normally consolidated and over consolidated soils
- Shear strength of soil and Slope stability: - Mohr-circle, normal, shear and principal stresses; determination of shear strength parameters; stress path

Foundation Engineering:

- Site investigation: - Methods of soil exploration; boring, sampling, soil sampling, types of sample, soil sampler; field penetration test; plate load test, number of bore holes, depth of exploration,
- Lateral earth pressure theories, earth retaining structure and coffer dam:- types of earth pressure; Rankine's, Coulomb's, Culmann's earth pressure theories
- Bearing capacity and settlement of shallow foundation:- modes of soil failure; theories of bearing capacity; effect of water table; bearing capacity from in-situ-test; plate load test
- Mat foundation, pile foundation, well foundation:- floating foundation; bearing capacity and settlement of mat foundation; classification, use and selection of pile foundation;

determination of pile load capacity; group action of pile and efficiency; negative skin friction; type, shape, component and depth of well foundation

Section D: Structural Engineering

Applied Mechanics and Strength of Materials

- Resolution and composition of forces
- Resultant of force and moment for a system of force
- Moment of inertia of composite and built up section
- Position, velocity and acceleration of a particle and rigid body
- Rectilinear and curvilinear motion of particles
- Rectangular components of velocity and acceleration
- Equations of Motion, Motion due to central force and dynamic equilibrium
- Centroids of composite and built up section
- Axial loading, normal stress, normal strain and Hooke's law
- Transverse loading, shear stress, shear strain and their relationship
- Deformation of axially loaded bars, Temperature effect
- Analysis of axial force, shear force and bending moment diagrams for plane frame
- Beams of uniform and symmetric cross section in pure bending

Structural Analysis, Design of RCC Structures and Design of Steel and Timber Structures

Structural Analysis:

- Static and kinematic indeterminacy of 2D and 3D structures
- Displacement of structures by strain energy method, unit load method, castigliano's method, integration method, conjugates beam method, moment area method
- Determination of maximum and absolute maximum shear force and bending moment using ILD method
- Analysis of cable and arch
- Analysis of indeterminate structures by consistent deformation method and matrix method

Design of RCC Structures:

- Codal provisions for RCC structural design.
- Analysis and design of singly and doubly reinforced section, Flexural design, Shear design
- Detail analysis and design of one way and two-way slabs,
- Detail analysis and design of columns
- Detail design of footings

Design of Steel and Timber Structures:

- Analysis of bolted and welded joint
- Design concept of tension and compression member (LSM)
- Stiffened and unstiffened steel beam (LSM)
- Elements of Plate Girder
- Analysis and design of truss (LSM)

Concrete Technology and Masonry Structures

- Introduction of concrete and its ingredients
- Mix design methods (Nominal, DOE and IS standard design methods)

- Properties of fresh and hardened concrete
- Durability of concrete
- Design of load bearing walls under vertical load
- Non-destructive tests of masonry units and elements

Section E: Water Resources Engineering (Fluid Mechanics, Hydraulics, Hydrology, Irrigation Engineering and Hydropower Engineering

Physical properties of fluid, Pressure, Equilibrium stability of floating bodies, Fluid kinematics, Classification of fluid flow, Dynamics of flows, Eulers equation, Bernoulli's equation, Navier stokes equation, Boundary layer theory, Momentum equation, Open channel flow, Uniform and Non uniform flow, Energy & momentum principle for open channel flow, Flow in mobile boundary channel, Flow over notches & weirs, Gradually varied flow, Hydraulic Jump; Hydrologic cycle, Precipitation, Hydrological losses, Surface runoff, Rainfall-runoff correlation, Streamflow, Measurement of flow Hydrograph Analysis, Unit hydrographs, Peak flow estimation; Status irrigation development in Nepal, Irrigation water requirements, Surface and sub-surface Irrigation methods Canal types, Design of canals, Irrigation structures, River training, Waterlogging; History and status of hydropower development in Nepal, Principle, common terms and advantages, Components of hydropower plant, Hydropower potential, Classifications of hydropower plant, Water Conveyance Structures, Dam, Spillways, Energy Dissipators, Hydro-mechanical and Electro-mechanical equipment (Turbine, pumps, generator), Micro-hydropower

Section F: Environmental Engineering (Water Supply and Sanitation)

Drinking Water: Introduction to pollutants (sources, types and effects), sources and characteristics of water, water demand and quantity, estimation of future population, design period. Present status of Water Supply and Sanitation, Current issues and problems of Water Supply in rural and urban, Design norms and principles, Principles related to unit operation: Aeration, Flocculation and coagulation, Sedimentation process including course material removal, Filtration process/Slow sand filtration /Rapid filtration, Disinfection process.

Wastewater: Sources and nature of wastewater, wastewater characteristics (BOD, COD aerobic and anaerobic decomposition), Principles related to unit operation: Physical treatment: Screen /Grit chamber /Gas chamber /Mixing /Sedimentation /Flocculation /Floatation, Chemical treatment: Chemical precipitation, Absorption, Ion exchange, Electrolysis, Biological treatment: Aerobic and Anaerobic process, Aerated lagoons, Activated sludge, Trickling filters, Oxidation ditches, Sludge treatment: Drying, Dewatering, Filtration, Centrifugation, Chemical conditioning (immobilization), and Incineration.

Pokhara University

Faculty of Science and Technology

Central Entrance Examination Curriculum

Master of Science in Environmental Management (EM), Interdisciplinary Water Resources Management (IWRM), Natural Resources Management (NRM),

Total marks: 150 Qualifying marks: 75 (Paying)/53(Scholarship)

Time: 3 hrs

Entrance curriculum mainly covers common topics of various streams: Mathematics (Quantitative aptitude), General Awareness, Basic Water Science, Engineering and Hydrology, Natural Resouces Management, Environmental Management.

Section	Course	Weightage (%)
A	Fundamental of Mathematics	15
B	General awareness	10
C	Basic Water Science, Engineering and Hydrology	25
D	Natural Resouces Management	25
E	Environmental Management	25
	Total	**100**

Section A: Fundamental of Mathematics

Basic Mathematics (Numbers: Fractions, Decimals and Percentages; Ratio and Proportion; Roots and Power; Logarithms; Progressions; Elementary Geometry; Elementary Trigonometry; Introductory Set Theory) Algebra (Polynomial, Equations and Inequalities; Simultaneous equations and solutions; Elementary Linear Programming, Vector Algebra); Calculus (limits and continuity, differentiation, integration, ordinary first order linear differential equation, partial differential equation), Introduction of Probability and Statistics, Permutations and Combinations.

Section B: General Awareness

General knowledge of environment, geography, environment/water law and regulations; economics and human development indicators, physics and chemistry, Environmental Protection Guidelines, Concept of Environmental System, Environmental Impact assessment process and its requirement, Global water and climate issue.

Section C: Basics of Water Science, Engineering and Hydrology

Physical properties, Fluid pressure, Equilibrium stability of floating bodies, Fluid kinematics, Classification of fluid flow, Dynamics of flows, Euler's equation, Bernoulli's equation, Navier stokes equation Boundary layer theory, Momentum equation, Open channel flow, Uniform and Non uniform flow, Energy & momentum principle for open channel flow, Flow in mobile boundary channel, Flow over notches & weirs, Gradually varied flow, Hydraulic Jump and its analysis, Similitude and physical modeling, Physical hydrology, Surface runoff, Rainfall-runoff

correlation, Hydrograph Analysis, Unit hydrographs, Peak flow estimation, measurement of flow, hydrology and climatology

D. Natural Resource Management

Natural resources and associated problems, Forest / mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources. Food resources: World food problems, changes caused by agriculture and over-grazing, effects of modern agriculture, fertilizer-pesticide problems. Energy resources: growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Land resources: land as a resource, land degradation, man induced landslides. Conventions related to global warming, climate change and ozone depletion.

E. Environmental Management

Concept of Environmental Chemistry, Air pollution: sources, types, gaseous and particulate matter, smog, greenhouse effect, acid rain and ozone depletion. Water pollution: types, sources and classification of water pollution, ground water pollution, marine water pollution. Concept of DO, BOD, CODS their effects on flora and fauna. Soil pollution: sources and types – classification of soil pollutants, effects of pollution on soil, to health and productivity. Sewage – municipal sewage, lake/pond, river water.

Pokhara University

Faculty of Science and Technology

Central Entrance Examination Curriculum

Master of Science in Computer Science, Master of Computer Engineering, Master of Science in Information System Engineering

Total marks: 150 Qualifying marks: 75 (Paying)/53(Scholarship)

Time: 3 hrs

The questions in the entrance examination are categorized in two sections. These sections include Foundation of Mathematics and Computational Foundation. The **section A - Foundation of Mathematics** covers the mathematical theorems, tools and techniques that are required for basis of master in computer engineering and science. The **section B -Computational foundation** covers computer science knowledge.

Section	Course	Weightage (%)
A	Fundamental of Mathematics	30
B	Computational Foundation	70
	Total	**100**

Section A: Foundation of Mathematics

1. Fundamental of Differential and Integral Calculus and Vector Calculus

Functions, limit, continuity and differentiability of functions, higher order derivatives, Asymptotes, Curvature. Integration and its standard techniques, definite integral and its applications, Ordinary Differential Equations, Double Integral, Vectors and Scalars, resolution of vectors, scalar and vector product of two and more vectors, Curl, Gradient and Divergence of Vectors, Line (Green and Stock Theorem) Integral and Surface (Guess Theorem) Integrals of vectors, Eigen vectors and Eigen value of matrix.

2. Fourier Series, Integral and Transformations

Periodic functions, Fourier series, Even and Odd functions and their Fourier series, half range expansion of Fourier series, Fourier Integral, Fourier Sine and cosine Integral, Fourier Transformation, Fourier Complex Transformation, Inverse Fourier Transformation, Fourier Sine and cosine Transformation and its Applications.

3. Laplace and Z-Transformation

Laplace transform, Integration and derivative of Laplace Transformation, Inverse Laplace transform and Applications of Laplace transform on ODE. One-sided and two-

sided Z-transform, linear time invariant system, Unit impulse function, properties of Z-transform, region of convergence, inverse Z-transform by residue and partial fraction.

4. Introduction and Descriptive Statistics

Presentation and classification data frequency distribution, histogram, pictorial and diagrammatic method, measures of central tendency and location-mean, median, quartiles and percentiles, measures of dispersion (variability) range, quartile deviation, deviation, standard deviation, Probability, Combination and Permutations.

Section B: Computational Foundation

1. Programming Paradigms

C programming:- Procedural programming, structured programming, Object-oriented programming, control structures, function, arrays, pointers, functions, preprocessor directives, C libraries, Macros, Header files and prototyping.

Object-oriented programming:- Classes and Methods, Message, message passing formalization, message passing syntax in C++, mechanism for creation and initialization (constructor and its types), Issues in creation and initialization: memory map, memory allocation methods and memory recovery, Object Inheritance and Reusability, Template and generic programming- template classes, template functions.

2. Data Structure and Algorithm

Abstract data type, Data Structure Concept, Stack, Stack applications, Queue, Linear and circular queue and their application, Double Ended Queue, Priority queue, Link List, Doubly linked lists and its advantages, Implementation of Doubly Linked List, Linked, Implementation of stacks and Queues, Binary tree, Binary search tree, Binary tree traversals, Balanced trees, AVL balanced trees, Balancing algorithm, The Huffman algorithm, Game tree, B- Tree, Searching, Exchange sort, Bubble and quick sort, Merge and Radix sort, Shell sort, Heap sort, Binary search, Hashing, Hash function and hash tables, Collision resolution technique, Graphs, Graphs traversal and spanning forests, Kruskal 's and Round Robin algorithms, Shortest-path algorithm, Greedy algorithm, Dijkstra's Algorithm, Algorithm analysis, Growth of functions- Asymptotic notations, Big O Notation

3. Computer Architecture and Organization (20X1=20)

CPU organization, register organization, Instruction cycle, Computer Arithmetic, Instruction sets, addressing modes, Control Unit- hardwired control Unit, micro-programmed control unit, Cache memory- catch principle, mapping catch memory, write policy, replacement algorithms, Input-output organization- programmed I/O, interrupt driven I/O, Direct memory access, RISC vs. CISC, RISC pipelining, parallel processing- parallelism in uni-processor system, multiprocessor system and their characteristics, Flynn's classification, Cache coherence, vector processing and array processor, multi-core organization, dual core and quad core processors.

4. Operating system and concepts

Operating system concepts and functionalities, operating system structure, process states and transition, process control block (PCB), inter-process communication, critical regions and conditions, mutual exclusion, Dekker's and Peterson's algorithm, Dead lock, dead-lock avoidance, detection and prevention, threads, advantage of threads, process scheduling techniques, paging, segmentation, Distributed operating system- network architecture, Asynchronous Transfer Mode, Client-Server model.

5. Object-oriented Software Engineering

Software process and framework, process models, Agile development, Extreme programming, Scrum, Software modeling, quality management and testing, CMMI.

6. Database Management System

Need of DBMS, concept of DDL, DML and DCL, ER Model, UML class diagram, relational algebra, schema and views, SQL, normalization and normal forms, security.

Pokhara University

Faculty of Science and Technology

Central Entrance Examination Curriculum

Master of Science Electrical Engineering in Power System

Total marks: 150 Qualifying marks: 75 (Paying)/53(Scholarship)

Time: 3 hrs

Entrance curriculum mainly covers common topics of all streams covering Fundamental of Mathematics and Electrical Engineering of Bachelor's level.

Section	Course	Weightage (%)
A	Fundamentals of Mathematics	30
B	Circuit Theory , Fields , Basic Electronics and Instrumentation	20
C	Electrical Machine Theory, Power System , Protection and High Voltage	30
D	Power Electronics , Energy Utilization and Conservation and Control System	20
	Total	**100**

Section A: Fundamental of Mathematics

1. **Basic of Set, Continuity, Derivative, Vector and Scalar:** Set and functions, limit, continuity and differentiability of functions, Integration by using different integration techniques, standard integrals, definite integrals parts, vectors and scalars, resolution of vectors, scalar and vector product of two and more vectors, gradient, divergence, curl and directional derivative of vectors.
2. **Linear Algebra:** Definition and basic properties of matrices and determinants Rank of matrix, system of linear equations, inverse of a matrix, Eigen values and Eigen vectors.
3. **Infinite series:** Definitions of sequence and infinite series, the necessary conditions for convergence of an infinite series, test of convergence, alternating series test.
4. **Fourier series:** Periodic functions, Fourier series on the functions of period 2π, Euler's formula, Fourier series of a function having arbitrary period, even and odd functions and their Fourier series, half range functions
5. **Laplace transformation:** Laplace transform, Application of Laplace transform, Inverse Laplace transform, Convolution theorem on Laplace transform and application, Differential ewuation (ODE and PDE).
6. **Z-transform:** Definitions, one-sided and two-sided z-transform, linear time invariant system, Unit impulse function, properties of z-transform, region of convergence, inverse z-transform by residue and partial fraction, Parseval theorem, convolution.
7. **Nonlinear Equations:** Review of calculus and Taylor's theorem, errors in numerical calculations, trial and error method, Bisection method, Newton's method, Secant method
8. **Introduction of Descriptive Statistics:** Presentation and classification data frequency distribution, histogram, measures of central tendency -mean, median, mode, quartiles and percentiles, measures of dispersion (variability).

Section B: Circuit Theory, Fields, Basic Electronics and Instrumentation

1. **Electric Circuits :**
   Network graph, KCL, KVL, Node and Mesh analysis, DC/AC circuit analysis, Resonance, Passive filters, Ideal current and voltage sources, Thevenin's theorem, Norton's theorem, Superposition theorem, Maximum power transfer theorem, Three phase circuits, Power and power factor in ac circuits. Transient response: Transient response analysis for R-L, R-C & R-L-C circuits. Pole zero plots, Two port Networks: Z - parameters, Y-parameters & ABCD-parameters.
2. **Field:** Coulomb's Law, Electric Field Intensity, Electric Flux Density, Gauss's Law, Divergence, Electric field and potential due to point, line, plane and spherical charge distributions, Effect of dielectric medium, Capacitance of simple configurations, Biot-Savart's law, Ampere's law, Curl, Faraday's law, Lorentz force, Inductance, Magnetomotive force, Reluctance, Magnetic circuits, Self and Mutual inductance of simple configurations.
3. **Basic Electronics** :
   Characteristics of diodes, BJT, MOSFET; Simple diode circuits: clipping, clamping, rectifiers; Amplifiers: Biasing, Equivalent circuit and Frequency response; Oscillators and Feedback amplifiers; Operational amplifiers: Characteristics and applications; Simple active filters, VCOs and Timers, Combinational and Sequential logic circuits, Multiplexer, De-multiplexer, Schmitt trigger, Sample and hold circuits, A/D and D/A converters, 8085Microprocessor: Architecture, Programming and Interfacing.
4. **Instrumentation:** Bridges and Potentiometers, Measurement of voltage, current, power, energy and power factor; Instrument transformers, Digital voltmeters and multi-meters, Phase, Time and Frequency measurement; Oscilloscopes, Error analysis.

Section C: Electrical Machine Theory, Power System, Protection and High Voltage Engineering

1. **Electrical Machines:**
   Single phase transformer: equivalent circuit, phasor diagram, open circuit and short circuit tests, regulation and efficiency; Three phase transformers: connections, parallel operation; Auto-transformer, Electromechanical energy conversion principles, DC machines: separately excited, series and shunt, motoring and generating mode of operation and their characteristics, starting and speed control of dc motors; Three phase induction motors: principle of operation, types, performance, torque-speed characteristics, no-load and blocked rotor tests, equivalent circuit, starting and speed control; Operating principle of single phase induction motors; Synchronous machines: cylindrical and salient pole machines, performance, regulation and parallel operation of generators, starting of synchronous motor, characteristics; Types of losses and efficiency calculations of electric machines
2. **Power System :**
   Power generation concepts, ac and dc transmission concepts, Models and performance of transmission lines and cables, Series and shunt compensation, Electric field distribution and insulators, Distribution systems, Per-unit quantities, Bus admittance matrix, Gauss-Seidel and Newton-Raphson load flow methods, Voltage and Frequency control, Power factor correction, Symmetrical components, Symmetrical and unsymmetrical fault

analysis, operation System stability concepts, swing equation ; Equal area criterion , stability enhancements ,Power control: Load -frequency control, VAR-Volt control

3. **Protection:**
   Concept of switchyard components ,Relays and its types, circuit breaker , theory of ARC quenching , DC and AC circuit breaking, transient recovery voltage, Recovery voltage, Rate of rise of TRV and RV, Re-striking Voltage, frequency of oscillation , Principles of over-current, differential and distance protection; transformer protection , alternator protection , feeder and line protection , solid state relays and digital protection; and , Safety Engineering: Electric shocks, Equipment Earthing
4. **High Voltage Engineering** :
   Generation , Testing ; Switching and lightening overvoltage ,Protection against overvoltage , Dielectric breakdown- Gaseous breakdown – Vacuum breakdown, Corona discharges and Insulation coordination

Section D: Power Electronics, Energy Utilization and Conservation and Control Theory

1. **Power Electronics:**
   Characteristics of semiconductor power devices: Diode, Thyristor, Triac, GTO, MOSFET, IGBT; DC to DC conversion: Buck and Boost, Single and three phase configuration of uncontrolled rectifiers, Line commutated thyristor based converters, Bidirectional ac to dc voltage source converters, Issues of line current harmonics, Power factor, Distortion factor of ac to dc converters, Single phase and three phase inverters, Sinusoidal pulse width modulation.
2. **Energy Utilization and conservation:**
   Fundamentals of Electric drives – choice and applications; traction motors – characteristic features – electric braking, train movement and energy consumption; Design of illumination systems and various lighting schemes; Electric heating – methods of electric heating and its types – Electric welding - Principles of the conversion of solar radiation into heat; Solar Collectors-flat-plate collectors – concentrating collector – cylindrical parabolic; Wind energy conversion system: basic principles, site selection, basic components , Classification of WECS, Types of wind machines , Hydro-generation: Power output equation , components, site selection , turbine and generator selection.
3. **Control Theory:**
   Mathematical modeling and representation of systems, Feedback principle, transfer k diagrams and Signal flow graphs, Transient and Steady-state analysis of linear time invariant systems, Routh-Hurwitz and Nyquist criteria, Bode plots, Root loci, Stability analysis, Lag, Lead and Lead-Lag compensators; P, PI and PID controllers; State space model, State transition matrix.

Pokhara University

Faculty of Science and Technology

Entrance Examination Curriculum

Master of Science in Construction Management

Total marks: 150 Qualifying marks: 75 (Paying)/53(Scholarship)

Time: 3 hrs

Entrance curriculum mainly covers common topics of all streams covering Engineering Economics, Project Engineering, Construction Management and Engineering Professional Practice.

Section	Course	Weightage (%)
A	Engineering Economics	30
B	Project Engineering	30
C	Construction Management	30
D	Engineering Professional Practice	10
	Total	**100**

Section A: Engineering Economics:

Interest and Time Value of Money, Payback Period, Net Present Value, Internal Rate of Return, External Rate of Return, Benefit Cost Analysis, Financial and Economic Analysis, Breakeven Analysis, Sensitivity Analysis, Law of Demand and Supply.

Section B: Project Engineering:

Definition and Characteristics of Project, Project Cycle, Types of Project, Feasibility Analysis, Project Proposal, Bar Chart, CPM, PERT, Resource Levelling, Project Monitoring and Control, Earned Value Analysis, Time Cost Trade off Analysis, Capital Budgeting Techniques, Capital Structure Planning.

Section C: Construction Management:

Construction Management Framework, Material Management, Construction Equipment, Job Layout, Method of Contract, Types of Contract, Request for Proposal, Expression of Interest, Bidding Document, Tender Notice, Bid Evaluation, Conditions of Contract, Contract Document, Running Bill, Project Completion Report, Personnel Management, Project Maintenance, Health and Safety at site.

Section D: Engineering Professional Practice:

Ethics and Profession, Code of Conduct, Professional Associations, Nepal Engineering Council Act, Liability and Negligence, Professional Liability Insurance, Detailed duties of Engineers, Types of Business Organizations, Labor Law, Intellectual Property right.

Pokhara University
Faculty of Science and Technology
Central Entrance Examination Curriculum
Master of Science in Bioinformatics (M.Sc. Bioinformatics)

Total marks: 150 Qualifying marks: 75 (Paying) / 53 (Scholarship)
Time: 3 hrs

Entrance curriculum mainly covers the fundamental topics of Cell and Molecular Biology, Computer Science, and Mathematics and Statistics as follows.

Section	Course	Weightage (%)
A	Cell and Molecular Biology	50
B	Computer Science	30
C	Mathematics and Statistics	20
Total		100

Section A: Cell and Molecular Biology

1. Structure of the cell, Prokaryotic and eukaryotic cells, Membrane structure and function, Transport across cell membranes, Cell organelles and functions, Chromatin and chromosomes, and Cell division.
2. Properties and functions of carbohydrates, lipids, amino acids, proteins, enzymes, and vitamins. Carbohydrate metabolism and Electron transport system, and Photosynthesis.
3. Nucleic acids, Structure and functions of DNA and RNA, DNA replication, Gene, Genome, Central dogma, Gene transcription, Genetic code, Gene translation, Fundamentals of genetic engineering, Gene cloning vectors, Genetically modified organisms, Gene editing, Gene therapy, Mendel's law of inheritance, Chromosome aberrations, Genetic mutation, and Single Nucleotide Polymorphism, Polymerase chain reaction, Quantitative real time PCR, Gel electrophoresis, DNA fingerprinting.
4. Fundamentals of bioinformatics, Basic principles of genome sequencing, Gene and protein sequence, Human Genome Project, and Genome databases.

Section B: Computer Science

1. **Number System**: Binary systems and hexadecimal, Measurement of the size of computer memories, Example uses of binary and hexadecimal system
2. **Communication and internet technologies:** Introduction, Data transmission, Internet technologies, HTML, Hyperlinks, WWW, Web 2.0, Networks: WAN, LAN.
3. **Basic Logic gates and logic circuits:** Introduction, Logic gates, Truth tables, The function of the six logic gates, Simple Logic circuits, Universal Gates.
4. **Operating systems and computer architecture:** Operating systems, interrupts, CPU, computer memory hierarchy, input and output devices, file format.

5. **High- and low-level languages:** Programming languages types, translators, interpreters, compiling a program, running a program.
6. **Security and ethics:** What is computer security? Introductory concepts (Encryption, firewalls, proxy servers, biometric security) Data security needs and data integrity, cookies, loss of data and data corruption, security protocols, computer ethics, free software, freeware and shareware.
7. **Problem-solving and design:** Flow chart basics, computer program fundamentals, very simple concept of Algorithm design and pseudocode, conditional statements, loop structures, programming concepts (Declaration and use of variables and constants, basic data types) simple data structures, arrays.
8. **Databases:** Introduction, databases uses, structure of a database, role of databases in organizations.
9. **Computer Applications:** Artificial Intelligence and Big Data applications, applications of computer science in biological and medical systems, current trends of artificial intelligence and recent developments.

Section C: Mathematics and Statistics

1. Logarithms, Progressions, Partial Fractions, Binomial Expansion, Equations, System of Linear Equations, Inequalities, Systems of Linear Inequalities and their Graphs, Polynomial Equations, Basics of two-dimensional and three-dimensional coordinate geometry, Permutation and Combination, Set theory, Real Number System, Relation, Functions and Graphs, Limits and continuity, Derivatives, Anti-derivatives, Matrices and Determinants, Complex Numbers

2. Presentation of data, Descriptive statistics, basic probability concepts, Conditional probability, Random variables, Binomial distribution, Poisson distribution, Normal distribution, Terminology used in sampling, Sampling distributions of mean and proportion, Confidence interval, Sample size considerations, Terminology used in testing of hypothesis, Hypothesis testing: z-test, t-test and chi-square test, Correlation and Regression, Coefficient of determination.