Fourth Semester
Subjects:

1	EG 2201 SH	Social Engineering
2	EG 2201 AR	Construction Drawing and CAD
3	EG 2201 CE	Surveying II
4	EG 2202 CE	Estimating and Costing I
5	EG 2203 CE	Mechanics of Structure
6	EG 2204 CE	Soil Mechanics and Foundation Engineering
7	EG 2205 CE	Water Supply Engineering

Social Engineering
EG 2201 SH

Year: II **Total: 2 Hrs. /week**
Semester: II **Lecture: 2 Hrs./week**
Tutorial: Hrs./week
Practical: Hrs./week
Lab: Hrs./week

Course Description:
The main objective of social engineering course is to introduce about the Nepal in different aspect. This is an integrated course for diploma engineering level students comprising of social, cultural, history, geography, political, economy, religion, moral science subjects in general.

Course Objectives:
The diploma engineering students will be familiar in the following topics:
1. Introduce social science and social study
2. Understand economy condition of Nepal
3. Know the social and cultural change in short description
4. Understand the history of engineering
5. Know the professional ethics
6. Introduce briefly to the environment, social service, social development and social research

Course Contents:

Unit 1: Introduction to sociology, social study and social science [5 Hrs]

1.1. Introduction, scope and importance of social study, community
1.2. Relationship of sociology and social study
1.3. Relation between sociology and social science
1.4. Difference between social study and social science
1.5. Society: meaning, definition and characteristics
1.6. Introduction to sociology and rural sociology
1.7. Interrelation between social science and physical science
1.8. Interrelation between social study and other subjects
1.9. Science and engineering
1.10. Science and technology
1.11. Science and society
1.12. Science and religion
1.13. Applied sociology

Unit 2: Economy condition of Nepal [3 Hrs]

2.1. How an economic system functions, The theory of demand and supply
2.2. Importance of trade, Industry, Agriculture, transportation and communication
2.3. Features of economy, agro economy, mixed economy, common economy and phase wise development

Unit 3: Social and cultural change [6 Hrs]

3.1. Meaning of social and cultural change, Theory of origin of society, Culture: meaning, definition and characteristics
3.2. Social Norms & Values: meaning, definition and characteristics
3.3. Principle of social and cultural change, Theory of social and cultural change cultural values, norms, Discovery, Innovation, Diffusion, Acculturation & Modernization.
3.4. Characteristics of social change, Technology and social change, social movements
3.5. Factors causing social changes, Type of social change
3.6. Impact of Culture Change on Individuals and Communities
3.7. Industrialization and social change
3.8. Influence of technology in rural social life
3.9. Characteristics of industrial and rural society
3.10. Concept of urbanization and urban development

Unit 4: Introduction of Social development and services [4 Hrs]

4.1. Meaning and objectives of social development project
4.2. Concept of Social development program
4.3. Introduction of Social development and community participation in development activities, types of participation, Important of community participation
4.4. Social service: definition, types, characteristics and objective
4.5. Social worker: definition, types, characteristics and role
4.6. Position of women in society social inclusion

Unit 5: Concept of Social survey [4 Hrs]

5.1. Definition, characteristics, Methods, types and objectives
5.2. Steps of social survey
5.3. Social report writing: Introduction, definition, purpose, formats

Unit 6: Ethics and Moral [8 Hrs]

6.1. Definition of Ethics, Concept of ethics, Major religions of the world
6.2. Introduction of Engineering Ethics, Code of ethics
6.3. Introduction of Moral and immoral, Meaning of religion, Major religions of the world
6.4. Definitions of Utilitarianism, Duty Ethics, Right ethics, Virtue Ethics,
6.5. Definitions of Personality Tort, Social Responsibility, Plagiarism &Cheating, Whistleblowing
6.6. Ethic and Engineering
6.7. Ethics and social responsibility, negligence, tort and duty and liability
6.8. Professional Practice in Nepal

Evaluation scheme

The questions will cover all the chapters in the syllabus. The evaluation scheme will be as indicated in the table below:

Chapter	Title	Hrs.	Mark distribution
1	Introduction to social study and social science	05	6
2	Economy condition of Nepal	03	4
3	Social and cultural change	06	8
4	Introduction of Social development and services	04	6
5	Concept of Social survey	04	6
6	Ethics and Moral	08	10
Total		30	40

Textbooks

1. Rao C. N. Shanker (2005), Sociology, S. Chand, New Delhi
2. Schaefer, Richard T. and Robert P. Lamm (1999), Sociology (6th edition), Tata McGraw-Hill, New Delhi.
3. Dominelli, Lena (1997), Sociology for Social Work, Palgrave, London.

References

1. Berger, Peter (1963) An Invitation to Sociology, Anchor Books, New York.
2. Beteille, Andre (2002) Sociology: Essays on approach and Method, OUP, New Delhi.
3. Calhoun, Craig (2002) Dictionary of Social Sciences, OUP, Oxford.
4. Giddens, Anthony (2001) Sociology (4th edition), Polity Press, Cambridge.
5. Dr. Rajendra Adhikari, "Engineering Professional Practice- Nepalese and International Perspectives" Pashupati publishing house, Kathmandu, Nepal
6. Er Santosh Kumar Shrestha and Er Ram Kumar Shrestha 2nd Edition, (Aug2016) "Text book of Engineering Professional Practice" Heritage Publisher and distributors Pvt. Ltd., Kathmandu, Nepal
7. M. Govindarajan, S. Natarajan, V.S. Senthil Kumar, (Jan 2015) "Engineering Ethics includes Human Values", PHI Learning Pvt. Limited, New Delhi-110092,
8. https://resources.saylor.org/wwwresources/archived/site/textbooks/OpenStax%20Sociology.pdf

Construction Drawing and CAD
EG 2201 AR

Year: II **Total: 5 Hrs. /week**
Semester: II **Lecture: 1 Hrs./week**
Tutorial: 0 Hrs./week
Practical: 4 Hrs./week
Lab: 0 Hrs./week

Course Description:
This course provides students with a broad introduction into 2-dimensional and basic of 3-dimensional Computer-Aided Drawing and Drafting (CADD) with a focus on civil engineering drawings. This course is an intensive introduction to the use of a Computer Aided Design and Drafting (CADD) system for the development of construction drawing and documentation. Moreover, it also intends to impart skills on preparing drawings and sketches of construction details for building construction and construction of other structures and its implementation in field.

Course Objectives:
After the completion of this course student will be able to:
1. Introduce CAD software programs (Autodesk Auto CAD) to model construction projects
2. Create basic Civil and Architectural drawings;
3. Prepare setting out drawings for construction activities;
4. Prepare working drawings of different components of earthquake resistant buildings;
5. Prepare working drawing of engineering constructions;
6. Prepare basic 3-d objects;
7. Perform hand drawing.

Course contents:

Theory

Unit 1: Introduction to the Construction Drawing and CAD: [2 Hrs.]
1.1. Overview of the type of drawings (Concept drawing, working drawing, Structural drawing and As-built drawing etc.)
1.2. Introduction to application software (especially CADD, Land Development software) and its installation.
1.3. Computer graphics fundamentals (raster object and vector application) data storage and retrieval, hierarchical storage system, introduction to basic graphical application, drawing exchange.

Unit 2: Starting a New Drawing/Opening an Existing Drawing: [2 Hrs.]
2.1. Setting up a drawing, starting from scratch, using a Wizard, using an existing template file and creating a new template file.
2.2. Opening an existing drawing
2.3. Screen layout, pull-down menus, screen icons, command line and dialogue boxes, status bar toggles,
2.4. Setting preferences (Setting Units and Scale, managing drawing area by using MV setup and Limits, setting and use of drafting aids.
2.5. Saving Drawing in different formats (. dwg, dxf, dwt, pdf) and version of files.
2.6. Recovering Unsaved files.

Unit 3: Drawing Commands: [4 Hrs.]
3.1. Co-ordinate input methods (absolute, relative, polar, and dynamic)
3.2. Point, Lines, Polyline, Multiline, Construction Lines

3.3. Circle, Arc, Ellipse, Donut
3.4. Polygon, Rectangle, Spline, Solids etc.
3.5. Hatching
3.6. Text (multi-line & single line / true type fonts
3.7. Dimension tools

Unit 4: Modify Commands: [1 Hr.]

4.1. Object selection
4.2. Real-time pan and Zoom
4.3. Erase, Trim, Break
4.4. Copy, Cut, Mirror, Offset, Array,
4.5. Move, Rotate, Scale, Stretch,
4.6. Lengthen, Extend,
4.7. Chamfer, Fillet, explode, break at point, joint etc.

Unit 5: Features: [2 Hrs.]

5.1. View tools,
5.2. Layers concept, match and change properties.
5.3. measure and divide
5.4. inquiry commands (Id, Distance, Area, List, Mass property etc.
5.5. Working with Block, W-block and External References.
5.6. Drawing Exchange (convert to other format from drawing format and into drawing format)
5.7. Using drawing attributes, uses of predefined objects etc.
5.8. Uses of script files.
5.9. Use of Layout, and viewport to scale object and manage paper space.

Unit 6: Application of CADD in Civil Engineering Field: [1 Hr.]

6.1. Land development and surveying,
6.2. CADD and Highway Engineering
6.3. CADD and Building Drawing
6.4. CADD with water supply and sanitary drawings

Unit 7: Basic use of 3-D modeling in AutoCAD [2 Hrs.]

7.1. Overview of different 3-D planes and views.
7.2. Switching between 2-D and 3-D mode.
7.3. Changing UCS in 3-D mode.
7.4. Using Basic 3-D commands (Orbit, Extrude, Subtract and Slice)
7.5. Creating Basic 3-D objects (Box, Cylinder, and Cone etc.)
7.6. Creating Simple 3-D objects from 2-D objects (Round Table and extrude wall)

Unit 8: Plotters and Plotting the Drawing: [1 Hr.]

Practical

Unit 1: Starting a New Drawing/Opening an existing drawing [2 Hrs.]

1.1. Set up a drawing starting from scratch, using a Wizard, using and creating a template file, drafting aids.
1.2. Open an existing drawing
1.3. Prepare Screen layout, pull-down menus, screen icons, command line and dialogue boxes, toggles keys, Screen organization.
1.4. Set preferences (Setting Units and Scale, managing drawing area by using MV setup and Limits.)
1.5. Save drawing in different formats (. dwg, dxf, dwt, pdf) and versions of files.

1.6. Recover unsaved files.

Unit 2: Drawing Commands [5 Hrs.]

2.1. Draw a rectangle using Co-ordinate input methods (directive, absolute, relative and polar)
2.2. Draw Point, Lines, Polyline, Multiline, Construction Lines
2.3. Draw Circle, Arc, Ellipse, Donut
2.4. Draw Polygon, Rectangle, Spline, solids etc.
2.5. Hatch Objects and areas between lines.
2.6. Write Text (multi-line & single line / true type fonts)
2.7. Give Dimensions to various objects (circle, line, rectangle, polygon etc.) using Dimensions tools.

Unit 3: Modify Commands [2 Hrs.]

3.1. Perform various Object selection methods.
3.2. Apply: Erase, Trim, Break tools to modify the existing drawing.
3.3. Apply: Copy, Mirror, Offset, Array tools to modify the existing drawing.
3.4. Apply: Move, Rotate, Scale, stretch tools to modify the existing drawing.
3.5. Apply: lengthen Extend commands to modify the existing drawing.
3.6. Apply: Chamfer, Fillet, explode, and break at point and joint commands to modify the existing drawing.

Unit 4: Features [3 Hrs.]

4.1. Create Layers and perform match and change properties.
4.2. Measure line and divide in parts
4.3. Apply Inquiry commands
4.4. Perform Drawing Exchange (convert to the other formats from one drawing format.)
4.5. Use Layout, template and viewport to scale object and manage paper space.

Unit 5: Hand Drawing and Field Work: [30Hrs.]

5.1 Prepare drawing plate/plates of a Single Storied R.C.C. building with three or more rooms per floor with reinforced concrete slab meeting the requirements of Nepal Building code (NBC).
5.2 Prepare setting out plans for earth cutting and construction lines of building drawn in task 1 above.
5.3 Practice staking out in the field of the plan prepared on task 2 above.
5.4 Draw detail drawings of:
  5.4.1 Dog legged stair case (RCC)
  5.4.2 Door and Window frames including joints and fixing details
  5.4.3 Flush and panel door including joints and fixing details.
  5.4.4 Casement window including joints and fixing details.
5.5 Prepare a roof plan and elevation with valleys for CGI, and RCC roofing materials including their construction details.
5.6 Draw Racking, Flying and Dead shores with fixing details.
5.7 Draw septic tank and soak pit including sanitary fittings details.

Unit 6: Application of CADD in Civil Engineering Field [12Hrs.]

6.1 Draw a complete architectural drawing using CADD software (Location plan, Site plan, Floor plans, Elevations, Sections and detailed structural drawing) of a R.C.C. building, with three or more rooms per floor and two and half storey, following Nepal Building Code (NBC).

Unit 7: Basic use of 3-D modeling in AutoCAD [5 Hrs.]

7.1 Make 3-D drawing of a single-room rectangular shaped building with flat slab.

Unit 8: Plot and change the scale of drawing from model space and also from layout. [1 Hrs.]

Textbooks:

1. Civil Engineering Drawing; Gurcharan Singh, Standard Publishers distributers
2. Mastering AutoCAD 2019 and AutoCAD LT 2019 by George Omura, SYBEX publisher

References:

1. Autodesk AutoCAD 2019 Fundamentals by Elise Moss, SDC Publications
2. Sushil Kumar; Building Construction, Standard Publishers Distributers
3. Dr. B.C. Punmia, A.K. Jain, Arun Kr. Jain, Building Construction, Laxmi publication
4. W.B. McKay, Building construction, Vols. I – IV, ELBS, LONGMAN,
5. "Building Drawing with an Integrated Approach to Built Environment" by Shah, Tata McGraw-Hill Education Pvt. Ltd
6. Building Planning and Drawing", S S Bhavikatti and M V Chitawa, I K International Publishing House Pvt. Ltd.

Minimum Standard:

1. A well – equipped computer lab.
2. Drawing hall with all necessary tools and infrastructure which includes drawing tables, boards and etc.
3. Setting out tools such as thread, pegs, hammer, level pipe, nails and set square etc.

Evaluation Scheme

S. N.	Chapter	Mark distribution
1	**Hand Drawing and Field work**	**20**
1.1	Architectural drawing of two storey Building (plans and Elevations / Plans and Sections)	10
1.2	Detail drawing of dog-legged staircase/door and window frames or flush and panel door or casement window, including joints and fixing details	5
1.3	Racking or flying or dead shores with fixing details/septic tank and soak pit including sanitary fitting 5 marks	5
2	**Application of CADD in Civil Engineering Field**	**20**
2.1	Architectural drawing of two storey Building (plans and Elevations /Plan and Section)	10
2.2	Detail drawing of dog-legged staircase/door and window frames/flush and panel door or casement window, including joints and fixing details	5
2.3	3-D modeling in AutoCAD for a single room R.C.C. building	5
	TOTAL	**40**

Note:

1. Examination should be conducted on practical basis.
2. Examination should be held in two shifts: each for hand drawing and AutoCAD drawing separately.

Surveying II
EG 2201 CE

Year: II
Semester: II

Total: 7 Hrs. /week
Lecture: 3 Hrs./week
Tutorial: Hrs./week
Practical: 4 Hrs./week
Lab: Hrs./week

Course Description
This course focuses on familiarization of different surveying techniques and equipment. The different surveying techniques include area, volume, coordinate system, and graphical and analytical method of mapping.

Course Objective
After the completion of this course, students will be able to:
1. Apply different surveying techniques of civil engineering field;
2. Use modern survey instrument for surveying, constructions and map making procedures.

Course Content

Theory

Unit 1: Contouring [8 Hrs.]
- 1.1 Definition of the terms – Contour line, Contour interval, Horizontal equivalent, Index contour
- 1.2 Characteristics of contour
- 1.3 Criteria for selection of contour interval
- 1.4 Methods of contouring – Direct method, Indirect method (Square method/ Radial method/Tachometric method/Cross section method)
- 1.5 Interpolation of contours (Arithmetic calculation, Graphical method, Estimation method)
- 1.6 Uses of contour maps, Interpretation of typical contours sheets
- 1.7 Field procedures

Unit 2: Plane Table Surveying [6 Hrs.]
- 2.1 Principles of plane table surveying
- 2.2 Accessories required in plane table surveying
- 2.3 Working operations of plane table surveying
- 2.4 Orientation – Orientation by magnetic compass, Orientation by back-sighting
- 2.5 Methods of plane table surveying – Radiation method, Intersection method (at least two points)
- 2.6 Introduction of Resection method
- 2.7 Advantages and Disadvantages of plane table surveying

Unit 3: Theodolite [11 Hrs.]
- 3.1 Introduction of theodolite
- 3.2 Geometry of theodolite, fundamental lines and planes of theodolites
- 3.3 Uses of theodolite
- 3.4 Classification of theodolite – Transit theodolite, and Non-transit theodolite

3.5 Essentials of theodolite – Telescope, Micrometer screw, Horizontal circle, Vertical circle, Optical plumet, Levelling screws, Bubble tube, Level tube, Upper clamp and Upper tangent screw, Lower clamp and Lower tangent screw
3.6 Working principle of theodolite
3.7 Terminology –Transiting, Swinging the telescope, Changing Face
3.8 Temporary adjustment of theodolite – Setting up of theodolite, Centering, Levelling
3.9 Reading a theodolite - Zero setting, Elimination of parallax, Face left observation, Face right observation
3.10 Measurement of Horizontal angle – Reiteration method, and Mean direction method
3.11 Measurement of Vertical angle and Zenithal angle
3.12 Sources of errors in theodolite survey

Unit 4: Theodolite Traversing [10 Hrs.]

4.1 Definition of Traversing, Purpose of Traversing
4.2 Types of Traverse – Closed traverse/Open traverse
4.3 Traverse field works
4.4 Omitted measurements in traverse field works
4.5 Traverse adjustment – computation of angles, angular error, correction of angle, Computation of bearings, Computation of consecutive coordinates, Error in consecutive coordinates (Latitude and Departure), Correction of consecutive coordinates (using Bowditch rule/Transit Rule), and Computation of Independent coordinates, Computation of Adjusted Length and Adjusted Bearing.
4.6 Traverse plotting

Unit 5: Area and Volume Measurement [10 Hrs.]

5.1 Area measurement of geometric figures - Triangle, Parallelogram, Trapezium
5.2 Measurement of area from offsets – Mid-ordinate rule, Average ordinate rule, Trapezoidal rule, Simpson's one third rule
5.3 Measurement of area from coordinates
5.4 Measurement of area from cross section
5.5 Measurement of volume from cross section and Longitudinal section (Level section, Two Level section)
5.6 Measurement of volume by Trapezoidal formula, and Prismoidal formula

Practical (Field works)

1. Perform Contouring on a sloped ground by indirect method (Grid method) [12 Hrs.]
2. Perform Plane tabling and detailing [08 Hrs.]
3. Carryout Theodolite handling practices [12 Hrs.]
4. Perform Theodolite traversing, computation, plotting of traverse in grid sheet [20 Hrs.]
5. Perform measurement of area of a plot [08 Hrs.]

Evaluation of Practical: Continuous evaluation (Viva + Instrumentation + Objective test)

Textbooks:

1. R. Agor, "Surveying and Leveling", Khanna Publication New Delhi.
2. Dhakal B.B. and Karki B.K., "Engineering Surveying I &II", Heritage Publishers and Distributers Pvt. Ltd., Kathmandu, Nepal.

References:

1. N Basnet and M Basnet, "Basic Surveying – I & II", Benchmark Education Support Pvt. Ltd., Tinkune Kathmandu and Rajmati Press, Lalitpur.
2. S K Duggal, "Surveying" Vol I and II, Tata MC Graw Hill Publishing.
3. Dr. B. C Punmia, " Surveying " Vol I and II, Laxmi Publication New Delhi

Evaluation Scheme

The questions will cover all the chapters in the syllabus. The evaluation scheme will be as indicated in the table below:

Chapter	Title	Hrs.	Mark distribution*
1	Contouring	08	12
2	Plane Table	06	08
3	Theodolite	11	20
4	Theodolite Traversing	10	20
5	Area and Volume Measurement	10	20
	Total	**45**	**80**

* **There may be minor deviation in marks distribution.**

Estimating and Costing I
EG 2202 CE

Year: II **Total: 7 Hrs. /week**
Semester: II **Lecture: 3 Hrs./week**
Tutorial: 3 Hrs./week
Practical: 1 Hrs./week
Lab: Hrs./week

Course Description:
This course focuses on familiarization of estimating and costing of building works.

Course Objectives:
After the completion of this course, students will be able to:
1. Understand the estimated cost, actual cost and types of estimation;
2. Understand the procedures methods of measuring and quantifying the building works and
3. Prepare the estimating the cost of building works.

Course Contents:

Theory

Unit 1: Introduction **[5 Hrs.]**
- 1.1 Definition of Estimating
- 1.2 Purpose of Estimating
- 1.3 Estimate versus Actual cost
- 1.4 Administrative approval
- 1.5 Technical sanction
- 1.6 Capital cost
- 1.7 District Rates
- 1.8 Abstract of cost
- 1.9 Bill of quantities
- 1.10 Contingency
- 1.11 Plinth area
- 1.12 Carpet area
- 1.13 Work charged establishment

Unit 2: Types of Estimates: **[6 Hrs.]**
- 2.1 Approximate estimate
- 2.2 Detailed estimate
- 2.3 Revised estimate
- 2.4 Supplementary estimate
- 2.5 Annual repair and maintenance estimate
- 2.6 Extension and improvement estimate
- 2.7 Split up of the cost of building work
- 2.8 Internal Electrification, Sanitary and Water Supply works

Unit 3: Estimation of Building **[26 Hrs.]**
- 3.1. Data required for preparation of detailed estimate
- 3.2. Principle of units of measurement
- 3.3. Units of measurement and payment for Earthwork, Concrete Work, Soling, Damp Proof Course, Masonry Works
- 3.4. Limits of measurement and degree of accuracy

3.5. Methods of estimate of building works
3.6. Long wall and Short wall method
3.7. Centre Line method
3.8. Estimating quantities of materials in Building works (One Room, Two Room Building)
3.9. Earthwork in excavation and filling
3.10. Brickwork (Foundation and Super Structure)
3.11. Stone works
3.12. Plastering and Painting works
3.13. PCC
3.14. RCC
3.15. Metal works

Unit 4: Analysis of Rates **[8 Hrs.]**

4.1. Introduction
4.2. Purpose of analysis of rates
4.3. Requirements of rate
4.4. Factor affecting analysis of rates
4.5. Importance of rate analysis
4.6. Terms used in analysis of rates- Overhead cost, Task or out turn work, Labour rate, Material rate, Through rate
4.7. Government procedure of preparing analysis of rates for building works

Tutorial **[45 Hrs.]**

Taking out detailed quantities and prepare the estimate for the following:

1. Estimate of a 9" thick wall
2. Estimate one room building with RCC flat roof
3. Estimate one room building (having verandah) with RCC flat roof
4. Estimate steel reinforcement of footing, RCC beam, column and slab
5. Estimate brick masonry retaining walls
6. Estimate steel tubular truss and purlins
7. Estimate dog legged staircase
8. Determine approximate quantities of materials and labour for building based on CBRI, Roorkee
9. Perform computerized estimation of quantities of building work
10. Field visit of an under-construction building

References:

1. Amarjit Aggarwal "Civil estimating quantity surveying and valuation" Katson Publishing House, Ludhiyana, 1985
2. P.K. Guha "Quantity Surveying" (Principles and application Khanna Publishers

Evaluation Scheme

Unit	Title	Hrs.	Marks Distribution
1	Introduction	5	8
2	Types of Estimate	6	12
3	Estimation of Building	26	44
4	Analysis of Rates	8	16
		45 Hrs.	**80**

Mechanics of Structure
EG 2203 CE

Year: II **Total: 6 Hrs. /week**
Semester: II **Lecture: 4 Hrs./week**
Tutorial: 1 Hrs./week
Practical: Hrs./week
Lab: 2/2 Hrs./week

Course Description:
This course is about structural analysis of statically determinate structures and properties of some materials used in structure. It is requisite for design of simple structures.

Course Objectives:
After the completion of this course, students will be able to:
1. Identify stable and unstable and statically determinate and indeterminate structures;
2. Determine degree of static indeterminacy of statically indeterminate structures
3. Understand constitutive relation of some materials to be used in structures;
4. Analyze the simple determinate structures like truss, beam and frame, and
5. Analyze shaft and strut for torsion and axial load.

Course Contents:

Theory

Unit 1: Introduction: **[4 Hrs.]**
- 1.1 Definition of mechanics of structure.
- 1.2 Review on types of loads, types of supports and reaction. Their symbolic representation.
- 1.3 Stability, determinacy, indeterminacy and degree of freedom of structure (beam, frame and truss)
- 1.4 Introduction to statically determinate and indeterminate structures
- 1.5 Determination of degrees of static indeterminacies.

Unit 2: Simple Stress and Strain: **[14 Hrs.]**
- 2.1 Concepts of stress and strain
- 2.2 Linear stress and strain and their relation, Hooke's law and Young's modulus of elasticity.
- 2.3 Deformation of uniform bar due to axial load
- 2.4 Stress strain curves for different materials.
- 2.5 Ultimate strength and working stress of materials and factor of safety.
- 2.6 Factors affecting factor of safety.
- 2.7 Thermal stress.
- 2.8 Stress and strains in plain and composite bars.
- 2.9 Poisson's ratio, Shear stress, shear strain and modulus of rigidity.
- 2.10 Volumetric strain and Bulk modulus.
- 2.11 Relation between Young's modulus, Bulk modulus and modulus of rigidity.
- 2.12 Concept of Principle stresses, principle planes and shear stress

Unit 3: Axial force, Shearing force and Bending moment: **[12 Hrs.]**
- 3.1 Review of Axial force, shear force and bending moment
- 3.2 Axial force, shear force and bending moment diagrams for statically determinate Beam under various types of loading.

3.3 Axial force, shear force and bending moment diagrams for statically determinate Plane frame under various types of loading.
3.4 Point of contra flexure.
3.5 Axial force analysis for statically determinate truss

Unit 4: Theory of Simple Bending: [10 Hrs.]

4.1 Concept of bending and pure bending.
4.2 Assumptions in theory of simple bending.
4.3 Radius of curvature, neutral layer and neutral axis.
4.4 Stress due to bending.
4.5 Moment of resistance.
4.6 Derivation of flexural formula (Relation between bending stress, Radius of curvature and moment of resistance)
4.7 Shearing stress in beams.
4.8 Distribution of shear stress in rectangular cross section of beam.
4.9 Determination of bending stress for simple beams
4.10 Section modulus.

Unit 5: Deflection of beams [6 Hrs.]

5.1 Definition of elastic curve, slope and deflection of beam.
5.2 Differential equation of elastic curve.
5.3 Deflection of simply supported and cantilever beams.

Unit 6: Torsion: [6 Hrs.]

6.1 Introduction.
6.2 Definition of torque and angle of twist.
6.3 Stress due to torsion.
6.4 Derivation of torsional equation.
6.5 Strength of solid and hollow circular shaft.
6.6 Power transmitted by shaft.

Unit 7: Simple Strut Theory: [8 Hrs.]

7.1 Definition of column and strut.
7.2 Stability of columns
7.3 End conditions and their effects.
7.4 Derivation of Euler's formula for columns for different types of end conditions
7.5 Effective height and Slenderness ratio.
7.6 Introduction to eccentrically loaded column.

Tutorial

Unit 1: Introduction: [1 Hr.]

1.1 Differentiate statically determinate and indeterminate structures
1.2 Determine of degrees of static indeterminacies.

Unit 2: Simple Stress and Strain: [4 Hrs.]

2.1 Calculate deformation of uniform bar due to axial load
2.2 Draw stress strain curves for different materials and find out ultimate strength, yield strength and working stress.
2.3 Calculate stress and strains in plain and composite bars due to external and thermal loading.
2.4 Calculate poisson's ratio, Shear stress, shear strain and modulus of rigidity.

2.5 Calculate volumetric strain and Bulk modulus.

Unit 3: Axial force, Shearing force and Bending moment: [4 Hrs.]

3.1 Draw axial force, shear force and bending moment diagrams for Beam and Frame.
3.2 Determine location of point of contra flexure.

Unit 4: Theory of Simple Bending: [2 Hrs.]

4.1 Evaluate radius of curvature, neutral, bending stress and draw stress diagram.
4.2 Calculate moment of resistance and section modulus.

Unit 5: Deflection of beams: [1 Hr.]

5.1 Determine deflection of simply supported and cantilever beams.

Unit 6: Torsion: [1 Hr.]

6.1 Determine stress in solid and hollow circular shaft.
6.2 Determine strength of solid and hollow circular shaft.
6.3 Evaluate power transmitted by shaft.

Unit 7: Simple Strut Theory: [2 Hrs.]

7.1 Determine critical load for different types of columns and strut.

Practical (Laboratory)

1 Determine Young's modulus, yield stress and ultimate strength of mild steel specimen (Stress-strain curve)
2 Measure strain and determine force in members of a plane truss
3 Measure deflection of simple beams
4 Determine buckling load of different types of columns

Textbooks:

1. G B Motra, "A text book of strength of materials", Publisher .....
2. R.K. Rajput "Strength of Materials", ...

References:

1. Surendra Singh "Strength of materials" S. K. Kkataria and sons.
2. Ferdinand P. Beer E Russell Johnston "Mechanics of Materials", Mcgrow hill Book Company.

Evaluation Scheme

The questions will cover all the chapters in the syllabus. The evaluation scheme will be as indicated in the table below:

Chapter	Title	Hrs.	Mark distribution*
1	Introduction	04	04
2	Simple Stress and Strain	14	20
3	Axial force, Shearing force and Bending moment	12	16
4	Theory of Simple Bending	10	14
5	Deflection of beams	06	08
6	Torsion	06	08
7	Simple Strut Theory	08	10
Total		60	80

* There may be minor deviation in marks distribution.

Soil Mechanics and Foundation Engineering
EG 2204 CE

Year: II **Total: 7 Hrs. /week**
Semester: II **Lecture: 4 Hrs./week**
Tutorial: 2 Hrs./week
Practical: Hrs./week
Lab: 2/2 Hrs./week

Course Description:
This course is intended to give student a brief introduction to the field of soil mechanics & Foundation Engineering and use of the basic data for analyzing various soil problems common to the civil engineering.

Course Objectives:
After the completion of this course, students will be able to:
1. Understand the fundamental and relevant principles of soil mechanics and Foundation Engineering
2. Have an overall picture of the behavior of soil
3. Describe the nature of some of the soil problems encountered in civil engineering and
4. Formulate the basic technique and to develop the methodologies to solve the soil problem.

Course Contents:

Theory

Unit 1:Introduction: **[2 Hrs.]**
- 1.1 Definition of soil
- 1.2 Soil mechanics
- 1.3 Importance of soil mechanics
- 1.4 Origin of soil, Formation of soil, transportation of soils

Unit 2:Basic Terminology and Interrelations: **[4 Hrs.]**
- 2.1 Introduction
- 2.2 Phase diagrams
- 2.3 Void ratio, porosity, degree of saturation, unit weight, density, air content and percentage air voids
- 2.4 Interrelations

Unit 3:Index properties of Soil: **[6 Hrs.]**
- 3.1 Introduction
- 3.2 Specific gravity
- 3.3 Water content
- 3.4 Particle size distribution
- 3.5 Consistency of soils
- 3.6 Determination of field density

Unit 4:Soil Classification: **[6 Hrs.]**
- 4.1 Purpose of soil classification
- 4.2 M.I.T classification system
- 4.3 Textural soil classification
- 4.4 Unified soil classification system
- 4.5 Field identification of soil

Unit 5:Soil Water and Effective Stress **[9 Hrs.]**
- 5.1 Types of soil water

5.2 Water table
5.3 Permeability, factors affecting permeability of soil
5.4 Seepage through soils
5.5 Darcy's Law
5.6 Determination of coefficient of permeability: laboratory methods
5.7 Principle of effective stress
5.8 Quick sand condition
5.9 Approximate stress distribution method for loaded areas

Unit 6:Compaction: [4 Hrs.]

6.1 Introduction, purposes of compaction
6.2 Standard proctor test
6.3 Field compaction methods
6.4 Factors affecting compaction
6.5 Compaction control

Unit 7:Consolidation: [9 Hrs.]

7.1 Introduction, difference between consolidation and compaction
7.2 Primary and secondary consolidation
7.3 Settlement
7.4 Terzaghi's spring analogy
7.5 The standard one-dimensional consolidation test
7.6 Pressure-void ratio curves
7.7 Define co-efficient of compressibility
7.8 Define co-efficient of volume change
7.9 Expression to obtain consolidation settlement

Unit 8:Shear Strength of Soils: [6 Hrs.]

8.1 Introduction
8.2 Principle plane and principle stress
8.3 Mohr's circle for two-dimensional stress system
8.4 Mohr-Coulomb failure theory
8.5 Determination of shear strength parameter
8.6 Direct shear test
8.7 Unconfined compression test

Unit 9:Earth Pressure Theory: [5 Hrs.]

9.1 Introduction
9.2 Different types of lateral earth pressures
9.3 Introduction to Rankine's earth pressure theory (Active and passive earth pressure in cohesive and cohesionless soil)
9.4 Types of retaining walls
9.5 Principles of the design of retaining walls

Unit 10: Bearing Capacity: [9 Hrs.]

10.1 Introduction
10.2 Types of foundation
10.3 Basic definition
10.4 Gross and net foundation pressure
10.5 Terzaghi's bearing capacity theory
10.6 Bearing capacity of footing with finite dimensions
10.7 Effect of water table on bearing capacity
10.8 Settlement of foundation

Tutorials

Unit 2: Basic terms and Interrelationship [10 Hrs.]
Unit 3: Particle size distribution and consistency Index [1 Hrs.]
Unit 5: Determination of Coefficient of permeability and effective stress [5 Hrs.]
Unit 6: Calculation of Dry density, moisture content, plotting of compaction curve [3 Hrs.]
Unit 7: Coefficient of compressibility and volume change [1 Hr.]
Unit 8: Mohr column failure theory [3 Hrs.]
Unit 9: Determination of Active earth and passive earth pressure by Rankine's earth pressure theory [4 Hrs.]
Unit 10: Determination of Bearing capacity based on Terzaghis' bearing capacity theory [3 Hrs.]

Practical (Laboratory)

1. Perform sieve analysis of Coarse-grained soil (1 session)
2. Determine specific gravity by Pycnometer method (1 session)
3. Determine liquid limit and plastic limit (1 session)
4. Determine field density by Sand replacement method and Core cutter method (1 session)
5. Perform compaction test: Standard proctor test (1 session)
6. Perform direct shear test (1 session)
7. Perform unconfined compression test (1 session)

Text books:

1. K.R Arora, "*Soil Mechanics and Foundation Engineering*", Standard Publishers Distributors, Nai-sarak, New Delhi

References:

1. V.N.S Murthy "*A Text Book of Soil Mechanics and Foundation Engineering* in *SI Units* "UBS Distributors Ltd. New Edition
2. Prof.T. N Ramamurthy, Prof.T. G Sitaram "*Geotechnical Engineering, Soil Mechanics"* S. Chand Publishing, New Delhi, New Edition.
3. Dr. Sehgal "A text book of soil mechanics" S.B CBS Publishers and Distributors, New Delhi, New Edition
4. Prof. Dr. Ramakrishna Poudel, Asst. Prof Ramesh Neupane "A Text book of soil mechanics", M.E. Nepal Pvt. Ltd, Kathmandu

Evaluation Scheme

The questions will cover all the chapters in the syllabus. The evaluation scheme will be as indicated in the table below:

Unit	Title	Hrs. (L+T)	Marks Distribution
1	Introduction	2	2
2	Basic terminology and interrelations	14	12
3	Index Properties of soil	7	6
4	Soil classification	6	6
5	Soil water and effective stress	14	12
6	Compaction	7	6
7	Consolidation	10	8
8	Shear strength of soils	9	8
9	Earth pressure theory	9	8
10	Bearing capacity	12	12
	Total	**90**	**80**

Note: Attempt any five questions out of six. All questions have (a) and (b) sub- questions.

Water Supply Engineering
EG 2205 CE

Year: II **Total: 6 Hrs. /week**
Semester: II **Lecture: 4 Hrs. /week**
Tutorial: 1 Hr./week
Practical: Hrs./week
Lab:2/2 Hrs./week

Course Description:
This course focuses on familiarization of fundamental of water supply engineering terminology, principle, system management, different component of w/s design and construction.

Course Objectives:
After the completion of this course, students will be able to:
1. Assess the various water consumption categories;
2. Describe the sources and methods of water collection;
3. Explain and illustrate water transmission and distribution systems;
4. Describe and illustrate pipe fittings, valves accessories and layout;
5. Carry out qualitative and quantitative analysis of water;
6. Explain the process of the water treatment
7. Outline and sketch the water treatment process.

Course Contents:

Theory

Unit 1:Water supply: **[3 Hrs.]**
- 1.1 Introduction
- 1.2 Importance and necessity of planned water supply system
- 1.3 History of planned water supply system in Nepal
- 1.4 Impact of water supply
  - 1.4.1 Positive Impact-long term and short-term impact
  - 1.4.2 Negative Impact
- 1.5 Water supply and its impact on public health, women, and environment
- 1.6 Components of water supply system (Rural and Urban) and their function

Unit 2:Sources of Water Supply: **[6 Hrs.]**
- 2.1 Hydrological Cycle and sources of water
- 2.2 Surface Sources: River, Streams, Pond, Lake, Impounded reservoir
- 2.3 Ground Sources: Springs – gravity and artesian, Wells – shallow, deep, artesian and tube wells, Infiltration galleries and wells
- 2.4 Introduction to alternative Sources of water: Rain Water Harvesting, Conservation Pond, fog collection
- 2.5 Conservation and protection of water sources
- 2.6 Selection and measurement of water sources

Unit 3:Quantity of Water: **[6 Hrs.]**
- 3.1 Water demand:
  - 3.2.1 Domestic demand
  - 3.2.2 Livestock demand
  - 3.3.3 Commercial demand
  - 3.3.4 Public/municipal demand

3.3.5 Industrial demand
3.3.6 Firefighting demand
3.3.7 Loss and wastage
3.3.8 Total water demand

3.2 Water supply project: Definition, Design period, factors affecting design period, project selection criteria

3.3 Population forecasting: necessity and methods
3.4.1 Arithmetical increase method
3.4.2 Geometrical increase method
3.4.3 Incremental increase method
3.4.4 Numerical on population forecasting and water demands

3.4 Variation in demand of water: types of variation, average demand, peak demand, peak factor, factors affecting demand of water, socio-economic factors affecting demand of water

Unit 4:Intake: [4 Hrs.]

4.1. Definition and Classification of intake
4.2. Characteristics
4.4.1 River intake
4.4.2 Reservoir intake
4.4.3 Spring Intake
4.3. Site selection and protection measures for intake works

Unit 5:Quality of Water: [6 Hrs.]

5.1. Pure and impure water
5.2. Potable and wholesome water
5.3. Polluted and contaminated water
5.4. Impurities in water: classification and effects
5.4.1 Suspended impurities
5.4.2 Colloidal impurities
5.4.3 Dissolved impurities
5.5. Hardness in water, types of hardness, alkalinity in water
5.6. Living organisms in water: virus, algae, worms and bacteria
5.7. Water related diseases: water borne, water washed, water based and water vector, transmission routes and preventive measures
5.8. Water quality standard for drinking purpose (WHO, GoN)
5.9. Water sampling and storing
5.10. Physical analysis (temperature, colour, turbidity, taste and odour)
5.11. Chemical analysis (total solids, pH, chlorine)

Unit 6:Treatment of Water: [16 Hrs.]

6.1. Objectives of water treatment
6.2. Screening: -Purpose, coarse and fine screens
6.3. Plain Sedimentation: - purpose, types of sedimentation tank, ideal sedimentation tank
6.4. Sedimentation with coagulation
6.4.1 Purpose
6.4.2 Process
6.4.3 Coagulants (types and their chemical reactions)
6.4.4 Flocculation tanks

6.4.5 Clarifier

6.5. Filtration
- 6.5.1 Purpose
- 6.5.2 Theory of filtration
- 6.5.3 Types of filters and its operation and maintenance
  - 6.5.3.1 Slow sand filter
  - 6.5.3.2 Rapid sand filter
  - 6.5.3.3 Pressure filter

6.6. Disinfection: purpose, methods of disinfection-boiling, ultra violet ray, ozone treatment, electro catadyne, sodish.

6.7. Chlorination: chlorine dose, residual chlorine, contact time, forms of chlorination - plain chlorination, break point chlorination, super chlorination and de-chlorination, factors affecting chlorination

6.8. Softening: purpose, removal of temporary hardness by boiling and lime treatment, removal of permanent hardness by lime soda, zeolite process

6.9. Miscellaneous treatments: aeration methods, removal of iron and manganese, domestic purification process

Unit 7:Reservoirs and Distribution System: [4 Hrs.]

7.1. Water storage (Reservoir): clear water reservoir, service reservoir

7.2. Distribution system: gravity, pumping, and dual system

7.3. Introduction to Ferrocement tank

7.4. Layout of distribution system: dead end, grid iron, ring and radial system

7.5. System of supply: continuous and intermittent system

Unit 8:Gravity Water Supply System: [4 Hrs.]

8.1. Concept of gravity water supply

8.2. Schematic diagram of a typical gravity water supply system

8.3. Hydraulic grade line

8.4. Break pressure tank

8.5. Public tap stand post

8.6. Residual head requirement

8.7. Numerical examples of pipeline design

Unit 9:Conveyance of Water: [4 Hrs.]

9.1. Types of pipe: CI, GI, steel, PVC, polythene, PPR pipes

9.2. Laying procedure of pipes

9.3. Pipe joints–Purpose, Types-socket and spigot, flanged, expansion, collar and screwed socket joints

9.4. Testing of pipe joints (leakage test)

Unit 10: Valves and Fittings: [4 Hrs.]

10.1. Valves- Purpose, Types-sluice, reflux, air and drain valves, Meter, Globe, Ball, Safety, Gate.

10.2. Fittings-Purpose, Types-stop cocks, water taps, bends, reducers, tees, socket, elbow, union, cross, wash basin, shower, sink

10.3. Operation and Maintenance-Necessity, Methods-regular and emergency.

Unit 11: Water supply in Emergency Situation: **[3 Hrs.]**

11.1. Introduction: Sphere Guidelines
11.2. Quantity of water required in emergencies
11.3. Cleaning and disinfecting water sources, tanker, pot/utensils
11.4. Rehabilitation of small-scale piped water distribution systems, water treatment works after an emergency
11.5. Emergency treatment of drinking-water at the point of use

Tutorials: **[15 Hrs.]**

1. **Introduction** **[1 Hr.]**
   Schematic diagrams of typical Urban and Rural water supply systems

2. **Quantity of Water** **[4 Hrs.]**
   Numerical on population forecasting by Arithmetical increase Method, Geometrical increase Method, incremental increase Method, Numerical on determination of water demands of a community

3. **Intakes** **[1 Hr.]**
   Typical figures of River, Reservoir and spring intakes

4. **Treatment of water** **[3 Hrs.]**
   Typical figure of sedimentation tank, Filtration-slow and rapid sand filter

5. **Reservoirs and Distribution System** **[1 Hr.]**
   Layout of distribution system: dead end, grid iron, ring and radial system, ferrocement tank

6. **Gravity Water Supply System:** **[3 Hrs.]**
   Schematic diagram of a typical gravity water supply system, Break pressure tank Public tap stand post, Numerical examples of Pipeline design

7. **Conveyance of Water** **[1 Hr.]**
   Typical figures of pipe joints

8. **Valves and Fittings** **[1 Hr.]**
   Typical figures of valves

Practical

1. Determine physical parameters (Colour, Turbidity, Temperature)
2. Determine pH value
3. Perform jar test
4. Determine total solids
5. Determine dissolved oxygen

Text books:

1. S.K. Neupane, *"Water Supply Engineering*", Bhunipuran Prakashan, Bagbazar, Kathmandu.

References:

1. Birdie, G.S. and Birdie, J.S, Water Supply and Sanitary Engineering, Dhanapat Rai & Sons Publishers, NaiSarak, Delhi- 110006, India.

2. Dr. Punmia B C, Jain A, and Jain, A, Water Supply Engineering, Laxmi Publications (P) Ltd, New Delhi
3. Barry, R, The Construction of Building (Volume 4) Building Services, Affiliated East- west Press Pvt. Ltd., New Delhi

Evaluation Scheme

The questions will cover all the chapters in the syllabus. The evaluation scheme will be as indicated in the table below:

Unit	Title	Hrs.	Marks distribution*
1	Water supply	4	4
2	Sources of Water Supply	6	8
3	Quantity of Water	10	12
4	Intake	5	4
5	Quality of Water	6	8
6	Treatment of Water	19	20
7	Reservoir and Distribution System	5	4
8	Gravity Water Supply System	7	8
9	Conveyance of Water	5	4
10	Valves and Fittings	5	4
11	Water supply in Emergency Situation	3	4
		75	80

*There may be minor variation in marks distribution.

The questions setting should be in the multiplication of 4.