MTH 212 Engineering Mathematics III (3-2-0)

Evaluation:

	Theory	Practical	Total
Sessional	50	-	50
Final	50	-	50
Total	100	-	100

Course Objectives:

The main objectives of this course is to provide the basic knowledge of linear algebra, vector calculus, Fourier series, linear programming by graphical and simplex methods. After the completion of this course, students can use their knowledge in their professional course.

Course Contents:

2. Matrix and Determinant: **8 hrs**

2.1 Review of Matrix and determinant with their properties
2.2 System of linear equation with their solutions by Gauss elimination methods
2.3 Rank of matrix
2.4 Consistency of system of linear equation
2.5 Vector space and sub space
2.6 Linear transformation
2.7 Eigen values and vectors, Cayley Hamilton theorem (statement only) and its application.

3. Vector Calculus **16 hrs**

2.1 Differentiation and integration of vectors
2.2 Gradient, divergence and curl with their properties (without proof)
2.3 Line integral: Definition of line integral, Evaluation of line integral, properties. Greens theorem, Area by Greens theorem
2.4 Surface integral: Surface integral, tangent planes, Gauss divergence theorem. Dirichelet integral
2.5 Stokes theorem

4. Infinite series **8 hrs**

2.1 Sequence and series
2.2 Necessary condition of convergence of infinite series
2.3 P-test (hyper-harmonic test)
2.4 Ratio test
2.5 Root test
2.6 Integral test
2.7 Leibnitz test and absolute convergence
2.8 Interval of convergence of power series.
2.9 Taylor and Maclaurin expansion (statement only) and its application

5. Fourier Series **6 hrs**

2.1 Periodic function, Trigonometric series, even and odd function
2.2 Fourier series of a function with period 2π and arbitrary period 2L
2.3 Fourier sine and cosine series representation of the half range function

6. Linear Programming **7 hrs**

2.1 System of Linear Inequalities
2.2 Linear Programming
- 6.2.1 Model Formulation
- 6.2.2 Graphical Solution
- 6.2.3 Simplex method
- 6.2.4 The Dual model
- 6.2.5 Dual Simplex Method

Text Books:

1. Kreyszig, Erwin. *Advance Engineering Mathematics* (8th edition). New Delhi: Wiley-Easter Publication.
2. Paudel, Toya Narayan. *Engineering Mathematics III*, Bhotahity: Sukunda publication.

References:

1. Thomas, George B.& Finney, Ross L. *Calculus and Analytical Geometry.*
2. Swokoswski, E. W. *Calculus with Analytical Geometry.*
3. Singh, M. B. *Vector Analysis.*
4. Pant, G. D. *Algebra.*

MEC 131 Applied Mechanics II (2 – 2 – 0)

Evaluation:

	Theory	Practical	Total
Sessional	50	-	50
Final	50	-	50
Total	100	-	100

Course Objectives:

The purpose of the course is to provide basic knowledge of engineering mechanics dynamics portion to the students such that they can understand the basics of kinematics and kinetics for both particles and rigid bodies and their motion which can be applied in wide range of engineering applications.

Course Contents:

1. **Kinematics of Particles** — 5 hr
   - 1.7 Rectilinear Motion of Particles
   - 1.8 Curvilinear Motion of Particles
   - 1.9 Rectangular Components of Velocity and Acceleration
   - 1.10 Tangential and Normal Components
   - 1.11 Radial and Transverse Components
   - 1.12 Detailed Gravitational Motion

2. **Energy and Momentum Methods of Particles** — 5 hr
   - 2.1 Work done by Spring and Gravity
   - 2.2 Work done by a Force
   - 2.3 Kinetic and Potential Energy
   - 2.4 Principle of Work and Energy Applications
   - 2.5 Power and Efficiency
   - 2.6 Conservation of Energy
   - 2.7 Principle of Impulse and Momentum
   - 2.8 Impulsive Motion and Impact
   - 2.9 Direct Central and Oblique Impact

3. **Systems of Particles** — 5 hr
   - 3.1 Newton's Second Law and Systems of Particles
   - 3.2 Linear and Angular Momentum of a System of Particles
   - 3.3 Equations of Motion, Motion due to Central Force and Dynamic Equilibrium
   - 3.4 Conservation of Momentum
   - 3.5 Kinetic and Potential Energy of a System of Particles
   - 3.6 Conservation of Energy of a System of Particles
   - 3.7 Principle of Impulse and Momentum of a System of Particles
   - 3.8 Steady Streams of Particles
   - 3.9 System with Variable Mass

4. Kinematics of Rigid Bodies **4 hrs**

4.1 Introduction
4.2 Translation and Rotation about fixed axis
4.3 General Plane Motion
4.4 Absolute and Relative Velocity in General Plane Motion
4.5 Instantaneous Centre of Rotation
4.6 Absolute and Relative Frame; Coriolis Acceleration in Plane Motion
4.7 Rate of Change of a General Vector with respect to a rotating Frame; Coriolis Acceleration
4.8 General Motion and Motion about a Fixed Point
4.9 Three-dimensional Motion of a Particle relative to a rotating Frame; Coriolis Acceleration

5. Revision of Plane Motion of Rigid Bodies: Forces, Moments and Accelerations **4 hrs**

5.1 Introduction
5.2 Equation of Motion of a Rigid body in Plane Motion
5.3 Angular Momentum of Rigid bodies in Plane Motion
5.4 Plane Motion of Rigid body; D'Alemberts Principle
5.5 Application of Rigid Body Motion in Plane

6. Plane Motion of Rigid bodies: Energy and Momentum **5 hrs**

6.1 Principle of Work and Energy for Rigid bodies
6.2 Work done by External Forces
6.3 Kinetic Energy of Rigid body in Plane Motion
6.4 Conservation of Energy: Work- Energy Application
6.5 Impulse and Momentum for Systems for Rigid bodies
6.6 Conservation of Angular and Linear Momentum
6.7 Impulsive Motion and Eccentric Impact

7. Mechanical Vibration **2 hrs**

7.1 Undamped free Vibration for Particles and Rigid bodies
7.2 Simple Harmonic Motion
7.3 Frequency and Period of Oscillation
7.4 Application of Vibration in Civil Engineering

Text Books:

1. "Engineering Mechanics-Statics and Dynamics", Shames, I. H. 3rd ed., New Delhi, Prentice Hall of India, 1990.
2. "Mechanics of Engineers-Statics and Dynamics", F. P. Beer and E. R. Johnston, Jr. 4th Edition, McGraw-Hill Book Co., New York, USA (Asia Editions), 1987.

References:

1. "Engineering Mechanics-Statics and Dynamics", R.C. Hibbeler, Ashok Gupta, 11th edition. New Delhi, Pearson, 2009.

2. "Engineering Mechanics- Statics and Dynamics", I.C. Jong and B.G. Rogers.
3. "Engineering Mechanics- Statics and Dynamics", D.K. Anand and P.F. Connif.
4. "Engineering Mechanics of Solids", Egor.P. Popov, 2nd Edition, New Delhi, Prentice Hall of India, 1996.
5. "Engineering Mechanics- Statics & Dynamics", Dr. D.S. Kumar,S.K. Kataria& Sons, New Delhi, Reprint 2011.

CVL 211 Civil Engineering Materials (2-0-2)

Evaluation:

	Theory	Practical	Total
Sessional	30	20	50
Final	50	-	50
Total	80	20	100

Course Objectives:

This course is intended to provide a basic knowledge of various civil engineering materials that can be used in construction and maintenance of civil engineering project. Different materials, their manufacturing process, composition and properties has been introduced which provides in important insight of materials that will help in selection and proper use of these materials. In addition, this course objects to provide hands-on experiences with testing of construction materials.

Course Contents:

1. Introduction **3 hrs**

1.1 Introduction and scope of civil engineering material

1.2 Types of civil engineering materials (metals, timber, ceramics, polymers, composites)

1.3 Properties of civil engineering materials: physical- density, specific gravity, opacity, porosity, water absorption capacity, fire resistivity; mechanical- strength (compressive, tensile, shear, flexural, impact), hardness, ductility, elasticity, resilience, toughness, stiffness, abrasive resistance, fatigue, creep; thermal- specific heat, thermal conductivity, thermal expansion; electrical-conductivity, electric permittivity, dielectric strength, magnetic- magnetic permeability, magnetic retentively

1.4 Material-Environment (temperature, humidity, rain and fire) interaction

2. Clay Products **4.5 hrs**

2.1 Constituents of good brick earth

2.2 Manufacturing of bricks

2.3 Qualities of good bricks

2.4 Classification of bricks (different classes and ISI classification) and their characteristics

2.5 Different tests for brick (shape and size, water absorption, efflorescence, compressive strength)

2.6 Stabilized earth bricks, sand-lime bricks and refractory bricks

2.7 Miscellaneous clay products: tiles, terracotta, earthenware, stoneware, concrete blocks

2.8 Glazing

3. Stone and Aggregates **4.5 hrs**

3.1 Physical classification of stones (stratified, unstratified and foliated)

3.2 Quarrying, dressing and seasoning of stone
3.3 Artificial Stone: Characteristics and uses
3.4 Classification of aggregate (fine and coarse)
3.5 Gradation of aggregate
3.6 Fineness modulus of aggregate
3.7 Bulking of Sand
3.8 Testing of coarse aggregate (water absorption, shape, abrasion, toughness, impact, soundness and reactivity)
3.9 Testing of sand (for clay, organic materials and salts)

Cementing Materials **4.5 hrs**

4.1 Clay as a cementing material
4.2 Lime: types (fat, hydraulic and poor), properties and its uses
4.3 Indian standard classification of lime
4.4 Cement, its composition (Bogue compounds) and properties
4.5 Hydration, heat of hydration and gain of strength of cement
4.6 Ingredients of cement and cement manufacturing process
4.7 Types of cement (OPC, PPC, RHC, white cement) and their uses
4.8 Testing of cement (fineness, soundness, consistency, setting time, compressive strength and tensile strength)
4.9 Mortar: function and types (mud, lime, cement and gauged)

Mechanical behavior **3 hrs**

5.1 Types of stress/strains (True and Engineering) and their relationship
5.2 Stress-strain curve of ductile and brittle materials
5.3 Fracture of metal: ductile and brittle
5.4 Mechanism of brittle fracture: Griffith's theory
5.5 Hardness: Types (scratch, indentation and rebound) and its tests (brinell and rockwell)
5.6 Impact strength and its test (charpy and izod)

Metals and Alloys **5 hrs**

6.1 Iron: types, manufacturing process, properties and uses
6.2 Steel: composition and types (carbon steel and alloy steel)
6.3 Types of carbon steels and their uses
6.4 Basic introduction of heat treatment of steel
6.5 Different forms of rolled steel section
6.6 Reinforcing steels (TOR and TMT)
6.7 Properties, advantages and uses of stainless steel, tool steel, brass, aluminum and duraluminum
6.8 Corrosion of metals and its prevention

Timber **3 hrs**

7.1 Timber: source, types, classification, characteristics, advantages and uses
7.2 Growth and structure of exogeneous tree
7.3 Defects in timber

7.4 Seasoning of timber: air, water, kiln, chemical, electrical and boiling
7.5 Preservation of timber
7.6 Properties and uses of bamboo
7.7 Wood based products (veneer, plywood, impreg timber, compreg timber, boards)

8. Miscellaneous Materials **2.5 hrs**

8.1 Types, properties and uses of Asphalt, Bitumen and Tar
8.2 Types, properties and uses of Glass, Plastics and Rubber
8.3 Gypsum products and Composite materials

Laboratory Works:

1. Determination of specific gravity of cement
2. Determination of bulk density of sand and coarse aggregate
3. Gradation and determination of fineness modulus of aggregate
4. Test of sand for presence of clay and organic materials
5. Generation of curve for bulking of sand
6. Water absorption and efflorescence test of bricks
7. Determination of compressive strength of brick and cement.
8. Abrasion and toughness test of coarse aggregate
9. Determination of fineness, consistency, soundness, setting time of cement
10. Toughness test of timber and mild steel

Field Visit:

One industrial visit.

Text Books:

1. Singh, P. (2008). *Civil Engineering Material.* Katson Books.
2. Rajput, R.K. (2004). *Engineering Material*, New Delhi: S. Chand & Company Ltd.

References:

1. Singh, G., & Singh, J. *Building Materials*. Delhi: Standard Publishers Distributors.
2. Khurmi R.S. & Sedha. *Material Science and Processes*. New Delhi: S. Chand and Company Ltd.
3. Peter A. Thronton & Vito J. Colangelo (1985). *Fundamentals of Engineering Materials*. Prentice Hall.

WRE 210 Fluid Mechanics (3 – 2 – 2)

Evaluation:

	Theory	Practical	Total
Sessional	30	20	50
Final	50	-	50
Total	80	20	100

Course Objectives:

The course aims to acquaint the students with basic concepts of Fluid Mechanics. The general objectives of the course is to provide sound understanding of the properties of fluids and fluid forces in static and dynamic applications and to apply understanding to the solution of a wide variety of engineering fluids problems including problems in the application phase of irrigation and hydropower engineering courses.

Course Contents:

1. Physical Properties of Liquid **4 hrs**

1.1 Definition of Fluid Mechanics: basic concept, scopes and application in civil engineering

1.2 Matters as solid, fluid or gas; shear stress in fluids and difference between solids and fluids

1.3 Control volume and continuum concept in fluid mechanics

1.4 Physical properties of liquid: mass density, specific weight, specific volume, relative density, specific gravity, cavitation and vapor pressure, cohesion and adhesion, surface tension, capillarity (relations, their dimensions, units as well as values for different materials)

1.5 Viscosity: definitions, causes of viscosity in liquid and gases, Newton's law of viscosity, variation of viscosity with temperature, classification of fluids as Newtonian and Non-Newtonian

2. *Fluid Pressure and its Measurement* **5 hrs**

2.1 Intensity of pressure

2.2 Pascal's law

2.3 Fundamental equation of fluid statics (Pressure-Depth relationship)

2.4 Absolute, gauge and atmospheric pressure at a point and their relationship

2.5 Pressure head at a point and units of pressure measurement

2.6 Measurement of pressure:

2.6.1 Manometers: Simple manometer as piezometer, U-tube manometer, vertical and inclined single column manometer, differential manometer, inverted U-tube differential manometer, micro-manometer as differential manometer

2.6.2 Mechanical gauge: Introduction, general working principle and simple diagram of bourden tube pressure gauge, diaphragm pressure gauge, bellows pressure gauge and dead weight pressure gauge

3. Hydrostatic Forces on Submerged Surfaces **5 hrs**

3.1 Introduction
3.2 Total pressure and centre of pressure (horizontal, vertical and inclined plane and curve surfaces)
3.3 Pressure diagram (horizontal, vertical and inclined plane and curve surfaces)
3.4 Computation of pressure forces on gates, dams, head water tank and other hydraulic structures (plane and curve)

4. Equilibrium Stability **6 hrs**

4.1 Buoyancy, floatation concept, thrust on submerged and floating surfaces
4.2 Condition of equilibrium: stability of submerged and floating bodies
4.3 Metacentre and determination of metacentric height (analytical and experimental method)
4.4 Liquid in relative equilibrium: liquid in a container subjected to uniform acceleration in horizontal, vertical and inclined directions; and uniform radial acceleration about vertical axis

5. Fluid Kinematics **4 hrs**

5.1 Introduction
5.2 Approaches: Lagrangian and Eulerian
5.3 Description of flow patterns: streamlines, streak lines, path lines, stream tube
5.4 Types of fluid flow: uniform and non-uniform, steady and unsteady, one dimensional, two and three dimensional, laminar and turbulent
5.5 Conservation principle of mass and continuity equation of cartesian and polar co-ordinates
5.6 Flow through stream tube, discharges and mean velocity of flow

6. Fluid-Dynamics **4 hrs**

6.1 Introduction
6.2 Various forces acting on a fluid in motion (gravitational, pressure, viscous, turbulent, surface tension and compression)
6.3 Introduction to Reynolds' and Navier-Stokes' equation of motion
6.4 Development of Euler's equation of motion and its application
6.5 Various forms of energies/head in fluid flow
6.6 Bernoulli's equation: derivation, assumptions, applications and its physical meaning

7. Flow Measurements **7 hrs**

7.1 Flow measurement devices: Venturimeter (horizontal, inclined & vertical), Orifice meter, Nozzle meter and Pitot tube
7.2 Flow through orifices: small orifice, large orifice, partially and totally submersed orifices
7.3 Hydraulic coefficients (C_v, C_c and C_d) and their determination
7.4 Notches and weirs: definition and classification

7.5 Discharge equation for rectangular, triangular, trapezoidal and Cippoletti notches with & without approach velocity consideration, narrow crested weir, broad crested weir, sharp crested weir and ogee weir

7.6 Emptying and filling of reservoir: without inflow (rectangular/cylindrical, conical and hemispherical tank or vessel), with inflow (cylindrical /rectangular tank or vessel)

8. Momentum Analysis of Flow **5 hrs**

8.1 Introduction

8.2 Derivation of impulse-momentum equation

8.3 Applications of equations to calculate forces on pipe bends enlargements and reducers

8.4 Forces exerted by jets on stationary and moving vanes of different shapes (vertical, inclined and curved)

8.5 Concept of angular momentum and its applications with example

9. Flow Through Submerged Body and Boundary Layer Theory **3 hrs**

9.1 Introduction to drag and lift forces on a submerged body

9.2 Expression for drag and lift forces

9.3 Drag (pressure & friction) on flat, cylindrical and spherical shaped body, concept of aerofoil

9.4 Boundary layer theory: definition, boundary layer concept along a thin flat plate (laminar, transition, turbulent boundary layers and laminar sub layer), characteristics

9.5 Boundary layer thickness: displacement, momentum and energy thicknesses

9.6 Civil engineering applications of boundary layer concept

10. Dimensional Analysis **2 hrs**

10.1 Introduction to dimensional analysis (physical quantity and their dimensions)

10.2 Methods of dimensional analysis: Rayleigh's method and Buckingham's π-theorem

10.3 Applications of dimensional analysis

Laboratories:

1. Newton's law of viscosity
2. Hydrostatic force on a submerged body
3. Stability of a floating body
4. Verification of Bernoulli's theorem
5. Impact of flow jet
6. Flow through edged orifice
7. Flow over broad-crested weir

Text Books:

1. Modi, P.N. and Seth, S. M. *Fluid Mechanics and Hydraulic*
2. Rajput, R. K. *Fluid Mechanics and Hydraulic Machines*

References:

1. Bansal, R. K. *A Text book of Fluid Mechanics.*
2. Jain, A.K. *Fluid Mechanics and Hydraulics.*
3. Jagdish Lal. *Fluid Mechanics and Hydraulics.*
4. Webster. *Fluid Mechanics.*
5. Dixit, A. *Water science.*
6. Garde, R. J. *Fluid Mechanics.*

STR 210 Strength of Materials (3 – 2 – 1)

Evaluation:

	Theory	Practical	Total
Sessional	30	20	50
Final	50	-	50
Total	80	20	100

Course Objectives:

The main objective of this course is to provide basic concept of force, stress, strain and basic properties of materials under stress. The course will also give concept of thin walled vessels and columns. Student will be able to use software and compare the results.

Course Contents:

1. **Introduction** 1 hr
   - 1.1 Types of loads – Static, Dynamic; Self weight, Imposed; Temperature
   - 1.2 Types of supports and their symbolic representation
   - 1.3 Reactions

2. **Geometrical Properties of Plane Areas** 6 hrs
   - 2.1 Centroids of areas
   - 2.2 Centroids of composite and built - up steel section
   - 2.3 Moment of inertia, polar moment of inertia, product of inertia and radius of gyration
   - 2.4 Parallel axis theorem
   - 2.5 Moment of inertia of composite and built - up steel section
   - 2.6 Transformation equations for moment of inertias and product of inertia
   - 2.7 Principal axes and principal moment of inertia
   - 2.8 Use of Mohr's Circle for transformation of moment of inertia and to find principal MOI

3. **Stress and Strain Analysis** 8 hrs
   - 3.1 Axial loading, normal stress, normal strain and Hooke's law
   - 3.2 Transverse loading, shear stress, shear strains and their relationship
   - 3.3 Poisson's ratio, volumetric strain, bulk modulus and Generalized Hook's law
   - 3.4 Stress under general loading condition and components of stress
   - 3.5 Elastic and elasto-plastic behavior in axial loading
   - 3.6 Ultimate stress, allowable stress and factor of safety
   - 3.7 Deformation of axially loaded bars (uniform, varying cross section and composite)
   - 3.8 Problems involving temperature effect
   - 3.9 Relation between the elastic constants
   - 3.10 Statically indeterminate axially loaded members (elementary)
   - 3.11 Stress tensor

4. Analysis of Beams and Frames **5 hrs**

4.1 Static indeterminacy (external and internal) (introduction)
4.2 Axial force, Shear force and Bending moments in structural members and their sign conventions.
4.3 Superposition of axial force, shearing force and bending moment
4.4 Determination of internal forces in statically determinate beams and rigid jointed plane frames
4.5 Maximum shearing force and bending moment and their position
4.6 Macaulay's method
4.7 Plotting axial force, shear force and bending moment diagrams for plane frames
4.8 Use of structural analysis software for analysis of structure

5. Transformation of Stress and Strain **5 hrs**

5.1 Introduction
5.2 Equations for transformation of plane stress
5.3 Principal stresses, Maximum shear stress and their planes
5.4 Equations for transformation of plane strain
5.5 Principal strains, Maximum shear strain and their planes
5.6 Mohr circle of stresses and strains

6. Theory of Flexure **6 hrs**

6.1 Beams of uniform and symmetric cross-section in pure bending
6.2 Normal and shearing stress due to bending
6.3 Analysis of composite beams
6.4 Problems based bending and shear stress
6.5 Calculation of deflection in uniform and symmetric beams in bending in simple cases.

7. Torsion **4 hrs**

7.1 Introduction
7.2 Calculation of torsional moment in element by the method of section
7.3 Analysis of torsional stress in solid circular section and their deformations (Torsional equation)
7.4 Shear stress distributions in hollow circular section
7.5 Power transmitted by shaft
7.6 Elastic and plastic torsion (Introduction only)

8. Thin Walled Structures **3 hrs**

8.1 Definition and characteristics of thin-wall vessels and shell structures
8.2 Types of stresses in thin-walled vessels
8.3 Calculation of stresses and strains in thin-walled spherical and cylindrical vessels

9. Buckling and Stability in columns **3 hrs**

9.1 Buckling and stability in columns
9.2 Euler's formula for columns with different end constraints
9.3 Generalized Euler's formula and drawback of Euler's theory

9.4 Concept of effective length and slenderness ratio
9.5 Rankine's formula

10. Springs 4 hr

10.1 Types of Springs
10.2 Close coiled, open coiled springs and laminated springs
10.3 Numerical based on springs
10.4 Impact loading and stress (introduction only)

Laboratories:

1. Material properties in uneasily structures (a) tension test (b) bending test.
2. Torsion test to determine modulus of rigidity.
3. Graphical method (Mohr's circle) of determining principal stresses and strains (Maximu shear stress).
4. Column behaviour

Text Books:

1. Rajput, R.K. (2006). *Strength of Materials*, S. Chand & Company Ltd.
2. Gere and Timosenko. *Mechanics of Materials.*
3. Ramamurtham, S. *Strength of Materials.*

References:

1. Timoshenko & Young. *Elements of Strength of materials*. East West Press Pvt. Ltd.
2. Ryder. G. H. *Strength of Materials*. McMillan ELBS.
3. Popov, E.P. *Mechanics of Materials*. Prentice Hall of India.

GTE 210 Engineering Geology (3 – 1 – 2)

Evaluation:

	Theory	Practical	Field Work	Total
Sessional	20	15	15	50
Final	50	-	-	50
Total	70	15	15	100

Course Objectives:

This course has been designed to provide basic knowledge of geology to the students of civil engineering. It would be helpful for them to understand how to identify the different types of rocks, minerals, geological structures, geological processes and their impacts on engineering structures. The students will also be able to analyze and use of geological and engineering geological maps. After completing this course, the students will know basic information on hydro-geology, geological setting of Himalaya, and geological structures for development of different infrastructures.

Course Contents:

2 hrs

1. **Introduction to Engineering Geology**
   - 1.1 Definition of geology and branches of geology
   - 1.2 Introduction of engineering geology (definition according to IAEG)
   - 1.3 Scope and objective of engineering geology in the field of civil engineering
   - 1.4 Importance of engineering geology in the context of Nepal

2 hrs

2. **Structure of the Earth**
   - 2.1 Internal structure of the Earth
   - 2.2 Plate tectonics and mountain building process
   - 2.3 Origin of Himalaya
   - 2.4 Geomorphology of Nepal Himalaya

4 hrs

3. **Mineralogy**
   - 3.1 Introduction of minerals and crystal
   - 3.2 Crystallographic axes and angle, crystal system
   - 3.3 Physical properties of minerals
   - 3.4 Rock forming minerals and their engineering significance

6 hrs

4. **Petrology**
   - 4.1 Petrographic classification of rocks and rock cycle
   - 4.2 Introduction, classification, structure, texture, uses and engineering significance of igneous rock, sedimentary rock and metamorphic rock
   - 4.3 Identification criteria of sedimentary, metamorphic and igneous rock in the field.

8 hrs

5. **Structural Geology**
   - 5.1 Primary and secondary structures
   - 5.2 Penecontemporaneous structures

5.3 Introduction to rock deformation reasons and its effect
5.4 Attitude of geological structures (Dip, Strike, Plunge, Trend)
5.5 Study of folds faults, joint and unconformity
5.6 Identification criteria of geological structures in the field
5.7 Study of rock mass classification system
5.8 Introduction of bore hole and bore hole problems

6. Rock Slope Engineering and Earth Processes **8 hr**

6.1 Introduction to different geological agent: running water, ground water, glacia wind and sea water
6.2 Various landforms produced by geological agents
6.3 Study of earth processes (Weathering, erosion, subsidence, expansive soil, mas wasting, volcanism Earthquake and glaciation) and the effect on development surfaces of the earth
6.4 Geological Indicators of impending disasters
6.5 Stereographic projection
6.6 Kinematic analysis of discontinuities and the slope

7. Hydrogeology **2 hr**

7.1 River channel morphology
7.2 Ground water movement and its origin
7.3 Introduction to aquifer
7.4 Spring Engineering
7.5 Significance of subsurface water movement

8. Site Investigation **6 hr**

8.1 Elements of an investigation
8.2 Type of site investigation (Direct and Indirect Methods)
8.3 Study of topographic, geological and engineering geological maps
8.4 Geological investigation for dam, reservoir, road, building, bridges and tunnel

9. Geology of Nepal **3 hr**

9.1 Geological division of Nepal
9.2 Engineering geological problem of each geological division of Nepal
9.3 Major rock type, Soil type, construction material and geological structure foun in different geological division of Nepal

10. Study of Reserve Estimation of Construction Material **4 hrs**

10.1 Types of reserves
10.2 Introduction to methods of estimation of reserve (cross section, isopath, extended area and block method)
10.3 Basic information of different quarry sites of limestones and Iron in Nepal

Laboratories:

1. Identification of minerals
2. Identification of rocks

3. Study of topographic maps and geological maps
4. Engineering geological mapping for road and landslide
5. Study of Arial Photographs and Image Satellite
6. Study of borehole problems
7. Plotting of stereo-net

Field Visit:
Three days field trip for geological survey and study.

Text Books:

1. Singh, P. (2004). *A Text Book of Engineering & General Geology*, Delhi: S. K. Kataria & Sons.
2. Sharma C.K. *Geology of Nepal.* Educational Enterprises.

References:

1. Banger, K.M. *Principles of Engineering Geology.* Standard Publisher Distributors.
2. Dahal, R. K. (2006). *Geology for Technical Students.* Bhrikuti Academic Publications.
3. Upreti, B. N. *Geology of Nepal Himalaya* (Unpublished).
4. Ander. *Principles of Physical Geology*, New York: John Wiley and Sons.
5. Billings, M.P. *Structural Geology*, New Delhi: Prentice Hall of India Private Limited.

CVL 290 Project I (0 – 0 – 2)

Evaluation:

	Theory	Practical	Total
Sessional	-	50	50
Final	-	50	50
Total	-	100	100

Course Objectives:

Project I is a compulsory course intended to enable the students to be familiar, distinguish and write the general and technical reports and proposals. During the course of study, student should select a course topic in any field of Civil Engineering. Certain guidelines will be provided by the course coordinator at the start of the semester. Individual study topic shall be assigned to the student. At the end of the semester, student shall submit a hard copy report. Besides this, course will also develop the skills of oral presentation; make them able to prepare seminar papers, workshop papers and poster designing. The major objectives of this course are:

- To enable the student for identifying problems in some field of Civil Engineering
- To promote students for collecting some sort of relevant data and prepare proposal for addressing the issue
- To impart skill for writing a proposal on the identified problem after the preliminary study
- To develop the skills of oral presentation; make them able to prepare seminar papers, workshop papers and poster designing

Course Contents

1. **Identifying the problem in the field of civil Engineering**

2. **Writing Proposal**
   - 2.1 Introduction
   - 2.2 Parts of the proposal
     - 2.2.1 Title page
     - 2.2.2 Abstract/Summary
     - 2.2.3 Statement of Problem
     - 2.2.4 Objectives
     - 2.2.5 Procedure/Methodology
     - 2.2.6 Conclusion

3. **Report Writing**
   - 3.1 Informal Reports: Memo writing
   - 3.2 Project Report
     - 3.2.1 Introduction
     - 3.2.2 detail contents
     - 3.2.3 conclusion
   - 3.3 Formal report
     - 3.3.1 executive summary
     - 3.3.2 Introduction

3.3.3 Main body
3.3.4 Conclusion and recommendation
3.3.5 Annexes

4. **Presentation Skills**

5. **Seminar Paper Presentation**

6. **Engineering Poster Design**

7. **Workshop paper Training**

Evaluation:
Individual presentation of submitted report is the final evaluation of the course. Evaluation scheme is as below:

- 50 marks is assigned by the course coordinator for overall study period and hard copy report.
- 50 marks is assigned for the presentation of the report.

References:

1. Kumar, Ranjit (2006). *Research Methodology*. Pearson Education.
2. *Report writing for technicians & Engineers.*