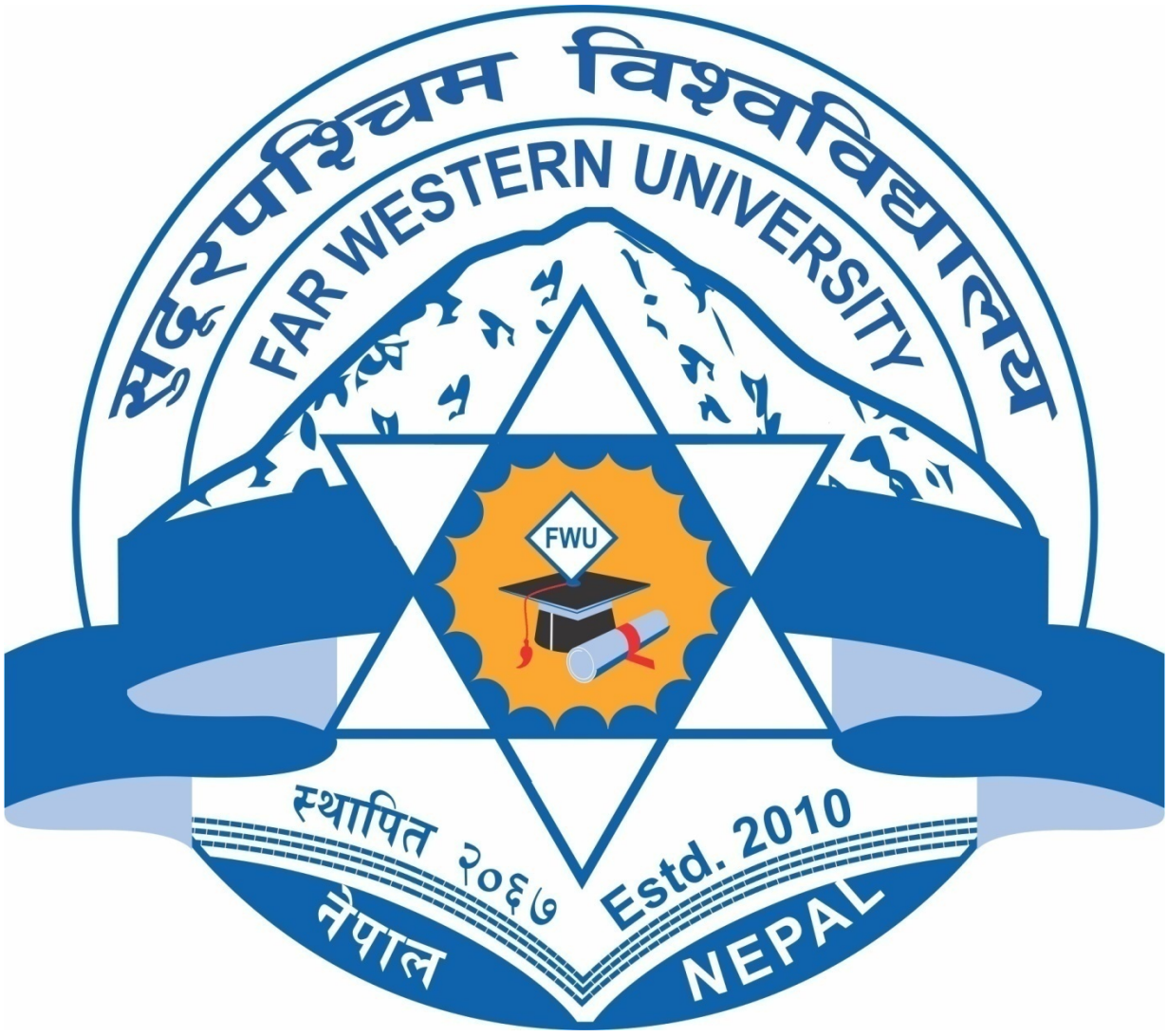
Far Western University
Bachelors Degree in Civil Engineering



Course Structure and Course Detail

Far Western University
Bachelors Degree in Civil Engineering

Course Structure and Course Code

1. Introduction

The Far Western University (FWU) is offering the course in Bachelors Degree in Civil Engineering. The objective of this course is to produce the Civil Engineers of quality standard to serve in the development activities of the nation. The details of this course include as follows:

1.1 Title of the Course

Bachelors Degree in Civil Engineering.

1.2 Duration of the Course

Duration of the Course is four (4) years. Each year consists of two semesters. The duration of each semester will have a minimum of ninety working days (15 weeks). The medium of instruction is English.

2. Course Structure

This course is divided into eight (8) semesters. The first year courses include fundamental common subjects. The second and third year courses generally include specific courses of the related discipline. The fourth year courses include professional and application type courses.

The course structure provides subject wise information about lecture, tutorial and practical hours per week, full marks and pass marks for the internal and final examination, and the duration of final examination.

3. Credit Hours

This is a full time course with 167 credit hours. Each student has to choose at least 4 elective subjects equivalent to 12 credit hours, one minor project of 3 credit hours, one seminar of 1 credit hour. A field based major project of 4 credit hours should be taken within the area of four elective subjects as far as possible.

4. Course Code

A course code is a combination of letters and numbers. Course code for Bachelors Degree in Civil Engineering is specified for each subject consisting of two letters followed by three digits for core courses and four digits for elective courses.

The first two letters of the Course Code denote respective discipline, eg. AR: architecture; CE: civil; CT: computer; EE: electrical; EX: electronics; GE: geomatic; ME: mechanical; SH: science and humanities.

The first digit denotes the year on which the subject is offered (1 for first year, 2 for second year, 3 for third year, and 4 for fourth year respectively).

The second digit denotes the semester on which the subject is offered (1 for first semester, 2 for second semester, 3 for third semester, 4 for fourth semester, 5 for fifth semester, 6 for sixth semester, 7 for seventh semester and 8 for eighth semester respectively). Third digit of core courses denotes the paper.

Similarly, second, third and fourth digit of elective courses denotes the cluster of electives, for example digit 501 to 509 for structural engineering subjects: 510 to 519 for water resources engineering subjects: 520 to 529 for environmental engineering subjects, 530 to 539 for highway

engineering subjects, and 540 to 549 for other electives. Fourth digit of elective courses denotes the respective elective subjects.

5. Instruction Method

Each course is specified with lecture, tutorial and practical hours per week. The method of instruction is lecture, enhanced by tutorials and/or practical depending upon the relevancy of the course. Tutorials are used to widen the concepts stated in the course. Practical and laboratory classes are used to develop necessary concepts and basic skills.

Presentations and use of multimedia is encouraged for forth year courses.

6. Internal Assessment and Final (End Semester) Examination

The student's performance in each subject is evaluated by internal and final examination.

6.1 Internal Assessment.

40 % of the total marks is allocated for internal assessment for theory part of all subjects. Internal assessment mark should include class attendance and performance, timely submission and correctness of assignments, class tests, quizzes, etc.

Evaluation of practical part of most of the subjects is done through continuous assessment. It includes lab performance, report submission, presentation, viva etc. However, for few courses final examinations are also conducted.

70 % attendance is mandatory to qualify for the final examination.

6.2 Final Examination

Examinations of theoretical subjects are conducted as per academic calendar of FWU. Duration of final examination will be 3 hours for most of the subjects.

6.3 Pass Marks

Each student must obtain 45 % in both internal assessment and final examination of each subject to pass in a particular subject. Only students who have passed the internal assessment of a particular subject are allowed to appear in the final examination of that subject.

7. Evaluation System

Students are evaluated on a continuous basis throughout the semester. Evaluation is done by the faculty, a consequence of the autonomous status granted to the faculty of engineering. Project work is evaluated on the basis of the review by internal and external examiners. For successful completion of the course, students should pass all the components of all subjects in all semesters. The overall performance of each student is measured by cumulative grade point average.

Depending upon the final weightage aggregate percentage scored by a student, a division is awarded as follows:
CGPA > 3.6: Distinction Division
CGPA < 3.6 and ≥ 3.0: First Division
CGPA < 3.0 and ≥ 2.0: Second Division
CGPA < 2.0 and ≥ 1.0: Pass Division

FIRST YEAR					
Semester I	**Course Code**	**23 Credits**	**Semester II**	**Course Code**	**22 Credits**
Engineering Mathematics I	SH111	3	Engineering Maths II (Integral + Differential Calculus)	SH121	3

Engineering Chemistry	SH112	4	Physics (Mechanics + Optics)	SH122	4
Engineering Drawing 1	AR113	2	Object Oriented Programming	CT123	4
Basic Programming and Data-Structure (C)	CT114	4	Engineering Drawing II (CAD aided)	AR124	2
Physics (Electricity + Magnetism)	SH115	4	Study Skills in English for Academic Purposes (EAP)	SH125	3
Applied Mechanics(Statics and Dynamics)	CE116	3	Construction Materials	CE126	3
English for Communication	SH117	3	Fundamental of Thermodynamics and Heat Transfer	ME127	3
SECOND YEAR					
Semester III	**Course Code**	**20 Credits**	**Semester IV**	**Course Code**	**21 Credits**
Engineering Mathematics III	SH231	3	Communication English II	SH241	3
Basic Mechanical Engineering	ME232	2	Building Drawing CAD Aided	AR242	2
Engineering Survey I	GE233	3	Structural Analysis I	CE243	3
Basic Electrical & Electronics Engineering	EX234	3	Probability and Experimental Design	SH244	3
Strength of Materials	CE235	3	Engineering Survey II	GE245	3
Engineering Geology	SH236	3	Building Technology	AR246	3
Fluid Mechanics	CE237	3	Hydraulics	CE247	4
THIRD YEAR					
Semester V	**Course Code**	**20 Credits**	**Semester VI**	**Course Code**	**22 Credits**
Computer Methods in Civil Engineering	CT351	3	Soil and Rock Mechanics	CE361	3
Engineering Economics	CE352	3	Irrigation Engineering	CE362	3
Structural Analysis II	CE353	3	Design of Steel &Timber Structure	CE363	3
Water Supply Engineering	CE354	3	Sanitary and Environmental Engineering	CE364	3
Transportation Engineering	CE355	3	Airport & Railway Engineering	CE365	3
Hydrology and River Engineering	CE356	3	Estimation,Costing & Valuation	CE366	3
Survey Camp	GE357	2	Seminar	CE367	1
			Concrete Technology &Masonry Structure	CE368	3
FOURTH YEAR					
Semester VII	**Course Code**	**20 Credits**	**Semester VIII**	**Course Code**	**19 Credits**
Design of RCC Structure	CE471	3	RS and GIS Application to Engineering	GE481	3
Hydropower Engineering	CE472	3	Construction Management& Project Engineering	CE482	3
Foundation Engineering	CE473	3	Engineering Professional Practice and Society	CE483	3
Safety Engineering	CE474	3	Major Project	CE484	4
Minor Project	CE 475	2	Elective III	CE	3
Elective I	CE	3	Elective IV	CE	3
Elective II	CE	3			

Electives

Structural Engineering Elective	**Environmental Engineering Elective**

Subjects	Code No	Credits	Subjects	Code No	Credits
Advanced Structural Engineering	CE4501	3	Advanced Environmental Engineering	CE 4520	3
Analysis & Design for Wind and Earthquake Effects	CE4502	3	Air Pollution Engineering	CE 4521	3
Planning and Design of Building Services	CE4503	3	Solid Waste Management	CE 4522	3
Vulnerability assessment and retrofitting techniques	CE4504	3	Environmental Impact Assessment	CE 4523	3
Structural Dynamics	CE4505				
Water Resources Engineering Elective			**Highway Engineering Elective**		
Water Resources Management	CE4510	3	Computer Application in Traffic and Highway Engineering	CE 4530	3
Flow Measurement and Ground Water Engineering	CE4511	3	Transport Project Planning and evaluation	CE 4531	3
Design and Analysis of Hydraulic Structures	CE4512	3	Highway Design in Hilly Terrain	CE 4532	3
Sedimentation Engineering	CE4513	3			
OTHER ELECTIVES					
Infrastructure for Sustainable Development	CE 4540	3			

Far Western University

Faculty of Engineering

Mahendranagar, Kanchanpur

Course Title: Applied Mechanics
Course code: CE 116
Nature of the course: Theory
Year: First, Semester: First
Level: BE (Civil)
Degree: Bachelors' Degree in Civil Engineering

Number of the lecture per week: 3
Tutorial/ week: 3 hour
Total hour: 45

1. Course Introduction:

The course is aimed to preparing students to understand the fundamentals of mechanics. It intends to enable the students to be acquainted with the basic concepts and principles of applied mechanics. Students will be familiarized with the fundamentals of forces, centroid and MOI, analysis of structure. The second part entails the principles of motion as applied to particles and rigid body dynamics.

2. Course Objectives:

At the end of this course the attendee should be able to:

- Acquire sufficient basic knowledge in applied mechanics
- Apply this knowledge base for studying major course in structure analysis and design
- Introduce the concepts and methods of mechanics needed for application in various branch of engineering problems.

3. Specific objectives and Concepts:

Specific Objectives	Contents
• Realize the scope of mechanics • Learn various branches of mechanics and distinguish between particle and rigid body • Learn to draw free body diagram in solving in solving mechanics problems •	**Unit I: Introduction (3 Hours)** Definition and scope of mechanics, concepts of particles, rigid body, deformed and fluid bodies, equation of static free body diagram(Definition and examples), system of units.
• Understand the characteristics of force. • Lear to resolve forces. • Understand the moment and couple of forces and their resolution.	**Unit II Forces (6 hours)** Definition and principle of forces, types of forces, principle of transmissibility & its limitations, resolution & composition of forces, moment of forces about a point and axes, theory of couples, resolution of forces into forces & couple & vice versa, resolution of system of forces.
• Distinguish between CG and Centroid. • Compute centroid of different plane figures • Compute moment of inertia of plane	**Unit III : Distributed Forces (5 hours)** Definition & derivation of center gravity, Centroid of lines areas and volumnes. Definition of second moment of area & radius

figures and composite figures.	of gyration, MOI of common figures, parallel and perpendicular axis theorems, MOI of built up section and MOI by direct integration.
• Understand Truss as a structural member. • Determine determinacy of trusses. • Analyze plane trusses by the method of joints and sections.	**Unit IV: Analysis of Plane Trusses (4 hours)** Definition of a Truss, types of trusses, determinacy and stability, analysis of trusses by the method of joints, analysis of trusses by the methods of section.
• Understand Beam as a structure. • Learn various forces developed in beams. • Analyze member forces in beam with sketch	**Unit V : Analysis of Beams (5 hours)** Definition and types of Beams, external and internal forces in beam. Definition of sign convention of axial force, shear force and bending moment, relation between load, shear force and bending moment, Axial force, shear force and bending moment diagrams.
• Understand development friction • Learn characteristics of friction • Apply this knowledge to analyze practical problems.	**Unit VI : Friction (3 hours)** Introduction (definition, types, causes & effects), Laws of dry friction, coefficient and angle of friction, condition of sliding or tipping, application to static problems.
• Understand the concept of dynamic as applied to particle. • Determine the motion of particle. • Develop equation of motion for different cases.	**Unit VII :Kinematics of particles (3 hours)** Introduction to dynamics, rectilinear motion of particles, position, velocity and acceleration of a particle determination of motion of particle, uniform rectilinear motion of particles, uniformly accelerated rectilinear motion of particles.
• Define motion of particle along a curved path. • Resolve velocity and acceleration. • Derive equation of motion for n-t and r- θ coordinate	**Unit VIII : Curvilinear Motion (3 hours)** Curvilinear motion of a particle, position, velocity and acceleration of a particle, rectangular components of velocity and acceleration, introduction of tangential and normal components, radial and transverse components.
• Define Newton's law as applied to particle. • Derive momentum equations and apply work energy principle. • Explain impulsive impact and apply principle of impulse and momentum to solve collision problems.	**Unit IX : System of Particles (7 hours)** Newton's Second Law of motion, Dynamic equilibrium, Linear and angular momentum : rate of change and conservation, Kinetic energy of particles, Principle of work & energy application, impulsive motion and impact, central impact (direct and oblique)
• Introduce & Define Kinematics of Rigid body.	**Unit X : Introduction to rigid body motion (7 hours)** Kinematics of Rigid body: Introduction, translation, rotation, general plane motion,

• Get idea about translation, rotation, general plane motion • Define Kinetics of Rigid body, equation of motion, linear and angular momentum in plane motion & conservation • to Know principle of work & energy application .	kinetics of rigid body: equation of motion, linear and angular momentum in plane motion & conservation, principle of work & energy application

Prescribed Text:

1. *"vector Mechanics for Engineers- statics and Dynamics", F.P. Beer and E.R.* Jonsion, Jr. 6e, Mc Graw-Hill Book Co., New York, USA, 1987

References:

2. *"Engineering mechanics-statics and Dynamics",* A. Mc Graw-Hill Book Co., New York, USA, 1987

Far Western University

Faculty of Engineering

Course Title: Basic Programming and Data Structure (C) **Credit: 3**
Course No: CT114 **Number of period per week: 3**
Nature of the Course: Theory + Practical **Total hours: 45**
Year: First, Semester: First **Level: B.E. Civil**
Degree: Bachelors Degree in Civil Engineering

1. Course Introduction

This course aims to provide introductory understanding of the various IT and programming tools used for software development. The course will also help the student to enhance their logical and analytical skill , since learning to write a program is totally logical and analytical. The course will help them to increase their problem solving skill. This course is an in-depth course designed to provide the basic concept of computer programming. The course begins from the basic terminologies used in computer such as definition of computer, input output devices, computer memories, Computer Programming and so on. The course is expanded to different aspects of programming languages, such as machine language, Assembly language, high level language, 4th generation language and so on.

2. Objectives

After successfully completing the course activities, the student will be able to:

- Know the functionality (Hardware & software) of computer
- Know the hardware and software architecture of computer
- Write algorithm & draw the flowchart for any task and operation
- Understand the importance of programming in engineering field.
- Know the functioning of software company
- Use different techniques to write a program
- learn to use different control structures (conditional structure, loop control structure etc)
- Learn the concept of Array, function, string, structure, pointer and file handling. These are the strong features of c language.
- Learn the concept and use of different data structures.

3. Specific Objectives and Contents

Specific Objectives	Contents
• To understand the basic concept and functionalities of a computer system.	**Unit I: Computer Fundamentals (2 hrs)** Introduction, Characteristics of Computer, Application of Computer, Basic Organization of Computer System, Input Unit, Processing Unit, Storage Unit, Output Unit, Computer Hardware, Computer Software, Types of Computer Software.,
• To develop the skill to solve a problem using different tools. • Understand the use of algorithm, flow chart and pseudo code in programming.	**Unit II: Program Designing Tools (2 hrs)** Algorithm, Advantages and Limitations of an Algorithm, Sample Examples, Flow Chart, Advantages and Limitations of a flowchart, Symbols used in a flow chart, Sample Examples Pseudo code, Advantages and Limitations of Pseudo

	code, Sample Examples.
• To be familiar with various aspects of a programming language such as syntax, semantics, errors etc. • To gain the knowledge of different language translators.	**Unit III: Basic Concept of Programming Language (4hrs)** Machine Language, Advantages and Limitation of Machine Language Assembly Language, Advantages and Limitations of Assembly Language High Level Language, Advantages and Limitations of High Level Language, Examples of Different High Level Languages (FORTRAN, COBOL, BASIC, PASCAL, C) Syntax and Semantics of a Language, Source Program and Object Program, Language Translators (Compiler, Assembler and Interpreter), Testing and Debugging a Program, Program Design Techniques (Structured Programming Concept and Modular Programming Concept), Procedure Oriented Programming System (POPS) and Object Oriented Programming System (OOPS), Compilation Process, ASCII
• To know the basic and essential parts of C programming • Understand detail of data type operators and statements • Understand to write simple programs	**Unit IV: C Fundamentals (6 hrs)** Character set of C, Variables, Constants, Identifiers, Rules for Declaring an Identifier, Key words, Data types, Enumerated Data type, typedef, typecasting, Delimeters, Operator in C (Arithmetic, Assignment, Comma, Increment, Decrement, Relational, Logical, address of, size of, ternary operator), Hierarchy-Precedence and Associatively of Operators Statements(Executable and Non- Executable Statements), Comments Basic Structure of a C Program, Pre- processor Directive, Input/ Output Functions, Format Specifiers, Field width Specifiers, Escape Sequences Programming Examples
• To know the details of decision making statements • Learn to handle the conditional statements To know the similarities and differences between if and switch statements	**Unit V: Decision Control Structure (3hrs)** Introduction, If statement, Nested if statement, if else statement, nested if else statement, use of logical operators, switch statements, comparison of if and switch statements, Programming examples
• Understand the details of implementing loop in a program • Understand the different types of Loops	**Unit VI: Loop Control Structure (4 hrs)** Introduction, Need of Looping, Types of Loop Statements (for, while, do while), Nesting of Loops, Break and Continue statement, Finite and infinite loops, Programming examples
• Know about handling of arrays and strings • Knowledge to group and handle set of similar data	**Unit VII: Arrays and Strings (5 hrs)** Introduction, Dimension of Array, 1D Array Declaration, 1D Array Initialization, 1D Array input, 1D Array output 2D Array Declaration, 2D Array initialization, 2D Array input/output

	String, String initialization String input/output, String Manipulation, 2D Array of String, Programming Examples
• Know about handling of pointer • Know the importance of pointer • Know the relation of pointer to array and string	**Unit VIII: Pointer (5 hrs)** Introduction, void pointer, null pointer, pointer constants, pointer variable, pointer arithmetic, 1D array& pointer, 2D array& pointer, pointer& strings, chain of pointer, application of pointer, Programming examples
• Know about handling of structures • Learn to group and handle set of dissimilar data in C programming	**Unit IX: Structure and Union (3 hrs)** Introduction, Accessing members of structure variable, Structure input/output, initializing a structure variable, array of structure, nesting of structure, pointer of structure variable Introduction to union, Programming examples
• Know about handling of user defined function • Learn about components of function • Learn about call by value and call by reference • Learn about recursion	**Unit X: Function (5 hrs)** Introduction, Components of a function program, function definition, function call, function proto type, actual arguments, formal arguments, return types, call by value, call by reference, passing both value and address, passing 1D and 2D array to a function, passing structure to a function , recursion, macro, storage classes, advantages of using a function Programming examples
• Learn importance of file • Learn to write data to a file and read data from a file	**Unit XI: File Input Output (4 hrs)** Introduction, File pointer, opening a file, modes of opening the file, file input/output operations, random access to a file Programming examples
Learn fundamentals of data structure	**Unit XII: Introduction to Data Structures (2 hrs)** Introduction, need of a data structure, types of data structures, over view of various data structures: array, stack, queue, linked lists, tree, graphs

Prescribed Text

Programming in C: V Rajaraman, PHI Publication, 2009 Edition

Programming in C: E Balagurusamy, Tata Mc-Graw Hill Publication, 6th Edition

A Text Book of C Programming: Karn & Mahato, Bench Mark Publication, 1st Edition

Reference

Data Structure using C: Aaron M. Tenenbaum, Yediclyah Langsam, Augenstein, Pearson Education Publication, 7th Edition 2009

Let us C: Yeswant Kanetkar, BPB Publication

Programming with C: Byron S Gottfried, Tata Mc-Graw Hill Publication, 3rd Edition

A book on C: A L Kelley, Ira Pohl, Pearson Education Publication, 4th Edition

Far Western University

Faculty of Engineering

Course Title: Basic Programming and Data Structure Practical

Credit: 1

Nature of the Course: Practical

Number of hours per week:

Year: First, Semester: First

(2 hrX3times or 3 hr x 2 times) 6

Level: BE Civil

Degree: Bachelors Degree in Civil Engineering

Objectives: By the end of the course the student should be able to:

- Write simple and complex programs
- Develop application programs
- Know the syntax and semantics of C language
- Identify and eliminate the syntax and semantic errors
- Effectively use concept of decision control structure
- Effectively use concept of loop control structure
- Effectively use concept of arrays and strings
- Effectively use concept of pointers
- Effectively use concept of structure
- Effectively use concept of function
- Effectively use concept of file I/O

Laboratory Works:

Sufficient programming examples from each of specified chapters

Books:

- *Programming in C*: V Rajaraman, PHI Publication
- *Programming in C*: E Balagurusamy, Tata Mc-Graw Hill Publication, 6th Edition
- *A Text Book of C Programming:* Karn & Mahato, Bench Mark Publication, 1st Edition

Far Western University
Faculty of Engineering

Course Title: Engineering Chemistry
Course No.: SH112
Nature of the Course: Theory
Level: B.E.
Year: First
Semester: First

Credit: **3**
Number of hours per week: **3**
Total hours: **45**

1. Course Description

The course intends to enable the students to be acquainted with the basic concepts of engineering chemistry. Students will be familiarized with basic concept of water, polymers, catalyst, electrochemistry, environmental chemistry, organic reaction mechanism etc.

2. Course Objectives:

The general objectives of the course are as follows:

- To acquaint the students with basic concepts of the Thermodynamics and electrochemistry.
- To enable the students to understand the basic idea of the co-ordination chemistry.
- To enable the students to understand the basic Knowledge of catalyst, characteristic of catalyst and application.
- To understand water and its qualities, estimation of hardness of water, softening of water etc.
- To be familiarize with Air Pollution, water Pollution, Soil pollution and their Pollutants, adverse effects pollution and possible control.
- To be introduced with stereochemistry, Geometrical isomerism, optical isomerism and terms used in the optical isomerism recemic mixture and resolutions,
- To get the concept of some organic reactions and their mechanism and also to get the idea about basic concept of polymers and polymerization.

3. Specific Objectives and Contents:

Specific Objectives	Contents
Understanding the 1st and 2nd law of thermodynamics, free energy and spontaneity, Maxwell relations, Gibbs-Helmholtz equation- Van't Hoff equations. To understand Electro chemical cells, Electrode Potential and standard electrode potential, Measurement of electrode potential, Nernst equation, E.M.F. and to understand the corrosion and its control To introduce about the co-ordination complexes, theories of co-ordination complexes and nomenclature, valence bond	**Unit I: Thermodynamics and Electrochemistry (10)hour** First and 2nd law of thermodynamics. Definition of free energy and spontaneity - Maxwell relations - Gibbs-Helmholtz equation - Van't hoff equations. Electro chemical cells, Electrode Potential and standard electrode potential, Measurement of electrode potential, Nernst equation, E.M.F. Of cell, Application of electrochemical and electrolytic cells, Electrochemical Series and its application. Principles of chemical and electrochemical corrosion, Factor influencing corrosion, corrosion control. **Unit II: Coordination Complexes** **7 (hour)** Introduction, terms used in coordination complexes, Werner's theory of coordination complexes, Sidgwick's model and Sidgwick's effective atomic number rule, Nomenclature of coordination compounds (Neutral type,

theory and its application in the formation of tetrahedral, square planar and octahedral complexes, limitation of valence bond theory, application of coordination complexes • Describe the catalyst and catalytic poisoning, types of catalyst and application of • To understand water quality parameters, Definition and expression, Estimation of hardness (EDTA method), Alkalinity (Titrimetry), Water softening. • To understand the air pollution, water pollution, soil pollution and pollutants involving pollutants and possible control of pollution, ozone depletion. • To get knowledge about Geometrical isomerism, optical isomerism, optical activity, recemic mixture and resolutions • To get the concept of some organic reactions and their mechanism, substitution and elimination Reactions and their types. • To familiar with addition, condensation and co-polymerization, preparation and application of polymers, thermoplastic and thermosetting plastics, sulphur based polymers.	simple cation and complex anion and complex cations and simple anion type) valence bond theory of complexes, application of valence bond theory in the formation of tetrahedral complexes , square planar complexes and , octahedral complexes, limitation of valence bond theory, application of coordination complexes **Unit III: Catalyst:** **4 (hour)** Introduction, action of catalyst (Catalytic promoters and catalytic poisoning), characteristic of catalyst, type of catalyst, theories of catalysis, application of catalysts. **Unit IV: Water** **4(hour)** Water quality parameters, Definition and expression, Estimation of hardness (EDTA method), Alkalinity (Titrimetry), Water softening (zeolite) - Demineralisation (Ion- exchangers) Domestic water treatment. **Unit V: Environmental Chemistry** **6 (hour)** Air Pollution, Air pollutant: SO_2, NO_2, CO_2 ,O_3 and hydrocarbons, effect of Air pollution on environment and possible control, green house effect, Ozone depletion and its photo chemistry, water Pollution, water Pollutants and their adverse effects and control, Soil pollution, soil Pollutants and their adverse effects and possible control **Unit VI: Stereochemistry** **4 (hour)** Introduction, Geometrical isomerism(Cis Trans Isomerism) Z and E concept of geometrical isomerism, optical isomerism , terms optical activity, Enantiomers, Diastereomers, meso structures, recemic mixture and resolutions **Unit VII: Organic Reactions & mechanism** **4 (hour)** Substitution reaction, types of substitution reactions SN^1 , SN^2 elimination Reactions, types of Elimination reactions E_1 and E_2, Factors governing SN^1, SN^2 , E_1 E_2 reaction mechanism **Unit VIII: Polymers 6 (hour)** Introduction, polymers and polymerization, Monomer - Functionality - Degree of polymerisation - Classification based on source and applications - Addition, Condensation and copolymerization. preparation and application of polyethene, polystyrene, PVC, teflon, nylon 6,6 Bakelite, epoxy resin, Thermoplastics and thermosetting plastics - sulphur based Polymers,

Note: The figures in the parentheses indicate the approximate periods for the respective units.

References:

1. Engineering Chemistry by Jaij and Jain
2. A text book of Engineering Chemistry by Shashi Chawala
3. A new concise Inorganic Chemistry by J.D. Lee
4. Principle of physical chemistry by Marron and Pruton
5. Essentials of Physical Chemistry by Bahl and Tuli
6. Selected topics in physical chemistry by moti kazi Sthapit
7. Balasubramanian M.R., Krishnamoorthy S. and Murugesan V., " Engineering Chemistry ",
8. Allied Publisher Limited., Chennai, 1993.
9. Kuriakose, J.C. and Rajaram J., " Chemistry in Engineering and Technology ", Vol. I and II,

Far Western University

Faculty of Engineering

Course title: Engineering Mathematics I Credit: 3

Course No: SH111 Number of period per week: 3

Nature of Course: Theory Total hours: 45

Year: First, Semester: First

Level: Bachelor of Engineering (Civil)

Course description: The course aims to acquaint the students with the basic concept of differentiation, integration and their applications as well as plane analytic geometry and vector calculus.

Course Objectives:

1. To enable the students, to understand the differential and integral calculus and its applications.
2. To acquaint the students with the basic concept of plane analytic geometry.
3. To know the brief idea of vector calculus.

1. **Limit, Continuity and Derivative** **17 hours**

   1.1 Basic concept of Limit, continuity and derivative of functions with their properties

   1.2 Higher order derivatives

   1.3 Mean value theorems (Rolle's theorem, Lagrange's mean value theorem and Cauchy's mean value theorem),Taylor's series and Maclurin's series.

   1.4 Indeterminate forms together with L'Hospital rule

   1.5 Asymptotes to Cartesian and polar curves

   1.6 Pedal equations to Cartesian and polar curves

   1.7 Curvature and radius of curvature

   1.8 Partial derivative of function of two or three variables

   1.9 Extreme of a function of two and three variables

2. Integration and its Applications **14 hours**

   2.1 Review of basic integration theory

   2.2 Definite integral as the limit of sum

   2.3 Definite integral with its general properties

   2.4 Improper Integrals

   2.5 Reduction formula; Beta and Gamma functions

   2.6 Determination of area, length, volume and surface area of solid of revolution

   2.7 Double integral of Cartesian curves only

3. Plane Analytic Geometry **8 hours**

   3.1 Transformation of coordinates: Translation and rotation

   3.2 Conic section (Parabola, Ellipse and Hyperbola)

   3.3 Introduction of central conics only

4. Vector Calculus **6 hours**

   4.1 Review of vector and scalar quantity

   4.2 Space coordinates (Cartesian, Cylindrical and spherical)

   4.3 Product of two or more vectors

   4.4 Reciprocal system of vectors and their properties

   4.5 Vector equation of lines and planes

Reference Books

1. Thomas, Finney, Calculus and Analytical Geometry Addison-Wesley
2. Erwin Kreyszing, Advanced Engineering Mathematics, John Wiley and Sons Inc.
3. Chet Raj Bhatta and et.al. Essentials of Mathematics, Ayam Publications
4. S.P.Shrestha, H.D.Chaudhary,P.R.Pokharel,A Textbook of Engineering Mathematics,vol.I

Far Western University

Faculty of Engineering

Course Title: Physics (Electricity and Magnetism) **Credit:** 3
Course No: SH 115 **Number of period per week:** 3
Nature of the Course: Theory **Total hours:** 45
Year: First, **Semester:** First **Level:** B.E. (Civil)
Degree: Bachelor's Degree in Civil Engineering

Course Introduction

The course intends to enable the students to be acquainted with the basic concepts and principles of electricity and magnetism. Students will be familiarized with the fundamentals of electrostatics, magnetostatics, electric and magnetic fields in matter, electromagnetic induction, Maxwell's equations, electromagnetic waves, etc.

Objectives

At the end of this course the students should be able:

- to acquire sufficient basic knowledge in electricity and magnetism.
- to apply this knowledge base for studying major courses.
- to introduce the concepts and methods of electricity and magnetism needed for application in various areas.

Unit I: Elementary Vector Analysis (6 hrs)

Gradient of a scalar, Divergence and curl of a vector, Product rules, Second derivatives, Integral Calculus, Gauss's, Stoke's and Green's theorems

Unit II: Electrostatics (7 hrs)

The electric field, Coulomb's law, Divergence and curl of electrostatic fields, Electric flux, Gauss's law and it's applications, Electric potential, Equipotential surface, Poisson's equation and Laplace's equation, Potential and field due to an electric dipole, Potential due to an infinitely long charged wire, Potential and field due to an uniformly charged disc, Electrostatic boundary conditions, Method of images

Unit III: Electric Fields in Matter (6 hrs)

Dielectrics, Induced dipoles, Polar and non-polar molecules, Dielectric polarization, Electric field due to a polarized dielectric (three electric vectors), Gauss's law in the presence of dielectrics, Energy stored in an electric field in the presence of dielectric, Boundary conditions on field vectors

Unit IV: Magneto statics (6 hrs)

The Lorentz force law, Magnetic field and the magnetic flux, The Biot-Savart law and its applications, Divergence and curl of B, Ampere's law and its applications, Magnetic vector potentials, Magnetic dipole, Magneto static boundary conditions

Unit V: Magnetic Fields in Matter (4 hrs)

Diamagnets, paramagnets and ferromagnets, Torques and forces in magnetic dipoles, Magnetization, Magnetic susceptibility and permeability, Ferromagnetism, Hysteresis

Unit VI: Electromagnetic Induction (4 hrs)

Faraday's law, Self and mutual induction, Self inductance of a solenoid, Toroid and two long parallel wires, Energy in magnetic fields, Transformer

Unit VII: Maxwell's Equations **(6 hrs)**

Maxwell's equations, The displacement current, Magnetic charge, Maxwell's equations in matter, Boundary conditions, The continuity equation, Poynting's theorem

Unit VIII: Electromagnetic Waves **(6 hrs)**

The wave equation, Electromagnetic waves in vacuum, Monochromatic plane waves, Energy and momentum in electromagnetic waves, Electromagnetic waves in matter, Propagation in linear media, Reflection and transmission at normal and oblique incidence

Prescribed Text:

Introduction to Electrodynamics, D. J. Griffith, Prentice Hall, 3rd Edition, 1999

References:

- *Foundations of Electromagnetic Theory*, J. R. Ritz, F. J. Milford and R. W. Christy, Narosa Publishing House, 1998
- *Physics: Part II*, R. Resnick and D. Halliday, Wiley Eastern Limited, 1985
- *Classical Electromagnetism*, J. Franklin, Pearson Education, 2005

Far Western University

Faculty of Engineering

Course Title: Engineering Drawing I
Course No: AR 113
Nature of the Course: Theory +Practical
Level: B.E.
Degree: Bachelor's Degree in Civil Engineering

Credit: 2
Number of period per week: 3
Total hours: 45+15
Year: First, Semester: First

1. Course Introduction:

The course intends to enable the students to be acquainted with the basic concepts and principles of drawing. Students will be familiarized with the fundamentals of drawing, instruments, symbols, conventions and current practices of drawing, etc.

2. Objectives:

To develop the basic understanding and enhance the skills of engineering graphic technology to the students. Also to develop sketching and drafting skill to facilitate communication.

At the end of this course, students should be able:

- To acquire sufficient knowledge of drafting
- To apply knowledge for studying major courses in BE

3. Specific Objectives and Contents

Specific Objectives	Contents
• Use of different instruments to draw technical drawing	**Unit I: Instrumental Drawing; Practices & Techniques 8(hrs)** 1.1 Equipment and Materials; Description of drawing instruments, auxiliary equipment and drawing materials 1.2 Techniques of Instrumental Drawing, Pencil sharpening, securing paper, proper use of T- squares, triangles, scales, dividers, and compasses, erasing shields, French curves, inking pens.
• Practice of free hand writing letters and numbers.	**Unit II: Freehand Technical lettering 2(hrs)** 2.1 Lettering strokes, letter proportions, use of pencils and pens, uniformity and appearance of letters, freehand techniques, inclined and vertical letters and numerals, upper and lower cases, Standard English lettering forms
• Use of dimension technique and dimension conventions	**Unit III: Dimensioning 2(hrs)** 3.1 Fundamentals and techniques; size and location dimensioning, measurement units, SI conventions 3.2 General dimensioning practices, placement of dimensions; aligned and unidirectional
• Types of scale • Application of scale and	**Unit IV: Engineering Scale: 2(Hrs)** 4.1 Use of scales, , reducing and enlarging drawings 4.2 Representative Factor, 4.3 Construction and Types of Scales, Plain Scales, Diagonal Scales, Vernier Scales, Comparative Scales 4.4 Scale of Chords

• Enhance skills and technique in 2D and 3D geometry • Applications of conic sections, space curves, and other engineering curves • Generate ideas about solids.	**Unit V Applied Geometry 8 (Hrs)** 5.1 Plane Geometrical construction; Bisecting and trisecting lines and angles, proportional division of lines, construction of angles, triangles, squares, and polygons. Construction using tangents and circular arcs 5.2 Methods for drawing standard curves such as ellipses, parabolas, hyperbolas, involutes, spirals, cycloid, helices and cam or heart wheel. 5.3 Solid Geometrical Construction; Classification and pictorial representation of solid regular objects such as; Prisms: square, cubical, triangular and oblique Cylinders: right and oblique Cones: right and oblique, Pyramid : square, triangular, oblique, truncated, Doubly-Curved and Warped Surfaces: Sphere, torus, oblate ellipsoid, serpentine, paraboloid, hyperboloid
• Explain the history of Descriptive Geometry • Understand the way of locating point, line, plane and solid in space • Develop idea of solving geometry when given verbally. • Calculate angle and length of lines and planes when they are in space	**Unit VI Basic Descriptive Geometry 4(Hrs.)** 6.1 Introduction: Application of descriptive geometry, principles to the solution of problems involving positioning of objects in three-dimensional space 6.2 The projection of points, lines, planes and solid in space 6.3 Projection of Solids Placed in different positions, 6.4 Parallel Lines 6.5 True Length of Lines; horizontal , inclined and oblique lines 6.6 Perpendicular Lines 6.7 Bearing of a Line 6.8 Point view or End View of a Line 6.9 Shortest Distance from a point to a Line 6.10 Principal Lines of a plane 6.11 Edge View of a plane 6.12 True shape of an Oblique plane 6.13 Intersection of a Line and a plane 6.14 Angle Between a Line and a plane 6.15 Angle Between Two Intersecting Lines 6.16 Angle Between Two Non- Intersecting (Skew) lines 6.17 Angle between two planes 6.18 Shortest Distance Between Two Skew Lines
• Understand the classification projection • Learn the symbol of projection • Understand the process of changing 3D figure into 2D figure • Learn the idea of hidden lines for unseen parts	**Unit VII Theory of Projection and Orthographic Projection 9(hrs)** 7.1 Common types of projections – Pictorial (Perspective, Isometric, Oblique) and Orthographic Projection 7.2 System of orthographic projection First angle projection and Third angle projection 7.3 Principal Views; Methods for obtaining orthographic views Projection of lines, angles and plane surfaces; analysis in three views 7.4 Projection of curved lines and surfaces, object orientation and

	selection of views for best representation Full and hidden lines 7.5 Orthographic Drawings; making an orthographic drawing, visualizing objects from the given views Interpretation of adjacent areas True-length lines Representation of holes Conventional practices
• Develop the concept of cutting solids by an imaginary cutting plane and revealing the unseen parts from the solid • Use of section lines • Conventions for hidden lines, holes, ribs, spokes	**Unit VIII Sectional** **3 (Hrs.)** 6.1 Full Section 6.2 Half Section 6.3 Broken Section 6.4 Revolved Section 6.5 Removed (Detail) Section 6.6 Phantom or Hidden Section 6.7 Auxiliary Sectional views 6.8 Specifying Cutting Planes for Section
• Develop the concept of development of outer surface of solids • Develop an idea of penetration of solids into planes • Understand the process of generation of curves on the surface of when different solids get intersected / penetrated	**Unit IX Developments, Intersections and Interpenetration 8(Hrs.)** 10.1 Developments of a right or oblique prism, cylinder, pyramid and cone 10.2 Development of a truncated pyramid and cone Triangulation method for approximately developed surfaces 10.3 Transition pieces for connecting different shapes Development of a sphere 10.4 Intersections & Interpretation 10.5 Lines of intersection of geometric surfaces 10.6 Piercing point of a line and a geometric solid 10.7 Intersection lines of two planes 10.8 Intersection of prisms and pyramids 10.9 Intersection of a cylinder and an oblique plane 10.10 Intersection of a sphere and an oblique plane 10.11 Constructing a development using auxiliary views 10.12 Intersection of two cylinders 10.13 Intersection of a cylinder and a cone

LABORATORY

1. Freehand technical lettering and use of drawing instruments
2. Freehand technical lettering and use of drawing instruments (cont)
3. Dimensioning and Scaling
4. Applied geometrical drawing I
5. Applied geometrical drawing I
6. Descriptive geometry I
7. Descriptive geometry II
8. Descriptive geometry III
9. Projection and Multi view Drawing I
10. Projection and Multi view Drawing II
11. Sectional Views I
12. Sectional Views II
13. Developments of Surface I
14. Developments of Surface II

15. Effect of Intersections

Recommended Books:

- Luzadder W.J. (1981). *Fundamentals of Engineering Drawing,* Prentice Hall.
- French T E., Vierck C.J. and Foster R.J (1981). *Engineering Drawing and Graphic Technology*, McGraw Hill.
- Bhatt N.D. (2011) *Engineering drawing*, Charotar Publishing House.

Far Western University

Faculty of Engineering

Course Title: English for Communication
Course No. : SH 117
Nature of Course: Theory
Level: B.E. (Civil)
Degree: Bachelor's Degree in Civil Engineering

Year: I; Semester: II
Credit : 3
Total hours 45

1. Course Introduction

This is a compulsory English course for B.E. students irrespective of their major subjects. The course exposes the students to the basic communication skills that they require in their day-to-day academic settings at the undergraduate level. The course begins with the four basic skills of language i.e. listening, speaking, reading and writing integrated with the vocabulary and grammar associated with them. Additionally, there is a separate chapter that focuses on the acquisition of the academic vocabulary in use.

2. Course Objectives

General objectives of this course are to:

a) develop communicative competence in order to successfully participate in the academic discourse
b) make students critical readers
c) expose students to the varieties of reading texts from different disciplines
d) help students develop critical thinking skills
e) expose them to the wealth of academic vocabulary in context
f) help students develop strategies of communication in speaking and writing

3. Contents in Detail with Specific Objectives

Specific Objectives	Contents in Detail
• Listen for main ideas and details • Make inferences • Listen for opinions • Follow a summary • Listen for specific information • Understand figurative expressions to interpret speaker's intention • Listen for signposts to understand the structure of the text • Listening for rhetorical questions to understand the structure of a lecture	**Unit One: Listening** 1.1. Listening for gist – skimming 1.2. Listening for detail understanding 1.3. Making inferences and forming opinions from listening 1.4. Summarizing what was listened 1.5. Listening for comprehension 1.6. Comprehending figurative expressions and rhetorical expressions in speech
• Participate in a conversation • Make notes to prepare for a presentation or group discussion • Take turns to make conversation go smoothly • Give advice, ask for clarification, express reasons, ask for reasons, ask questions • Lead discussions in groups • Prepare dialogues with a partner for various conversation	**Unit Two. Speaking** 2.1. Engaging in conversation 2.1. Presentation skills 2.3. Turn taking 2.4. Language functions in the academic settings 2.5. Dialogues and group discussion 2.6. Leading group discussion

• Use graphic organizers to understand texts • Read and find the central idea of the text • Comprehend different types of texts • Locate specific information in the texts • Identify source of information	**Unit Three. Reading** 3.1. Using graphic organizers to understand texts 3.2.Reading for central theme 3.3. Comprehending different text types 3.4. Locating specific information in texts 3.5. Identifying source of information
• Analyze and develop paragraphs of different genres • Plan for writing • Revise, edit and rewrite • Write summaries • Write personal response to the texts • Write different letters • Write different types of essays	**Unit Four. Writing** 4.1. Analyzing and writing paragraphs 4.2. Process writing 4.3. Summary writing 4.4. Letter writing 4.5. Responding to the texts in writing 4.6. Essay writing
• Use the academic vocabulary in professional communication. • Select and use academic vocabulary in writing assignments • Recall and use appropriate vocabulary in a range of academic discourse • Apply appropriate strategies to enrich their academic vocabulary.	**Unit Five. Vocabulary** 5.1. Academic vocabulary 5.2. Word combinations 5.3. Vocabulary at the academic institutions 5.4. Vocabulary of academic conversation 5.5. Reading and vocabulary 5.6. Writing and vocabulary
• Explain ideas and reflect on them • Connect ideas across texts or readings • Relate personal experience to the topic • Blend information from various texts • Evaluate experiences and events	**Unit Six. Critical Thinking** 6.1. Comparing and contrasting information 6.2. Connecting ideas across texts or reading 6.3. Writing with personal reflections and experience 6.4. Synthesizing information from various sources 6.5. Evaluating ideas

7. References

1. Daise, D., Norloff, C. and Carne, P. (2011)). *Q: Skills for Success (Reading and Writing) – 4.* New York. Oxford University Press. (Unit I, II and VI)
2. Freire, R. and Jones, T. (2011). *Q: Skills for Success (Listening and Speaking) – 4.* New York. Oxford University Press. (Unit III, IV and VI).
3. McCarthy, M. and O'Dell, F. (2008). *Academic Vocabulary in Use.* New Delhi. Cambridge University Press. (Unit V).

Dictionary

4. Hornby. A.S. (2010). Eighth Edition. Oxford Advanced Learner's Dictionary. Oxford: Oxford University Press.

Far Western University

Faculty of Engineering

Course title: Engineering Mathematics II
Course No : SH 121 **Credit: 3**
Nature of Course: Theory **Total hour: 45**
Level: B.E. **Year: I; Semester: II**
Degree: Bachelors' Degree in Civil Engineering

1. Course Description:

The course aims to acquaint the students with the basic concept and applications of differential equations, multiple integrals, two and three dimensional geometry and Matrix theory in engineering fields.

2. Course Objectives:

(i) To enable the students, to understand the differential equations and its applications.
(ii) To acquaint the students with the basic concept of multiple integral and two and three dimensional geometry.
(iii) To know the applications of matrix theory in engineering fields.

3. Specific objectives and contents:

• **Specific Objectives:** To know the definitions of matrix and its types. • To understand the definitions of determinant and their properties. • To get the clear concept of vector space and correlate with matrix space. • To study the linear transformations and theory related to it. • To solve system of linear equations and its applications. • Study the definition of rank and its relation with matrix theory. • Define the term eigen values and eigen vectors and applications.	**Unit 1: Matrix and Determinant** **9 Hrs** 1.1 Matrix and Determinants 1.2 Vector Spaces 1.3 Linear Transformations 1.4 System of Linear Equations, Gauss Elimination 1.5 Rank, Matrix 1.6 Eigen values and Eigen vectors

Study the meaning of Direction cosines and direction ratios. • To study the theory related to straight lines • To obtain the equation of spheres and tangent planes and theory related to it • To define the cone and cylinder and their standard equations • To study the plane curves • To obtain the parametric equation • To study the polar coordinates • To study the integrals in polar coordinates • Define the multiple integrals and its basics • To obtain the area and volume using multiple integral • To obtain the center using the concept of multiple integrals • Study of order and degree of differential equation with examples • Study the different type of differential equation and their solutions • To study the homogeneous and non homogeneous differential equation with their solutions • To study the initial value problems • To study the power series and its solution • To study the Legendre's and Bessel's equation and their solutions • To study their properties and applications	**Unit 2: Three Dimensional Geometry 12 Hrs** 2.1 Review of Direction Cosines, Direction Ratios, planes. 2.2 Straight Lines 2.3 Sphere and its Tangent Planes 2.4 Cone and Cylinder (definitions, standard equation only) **Unit3: Plane Curves and Polar Coordinates 5 Hrs** 3.1 Plane Curves 3.2 Parametric Equation 3.3 Polar Coordinates 3.4 Integrals in Polar Coordinates **Unit 4:Multiple Integrals 5 Hrs** 5.1 Multiple Integrals 5.2 Area and Volume 5.3 Centroids **Unit 5: Differential Equation 14 Hrs** 5.1 Order and degree of Differential Equation 5.2 First order differential equation with their solutions (reducible to separable form, homogeneous form, exactness condition) linear and Bernoulie's equation. 5.3 Second order differential equation (Homogeneous and non homogeneous) with constant coefficient as well as variable coefficient. 5.4 Initial value problems 5.5 Power series Solution 5.6 Legendre's and Bessel's equation with their solution, properties and application

Reference Books

1. E.W. Swokowski, " Calculus with Analytic geometry " , Second Alternate edition, PWS-Kent Publishing Co., Boston.
2. E.Kreszig , " Advanced Engineering Mathematics" , Fifth Edition, Wiley, New York.

Far Western University

Faculty of Engineering

Course Title: Fundamentals of Thermodynamics and Heat Transfer

Course No: ME 127 **Number of period per week: 3**

Nature of the Course: Theory **Total hours: 45**

Year: First, Semester: II **Credit: 3**

Level: B.E.

Degree: Bachelor's Degree in Civil Engineering

1. Course Introduction

The course intends to enable the students to be proverbial with the basic concepts and principles of thermodynamics and heat transfer. Students will be familiarized with the heat transfer, laws of thermodynamics and thermodynamic cycles.

2. Objectives

At the end of this course the students should be able to understand:

- basic concepts of thermodynamics.
- laws of thermodynamics and heat transfer.
- thermodynamic cycles.
- application of thermodynamics and heat transfer.

3. Specific Objectives and Contents

Specific Objectives	Contents
• Understand the scope of engineering thermodynamics. • Distinguish between different types of systems and processes. • Knowledge about common properties of substances.	**Unit I: Introduction (4 hrs)** Definition and Scope of Engineering Thermodynamics, Value of energy to society, Microscopic versus Macroscopic Viewpoint, Concepts and Definitions - System, Surroundings, Boundary and Universe; Closed Systems, Open Systems, and Isolated Systems, Thermodynamic Properties: Intensive, Extensive and Specific Properties, Thermodynamic Equilibrium, State, Process, and Path Cyclic Process, Quasi-equilibrium Process, Reversible and Irreversible Process, Common Properties: Pressure, Specific Volume, Temperature, Zeroth Law of Thermodynamics, Equality of Temperature.
• Understand energy and energy transfer. • Derive expression for work transfer and power.	**Unit II: Energy and Energy Transfer (3 hrs)** Energy and its Meaning, Stored Energy and Transient Energy; Total Energy, Energy Transfer - Heat Transfer and Work Transfer, Expressions for displacement, work transfer and Power.
• Understand various properties of common substances.	**Unit III: Properties of Common Substances (6 hrs)** Pure Substance and State Postulate, Ideal Gas and Ideal Gas

	Relations, Two Phase (Liquid and Vapor) Systems: Phase Change; Subcooled Liquid, Saturated Liquid, Wet Mixture, Critical Point, Quality, Moisture Content, Saturated Vapor and Superheated Vapor, Properties of Two Phase Mixtures, Other Thermodynamic Properties: Internal Energy, Enthalpy, and Specific Heats, Development of Property Data: Graphical Data Presentation and Tabular Data Presentation.
• Understand first law of thermodynamics and its application.	**Unit IV: First Law of Thermodynamics (8 hrs)** First Law of Thermodynamics for Control Mass, First Law of Thermodynamics for Control Mass Undergoing Cyclic Process, First Law of Thermodynamics for Control Volume, Control Volume Analysis: Steady State Analysis and Unsteady State Analysis, Control Volume Application: Steady and Unsteady Work Applications and Steady and Unsteady Flow Applications, Other Statements of the First Law.
• Understand requirement of second law of thermodynamics and its application.	**Unit V: Second Law of Thermodynamics (8hrs)** Necessity of Formulation of Second Law, Entropy and Second Law of Thermodynamics for an Isolated System, Reversible and Irreversible Processes, Entropy and Process Relation for an Ideal Gases and Incompressible Substances, Control Mass and Control Volume Formulation of Second Law, Isentropic Process for an Ideal Gas and for an Incompressible Substances, Carnot Cycle, Carnot Efficiency, Heat Engine and Thermal Efficiency, Heat Pump, Refrigerator and coefficient of Performance (COP), Kelvin-Planck and Clausius Statements of the Second Law of Thermodynamics and their Equivalence
• Understand various thermodynamic cycles.	**Unit VI: Thermodynamic Cycles (8 hrs)** Classification of Cycles, Air Standard Analysis: Otto Cycle, Diesel Cycle and Brayton Cycle, Rankine Cycle, Vapor Compression Refrigeration Cycle.
• Understand the concept of heat transfer.	**Unit VII: Introduction to Heat Transfer (8 hrs)** Basic Concepts and Modes of Heat Transfer, One dimensional steady state heat conduction through a plane wall, Radial steady state heat conduction through a hollow cylinder, Heat flow through composite structures: Composite Plane Wall and Multilayer tubes, Electrical Analogy for thermal resistance, Combined Heat Transfer and Overall Heat Transfer Coefficient for Plane Wall and Tube, Nature of Convection: Free and Forced Convection, Heat Radiation, Stefan's Law, Absorptivity, Reflectivity and Transmisivity, Black Body, White Body and Gray Body

Prescribed Text

- *Fundamentals of Engineering Thermodynamics*: J. R. Howell & R. O. Buckius, McGraw Hill Publishers

Reference

- *Engineering Thermodynamics*: E. Rathakrishnan, Tata Mc Graw Hill.
- *Fundamentals of Thermodynamics*: V. Wylen, Sonntag & Borgnakke, 6th Edition, Wiley
- *Fundamentals of Engineering Thermodynamics*: M. J. Moran & H. N. Shapiro,5th Edition, John Wiley & Sons, Inc.
- *Thermodynamics An Engineering Approach*: Y. A. Cengel & M.A. Boles, 5th Edition, McGraw-Hill, 2006
- *Heat Transfer*: J. P. Holman, McGraw-Hill

Far Western University
Bachelor of Engineering (Civil)
Course of Study

Course Title: Construction Materials **Credit: 3**
Course Code.: CE126 **Number of hours per week: 2**

Nature of the Course: Theory **Total hours: 45**
Year/Semester: First/Second **Level: Bachelor of Engineering (Civil)**

1. Course Introduction:

The course is aimed to preparing students to understand the fundamentals of construction materials. This course provides an introductory overview of the various materials used in construction. Resulting from this course, students will gain a comparative knowledge of material properties and possible applications in construction and architecture.

2. Course Objectives:

- At the end of this course the student should be able to understand the fundamentalsof construction materials used in construction
- Introduce students to the science and technology of construction materials.
- Review important material properties
- Teach students how to select appropriate construction
- Teach technologies of basic construction materials, such as steel, concrete, asphalt,wood, and polymers and composite materials.

3. Specific Objectives and Contents:

Specific Objectives	Contents
•	**UNIT 1. INTRODUCTION (3 Hours)**
• To know the classification, qualities and uses of commonly used building stones • To understand the process and importance of dressing of stones. • Understand the causes of decay of stones, their preservation and tests of stones.	**UNIT 2. BUILDING STONES (5 Hours)** 2.1 Common building stones and their uses 2.2 Quality of good building stones 2.3 Test for stones 2.4 Deterioration of stones 2.5 Preservation of stones 2.6 Dressing of stones
• Understand the importance of clay as a building construction material. • To understand the process of manufacturing good quality bricks and tiles and their uses.	**UNIT 3. BRICKS & TILES (5 Hours)** 3.1 Classification of bricks 3.2 Manufacture of bricks 3.3 Good Quality of bricks 3.4 Tiles and their types 3.5 Quality of tiles & their uses
• Understand the importance of timber products as a building construction material and their uses.	**UNIT 4. TIMBER (5 Hours)** 4.1 Varieties & uses 4.2 Defects in Timber

• To understand the process and importance of seasoning timber. • Understand the causes of decay of timber, their preservation and tests of timber.	4.3 Tests for good Timber 4.4 Deterioration and Preservation of Timber 4.5 Seasoning of timber 4.6 Products of timber & their uses
• Understand the type, properties and uses of lime and cement. • Understand the tests for cement. • To know the manufacturing process of an ordinary cement. • Understand the type, properties and uses of lime and cement mortar.	**UNIT 5. LIME & CEMENT (7 Hours)** 5.1 Type, Properties and uses of lime 5.2 Type, Properties and uses of cement 5.3 Constituents of Cement 5.4 Manufacture of an Ordinary Cement 5.5 Chemical Composition and Hydration of Ordinary Cement 5.6 Laboratory and standard tests for cement 5.7 Admixtures 5.8 Lime & cement mortar
• To know the properties and ingredients of concrete cement. • To understand the importance of good quality cement concrete. • To get brief idea about pre-cast concrete and R.C.C. work. • To understand the properties and handing of fresh concrete to gain the maximum strength.	**UNIT 6. Cement Concrete (10 Hours)** 6.1 Properties and ingredients of cement concrete ▪ Normal consistency, setting time, soundness. ▪ Compression strength of cement ▪ Grades of cement ▪ Quality of mixing water. ▪ Grading of aggregates and importance of size, shape and texture. ▪ Fine aggregate ▪ Coarse aggregate ▪ Water cement ratio 6.2 Materials used in R.C.C. work 6.3 Water proofing cement concrete 6.4 Pre-cast concrete 6.5 Fresh Concrete ▪ Workability – factors affecting workability, ▪ Measurement of workability – slump. Flow tests. ▪ Compaction factor and vee-bee consistometer tests. ▪ Segregation and bleeding. ▪ Process of manufacture of concrete: Batching. ▪ Mixing. ▪ Transporting ▪ Placing ▪ Compaction ▪ Curing ▪ Chemical admixtures- plasticizers, accelerators, retarders and air

	entraining agents. ▪ Mineral admixtures – fly ash. ▪ Silica fumes and rice husk ash. 6.6 Joints in concrete structure 6.7 Quality control of concrete
• Understand the importance of metal products as a building construction material and their uses. • Understand the type, properties and uses of metal and alloy as an engineering material. • To understand the process of corrosion and method of prevention.	**UNIT 7. Metals and Alloys (5 Hours)** 7.1 General Introduction 7.2 Type, properties and uses of iron 7.3 Type, properties and uses of steel 7.4 Nonferrous metals 7.5 Steel alloys 7.6 Corrosion ▪ Causes of corrosion and factor influencing corrosion ▪ Effect of corrosion-Ferrous and nonferrous metals ▪ Prevention of corrosion
• Understand the importance of other miscellaneous materials and their products as a building construction material and their uses.	**UNIT 8. Properties & uses : Other building materials (5 Hours)** 8.1 Reinforcing steel, structural steel 8.2 Cast Iron, Plain carbon steel 8.3 Glasses 8.4 Electrical, Thermal & Sound Insulating Materials 8.5 Paints, Varnish & Enamels 8.6 Plastics 8.7 Rubber 8.8 Gypsum Products 8.9 Asphalt, Bitumen and Tar

Evaluation System

Undergraduate Programs				
External Evaluation	**Marks**	**Internal Evaluation**	**Weight age**	**Marks**
End semester examination (Details are given in the separate table at the end)	60	Assignments	10%	40
		Quizzes	10%	
		Attendance	10%	
		Presentation	10%	
		Mid-Term & Pre-board exam	50%	
		Group work	10%	
Total External	60	Total Internal	100%	40

External evaluation

End semester examination

It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage	External exam marks
Group A: multiple choice*	20	20	20×1 = 20	20%	12
Group B: Short answer type questions	8	6	6×8 = 48	40%	24
Group C: Long answer type question	3	2	2×16 =32	40%	24
			100	100%	60

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submissionof the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers.Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percentclass attendance is mandatory for the students to enable them to appear in the end semester examination.
Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term & Pre-board examination: These are written examination and the questions will be askedcovering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Term Paper writing
- Case study
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified timeperiod. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period.

Prescribed Text:

1. *"Engineering Materials"*, Rangawala P.C. Charter Publishing House, Anand, India.

References:

1. *"Fundamental of Engineering Materials",* Peter A. Thomton and Vito J. Colangela,Pretice Hall College Div, 1985.
2. *"Engineering Materials",* Sushil Kumar, Standard Publication and Distributors, New Delhi.
3. *"Engineering Material",* R.K. Rajput , S. Chand & Company Ltd, 2004

Far Western University

Faculty of Engineering

Course Title: Engineering Drawing II **Credit: 2**
Course No: AR 124 **Number of period per week:3**
Nature of the Course: Theory + Practical **Total hours: 45+15**
Level: B.E. (Civil) **Year: I, Semester: II**

1. Course Introduction:

The course intends to enable the students to be acquainted with the advance concepts and principles of drawing. Students will be grasp knowledge of contemporary system of drafting and can directly perform professional works.

2. Objectives :

To develop a good understanding of pictorial drawings, assembly & disassembly drawing of machine components and other basic engineering drawings in civil, electronic, electrical and geographical. At the end of this course, students should be able:

To acquire knowledge of 3D graphics

To apply knowledge of mechanical, civil, electronic, electrical and geographical drawings in their professional life

Make drawing both manually as well as using CAD.

3. Specific Objectives and Contents

Specific Objectives	Contents
• To understand the concept of 3D views • Create difference between different types of pictorial projections	**Unit I: Pictorial Projection (8 hrs)** 1.1 Introduction; Characteristics, advantages and disadvantages 1.2 Axonometric Projection; Isometric drawing, Dimetric and Trimetric drawing 1.3 Oblique Projection; Cabinet and Cavalier drawing 1.4 Perspective Projection; Parallel and Angular drawing
• To understand the way of dimensioning, taking limits and tolerance in design and production of machine components	**Unit II: Design and Production Drawings-Machine Drawing (4 hrs)** 2.1 Introduction 2.2 Fundamental Techniques; Size and location dimensioning; Placement of lines and

	general procedures Standard dimensioning practice (SI system) 2.3 Limit Dimensioning; Nominal and basic size, allowance, tolerance, limits of size, clearance fit, interference fit Basic hole system and shaft systems
• To learn about mechanical joints • To learn the symbol of fasteners	**Unit III: Fasteners**: **(Nuts, Bolt Riveting and Welding) (6 hrs)** 3.1 Screw threads; ISO standards, representation and dimensioning Fasteners; Types and drawing representation Keys, Collars, joints, springs, bearings
• To learn about mechanical joints pipes • To learn about the process of joining pipes	**Unit IV: Piping Diagrams (4 hrs)** 4.1 Piping, Tubing and Types of Joints 4.2 Specification of Threads, Fittings and Valves 4.3 Standard Piping Symbols 4.4 Piping Drawings and Symbolic Diagrams
• To understand the way of overhauling a machine into its components • To understand the way of assembling components into a machine	**Unit V: Detail drawing : (Disassembly and Assembly) (10 hrs)** 5.1 Disassembly of machine into components (Overhauling) 5.2 Assembly of components into machine (Fitting) 5.3 Production of complete design and assembly drawings in 2D
• To learn conventional symbol used in various disciplines of engineering • To learn the way of drawing maps, charts Nomograms and copies etc.	**Unit VI: Other Engineering Drawings (5hrs)** 6.1 Civil Drawings Steel Construction, Wood Construction, Concrete construction, Masonry and Stone Construction 6.2 Electrical and Electronic Diagrams Standards Types of Diagrams; Line diagram, schematics and pictorials Symbols for Components

	Printed Circuits, Integrated circuits 6.3 Geographical Drawings Topographical Maps, Cadastral Maps, Engineering Maps 6.4 Graphs, Charts and Nomograms Rectangular Coordinate Graphs, Charts, Nommograms 6.5 Duplicating and Reproduction of Engineering Drawings Blue prints, Brown Prints and Blue- Line prints Duplicate Tracings, Photocopies	**LABORATORY** 1. Oblique Drawings 2. Isometric Drawings 3. Perspective Drawing 4. Sizing and dimensioning (Limit, Fit and Tolerance) 5. Threads and Fasteners 6. Welding, Joining and Piping 7. Detail drawings (Disassembly) 8. Detail drawings (Assembly) 9. Structural Drawing 10. Electrical and Electronics Diagrams 11. Topographical and Engineering Maps, Graphs, Chart and Nomograms and Drawing **Reproduction of Drawings.** 12. Machine Drawing using AutoCAD 2008. 13. Building Drawing using AutoCAD 2008. 14. Drawing using GIS. 15. Drawing using GIS (cont)
• To develop the skill of using computer software	**Unit VII: Computer Software used in Drawings (8 hrs)** 7.1 An introduction to AutoCAD (Computer Aided Design) 7.2 An introduction to Geographical Information System (GIS)	

Recommended Books:

Luzadder W.J. (1981). *Fundamentals of Engineering Drawing,* Prentice Hall.

French T E., Vierck C.J. and Foster R.J (1981). *Engineering Drawing and Graphic Technology*, McGraw Hill.

Jones and Jones. *Engineering Drawing*, Heywood, Manchester

Gopalakrishna K.R. *Machine drawing*, Subhas stores, Bangalore

Parkinson. *Engineering Drawing*, *Vol. 1 and 2*, Isaac Pitmans & sons LTD

Gill P.S. *Machine Drawing*

Far Western University
Faculty of Engineering
Bachelor of Engineering (Civil)
Course of Study

Course Title: **Mechanics and Optics** Credit: **3**

Course No.: **SH 122** Number of hours per week: **3**

Nature of the Course: **Theory** Total hours: **45**

Year: **First**, Semester: **Second** Level: **Bachelor of Engineering (Civil)**

1. Course Description

The course intends to enable the students to be acquainted with the basic concepts and principles of mechanics and optics. Students will be familiarized with the fundamentals of elasticity, surface tension, viscosity, interference, diffraction, polarization, fibreoptics, lasers, etc.

2. Course Objectives

At the end of this course the students should be able:

- to acquire sufficient basic knowledge in mechanics and optics.
- to apply this knowledge base for studying major courses.
- to introduce the concepts and methods of mechanics and optics needed for application in various areas.

3. Specific Objectives and Contents

Specific Objectives	Contents
• Understand the elastic properties of matter • Understand and distinguish between stress and strain • Learn Hooke's law • Understand different types of moduli of elasticity and their interrelationship • Understandthe torsion of a cylinder • Develop the idea of cantilever and bending of beams • Understandelastic hysteresis	**Unit I: Elasticity(6)** Elastic properties of matter, stress, strain, Hooke's law, different types of moduli of elasticity, interrelations of elastic moduli, torsion of a cylinder, internal bending moment, cantilever, bending of beams, elastic hysteresis

• Develop the concept of Surface tension and surface energy • Understand the molecular theory • Understand the angle of contact • Calculation of excess pressure over a curved surface • Understand capillarity	**Unit II: Surface Tension (4)** Surface tension and surface energy, molecular theory, angle of contact, excess pressure over a curved surface, capillarity
• Distinguish between streamline and turbulent motion • Understand the continuity equation • Defne the coefficient of viscosity • Understand critical velocity and the concept of Reynold's number • Derive the Poiseuille's equation • Understand the Stokes law and terminal velocity • Understand the Bernoulli's theorem and its applications	**Unit III: Viscosity (5)** Streamline and turbulent motion, Continuity equation, coefficient of viscosity, critical velocity, Reynold's number, Poiseuille's equation, Stokes law, terminal velocity, Bernoulli's theorem and applications
• Understand the basic concept and theory of interference • Distinguish between constructive and destructive interference • Develop the concept of coherent sources • Understand division of wavefront and amplitude • Understand the working of Fresnel's biprism, Lloyd's mirror, Michelson interferometer, Fabry-Perot interferometer and Wedge shape interferometer	**Unit IV: Interference (7)** Basic concept and theory, Coherent sources. division of wavefront and amplitude. Fresnel's biprism. Lloyd's mirror. Michelson interferometer. Fabry-Perot interferometer. Wedge shape interferometer.
• Understand theconcept of differaction and distinguish between Fresnel and Fraunhoffer diffraction • Understand zone plate • Diffraction through single and double slits • Understand the working of plane diffraction grating • Understand the dispersive and resolving power of grating. Microscopes and Telescopes	**Unit V: Diffraction (7)** Fresnel and Fraunhoffer diffraction. Zone plate, Diffraction through single and double slits. Plane diffraction grating. Dispersive and resolving power of grating. Microscopes and Telescopes
• Understand the concept of	**Unit VI: Polarisation (8)**

polarization • Understand double refraction and the resulting polarization • Learn the working of a Nicol prism as polarizer and analyzer • Learn Malus' Law: reduction in intensity • Understand the working of quarter wave plate and half wave plate • Understand different typs of polarized lights and method for their production and detection • Develop the concept of specific rotation • Understand the working of Laurentz's half shade polarimeter and its application in detection of adulteration	Basic concept of polarization, Double refraction. Nicol prism as polarizer and analyzer. Malus' Law, Quarter wave plate and half wave plate. Production and detection of plane, elliptically and circularly polarized light. Specific rotation; Laurentz's half shade polarimeter and detection of adulteration
• Understand the concept of total internal reflection and the propagation of light in optical fibres • Understand numerical aperture and its expression • Understand the working of single mode and multi modefibres and their applications • Understand spontaneous and stimulated emissions and the underlying laser action • Learn the differences of a laser beam from ordinary light • Understand the characteristics of laser beam: beam size, non-divergence, and high degree of monochromaticity and coherence • Understand the applications of laser beam in industries, medicine andcommunication	**Unit VII:Fibre Optics (3)** Propagation of light in fibres, numerical aperture, single mode and multi modefibres, applications **Unit VIII: Laser (5)** Spontaneous and stimulated emissions, Laser action, characteristics of laser beam- beam size, non-divergence, and high degree of monochromaticity and coherence, applications

Prescribed Text

- *Physics (Part I and II):* Robert Resnick and David Halliday, Wiley Eastern Limited

References

- *Fundamentals of Physics*: Haliday, Resnick and Walker, John Wiley and Sons
- *Modern Engineering Physics:*A. S. Vasudeva, S. Chand & Co
- *A Text Book of Optics:* Subramanyam and BrijLal, S. Chand & Co
- *Optics:*A. K. Ghatak, Tata Mc-Graw Hill

Far Western University

Bachelor of Engineering (Civil)

Course of Study 2071

Course Title: Physics Practical

Credit 1

Course No.: EPHY Pr-102

Total hours 15 t: 1

Nature of the Course: Practical

Objectives:

By the end of the course the student should be able to:

- Measure correctly the basic physical quantities
- Determine errors in measurements
- Analyze raw data and make valid conclusions
- Validate corresponding theoretical component
- Develop proper laboratory skills
- Design basic physics experiments
- Interpret experimental results and draw logical conclusions
- Relate theoretical concepts to practical skills

List of Experiments:

1. To find the wavelength of sodium light by Newton's rings experiment
2. To find the wavelength of sodium light by Fresnel's biprism experiment
3. To find the refractive index and Cauchy's constants of a prism by using spectrometer
4. To find the wavelength of sodium light by Michelson interferometer
5. To find the specific rotation of sugar solution by using a polarimeter
6. Determination of Y by cantilever
7. Surface tension by Jaeger's method
8. Study of bending of a beam and determination of Young's modulus
9. Elastic constant by Searle's method
10. Determination of coefficient of viscosity by Poisseuille's method

References:

1. *B.Sc. Practical Physics*: C. L.Arora,S. Chand and Company Ltd
2. *Practical Physics:*G. L.Squires, Cambridge University Press
3. *Practical Physics:* P. K. Shuklaand A. Srivastava, New Age International (P) Ltd

Far Western University

Faculty of Engineering

Course Title: Object Oriented Programming **Credit: 3**

Course No: CT 123 **Number of period per week: 3**

Nature of the Course: Theory + Practical **Total hours: 45**

Year: I, Semester: II

Level: B.E.

Degree: Bachelor's Degree in Civil Engineering

1. Course Introduction

This course aims to provide the object oriented concept after the students have understood the basic concept of programming in Basic Programming and Data Structure. This course will help the students to enhance their programming skills in Object Oriented approach and its vocabulary. The course will help the student to increase the problem solving technique and increase their logic towards the programming. C++ programming language is taught in this course as an Object Oriented Programming Language. The course starts with the basic introduction of OOP to the different features of the object oriented programming.

2. Objectives

After successfully completing the course activities, the student will be able to:

- Get the concept of Object and Classes.
- Know the difference between the OOP and Procedural Programming language.
- To present the syntax and semantics of the "C++" language as well as basic data types offered by the language
- To discuss the principles of the object-oriented model and its implementation in the "C++" language
- Know how to program in the actual scenario.
- Understand the importance of programming in engineering field.
- Learn to handle the different functionalities of OOP like friend function, inheritance, polymorphism, etc.
- Learn how to do file handling using the output stream objects

3. Specific Objectives and Contents

Specific Objectives	Contents
• To understand the basic concept of Object Oriented Programming Language and C++.	**Unit I: Introduction to Object Oriented Programming (5hrs)** Introduction, Issues with Procedural Programming Language, Procedure Oriented Language versus Object Oriented Programming, Concept of OOP (Object, Class, Abstraction, Encapsulation, Inheritance, Polymorphism), Advantages and Disadvantages of OOP, Introduction to C++, History of C++, Features of C++, C++ versus C
• To be familiar with the C++ program structure and basic program constructs.	**Unit II: Basics of C++ (7 hrs)** C++ Program Structure, Keywords, Identifiers, Literals, Operators and Punctuators, Statements, Data Type, Type Conversion, Namespace, User Defined Constant const, Input/Output Streams, Dynamic Memory Allocation using new and delete, Functions(function syntax, function overloading, inline function, pass by reference, return by

• To be familiar with the concept of Object and Classes. • To be able to do simple program using object and classes. • To be familiar with binary and unary operator overloading. • To be familiar with reusing the class with Inheritance. • To be familiar with the virtual functions and dynamic binding. • To learn about the generic programming and how it is achieved using templates. • To be able to differentiate between the conventional error handling and error handling using exceptions. • To be able to use stream operators for file handling.	reference), Array, Pointer, String. **Unit III Concept of Object and Classes (7 hrs)** Concept of class, access specifiers, Objects and member access, defining member function, constructor (default, parameterized and copy constructor), Destructors, array of objects, object as function arguments and returning objects, this pointer, DMA for objects and object array, static data member and static function, constant member function and constant objects, friend function and friend classes **Unit IV Operator Overloading (5 hrs)** Binary and Unary Operators, Overloadable Operators, Syntax and Rules of operator overloading, Unary Operator Overloading, Binary Operator Overloading, Converting Data Types (basic to class, class to basic, class to another class) **Unit V: Inheritance (6 hrs)** Base and Derived classes, protected Access Specifier, member function overriding, forms of inheritance (sinlge, multiple, multilevel, hierarchical, hybrid, multipath), virtual base class. constructor and destructor invocation in single and multiple inheritance. **Unit VI: Polymorphism (4 hrs)** Introduction, Virtual Function, pointer to derived class, pure virtual functions and abstract class, static and dynamic binding, virtual destructor **Unit VII: Templates and Exception Handling (5 hrs)** Templates, Function templates, Class templates, Exception handling constructs (try, catch, throw), Advantage over conventional error handling. **Unit VIII File Handling using stream operators (4 hrs)** File Input/Output using streams, Opening and Closing Files, Read/write to/from file, file access pointers and their manipulators, sequential and random access to file.

Prescribed Text

- *Object Oriented Programming with C++:* E Balagurusamy, Tata Mc-Graw Hill Publication, 4th Edition
- *" The secrets of Object Oriented Programming in C++"* : Daya Sagar Baral and Diwakar Baral, Bhudipuran Prakashan, 1st Edition

Reference

- *"Object Oriented Programming in C++"* : Robert Lafore, Galgotia Publictions, 2010 Edition
- *"C++ How To Program" :* Deitel and Deitel Pearson Education Inc., 5th Edition

Far Western University

Faculty of Engineering

Course Title: **Study Skills in English for Academic Purposes (EAP)**

Code: SH 125 Credit Hour: 3

Level: B.E. Civil Total Hours: 45

Degree: Bachelors' Degree in Civil Engineering Year: I; Semester: II

1. Course Introduction

This course aims at developing study skills and academic English skills in students. The course covers reading academic texts efficiently and effectively; taking notes from lectures and books; doing basic research; using library or computer-based resources; writing academic papers; taking part in discussions; presenting papers; managing study time and preparing for examinations In this course the students analyse characteristics of written and spoken academic texts, develop awareness of academic culture and learn to avoid plagiarism. The course also aims to develop independent learning skills and critical thinking and allows for personalisation of learning.

2. General Objectives

General objectives of this course are to:

g) introduce students to the basic concepts of academic skills
h) help them develop different types of academic reading skills
i) enable them to be successful in academic listening and speaking
j) help them manage study skills for academic purpose
k) write academic papers

3. Contents with Specific Objectives

Specific Objectives	Contents in Detail
• explain the basic concepts of academic skills • talk about the academic culture	**Unit One: Introduction to Academic Skills** 1.7. Thinking about academic culture 1.8. Thinking critically 1.9. Avoiding plagiarism 1.10. Academic vocabulary
• research texts for various kinds of meaning • read and prioritize ideas • read for detail understanding • recognize plagiarism • organize information • read critically	**Unit Two: Academic Reading** 2.1. Researching texts and understanding implicit meaning 2.2. Selecting and prioritizing ideas 2.3. Reading for detail 2.4. Recognizing plagiarism 2.5. Organizing information 2.6. Reading figures and tables 2.7. Critical reading
• understand lectures and take notes • make presentations • follow an arguments • work in groups • reach consensus	**Unit Three: Listening and Speaking in Academic Settings** 3.1. Understanding lectures 3.2. Taking notes 3.3. Making presentations 3.4. Following an argument 3.5. Working in groups and reaching consensus
• organize essays • use claims	**Unit Four: Academic Writing** 4.1.Organization of the essay

• refer to other's work • use academic vocabulary in writing • describe information in tables and figures	4.2.Using and supporting claims 4.3.Referring to other people's work 4.4.Writing skills in academic writing 4.5.Writing vocabulary 4.6.Describing information in figures and tables
• be aware of plagiarism • use complex noun phrases • use conjunctions and connectors	**Unit Five: Grammar in Academic English** 5.1. Avoiding repetition 5.2. Complex noun phrases 5.3. Conjunctions and sentence connectors
• Improve reading skills • take notes • learn through discussions • manage study time	**Unit Six: Managing Study Skills** 6.1.Improving reading efficiency 6.2.Note-taking skills 6.3.Basic research techniques 6.4.Writing skills 6.5.Learning through discussions 6.6.Managing your study

4. Methodology and Techniques

Modes of instruction:

- Lecture, Seminar, Exercises , Guided study, Tutorial, Independent study, Project work

Modes of learning:

- Attending lectures, Doing assignments, Writing papers, Independent and private study, Reading books, reviewing journals and papers, Critiquing, Group study
  Peer discussion

6. Prescribed Texts

a) Hewings, M. (2012). Cambridge academic English: Upper intermediate. Cambridge. Cambridge University Press***.(All Units)***

b) Wallace, M. (2009). *Study skills in English*. Cambridge. Cambridge University Press***.(All Units)***

Dictionary

5. Hornby. A.S. (2010). Eighth Edition. Oxford Advanced Learner's Dictionary. Oxford: Oxford University Press.

Far Western University
Faculty of Engineering
Bachelor of Engineering (Civil)
Course of Study

Course Title: Fluid Mechanics Credit: 3
Course Code: CE 237 Number of hours in a week: (2+1)
Nature of the Course: Theory + Tutorial Practical: 1.5/2 hr in a week
Year: II Semester: III
Level: Bachelor of Engineering (Civil)

1. Course Introduction:

This course is aimed to deliver the knowledge to the Civil Engineering Student at Bachelor Level about the concept of water Resources Engineering and their application in the field of Civil Engineering. Fundamentals of fluid mechanics are aimed to teach in this course so that it helps easy to understand the advance level water resources courses like Irrigation, Hydropower in subsequent semesters.

2. Course Objectives:

At the end of this course the students should be able -

- To understand the fundamental terms used in fluid mechanics.
- To know the basic applicability of fluid mechanics in advance water resources related courses.
- To know the behavior of fluids that is difference from solid.
- To know the flow measurement process and equipments as well as practical familiarity about it.
- To know the modeling criteria and importance of dimensional analysis

3.0 Specific Objectives and Contents

Specific Objectives	Contents
• To know the basic properties of fluids • To know the importance of Viscous fluid • To be able to differentiate between the Real and Ideal fluids	**Unit 1 . Physical Properties of Fluid (3 Hours)** 1.1 Definition of fluid, Basic Concept 1.2 Difference between solids, liquids and gases 1.3 Shear stress in fluids, Concept of Control Volume, Continuum of fluid 1.4 Physical properties of fluids (Mass density, Specific weight, Specific gravity, Compressibility, Capillarity, Surface tension, Vapor pressure and gas law 1.5 Viscosity (Definition, Newton's law, and Effects of viscosity with temperature variation, Viscometer and its uses) 1.6 Various types of fluids : Real and Ideal, Newtonian and non-Newtonian, compressible and incompressible
• To know the pressure variation in static fluid with height • To know the various types of pressure and their uses • To be able to handle the pressure measuring instruments with concepts	**Unit 2 . Fluid pressure and Height (3 Hours)** 2.1 Intensity of pressure 2.2 Pascal's Law 2.3 Hydrostatic law of pressure distribution (Pressure-DensityHeight relationship) 2.4 Pressure variation in a static fluid 2.5 Different types of pressure (Atmospheric, Absolute, Gauge and Negative) 2.6 Measurement of pressure : Manometers (Piezometer, Utube, Single column (vertical and inclined), Differential, Inverted U-tube), Bourden gauge

• To know the pressure forces on hydraulic equipments • To be able to select the suitability of water retaining faces in practical life • To be able to understand the Archimedes's principle and its applicability in real life • To know the effects of fluid acceleration inside the container	**Unit 3 . Hydrostatic Forces on Submerged bodies (10 Hours)** 3.1 Pressure force and point of application on submerged surfaces (Horizontal, Vertical, inclined and curve surfaces) 3.2 Pressure diagram and Pressure forces on hydraulic structures (Gate : plane and curve face, Dam and other water retaining structures) 3.3 Tensile stress in a pipe spherical shell due to fluid pressure 3.4 Buoyancy and floatation (Concept of flotation and Archimedes's principle, thrust on submerged and floating bodies, hydrometer) 3.5 Stability of floating and submerged bodies, Metacentre and determination of metacentric height 3.6 Relative equilibrium (Uniform linear acceleration and radial acceleration)
• To be able to know the differences of various states of fluid flows • To be understand the real life flows like stream lines, path line and streak lines • To know the importance and applicability of Continuity equation	**Unit 4. Fluid Kinematics (4 Hours)** 4.1 Description of Fluid flows 4.2 Classification of Fluid flows (Laminar and Turbulent, Steady and Unsteady, Uniform and Non-uniform, Compressible and Incompressible, Pressure and Pressureless, Ideal and Real, Rotational and Irrotational), One, Two and Three dimensional flows 4.3 Description of Streamlines, Path lines and Streaklines 4.4 Acceleration of a Fluid particle (Lagrangian and Eulerian approach) 4.5 Flow rate and Continuity equation in Cartesian and Polar Coordinates (One, Two and Three dimensional) 4.6 Flow net, its characteristics and utility
• To be able to understand the forces acting on fluid in motion • To know the fluid as a source of energy • To know the Energy conservation principle • To know the importance of momentum in real life • To know the importance of angular momentum	**Unit 5 . Fluid Dynamics (9 Hours)** 5.1 Forces acting on a Fluid in motion (Gravitational, Pressure, Surface tension, Compression and Turbulent) 5.2 Energy and its forms 5.3 Euler's and Navier-Stoke's Equation along Streamline 5.4 Euler's Equation in Cartesian Coordinates 5.5 Hydrostatic Equation from Euler's Equation 5.6 Principle of Energy Conservation : Bernoulli's Theorem and its physical meaning (TEL, HGL) 5.7 Bernoulli's Theorem from Steady Flow Energy Equation 5.8 Bernoulli's Equation for Real fluid (Considering friction) 5.9 Impulse- Momentum Relationship (Momentum principle and equations) 5.10 Application of Momentum equations to calculate forces in pipes (Reducer, Enlargement and in Bends) 5.11 Kinetic Energy correction factor and Momentum correction factor 5.12 Moment of a Momentum Equation, Force Exerted by Jet on stationary and moving vanes. 5.13 Angular Momentum and its application (Sprinkler analysis)

• To be able to handle the different shape and sizes of flow measurement equipments • To understand the principle of reservoir filling and emptying • To be able to select the flow measurement equipment in practical life	**Unit 6 . Flow Measurement (9 Hours)** 6.1 Flow through Orifice (Different sizes including submerged and partially submerged), Hydraulic Coefficients (CC, CV and CD) 6.2 Classification of Weirs and Notches 6.3 Discharges through Rectangular, Triangular, Trapezoidal and Cipoletti Notches 6.4 Discharges Through Weirs (Sharp crested weir, narrow crested weir, Broad crested weir and Ogee shaped weir) 6.5 Estimation of reservoir filling / emptying time (Cylindrical, Conical and Hemispherical) with and without inflow 6.6 Variable Head Meters (Pitot tube, Venturimeter, Orifice meter, Nozzle meter and Elbow meter)
• To understand the concept of Boundary layer and its applicability in real life	**Unit 7 . Boundary Layer Flows (2 Hours)** 7.1 Concept and Definition of Boundary Layer 7.2 Concept on : Boundary layer thickness, Momentum thickness and Displacement thickness 7.3 Application of Boundary layer concept on hydraulically smooth and rough boundary
• To understand the hidden rule behind the aeroplane flying in the sky and submarine in the water bodies	**Unit 8 . Flow Around Immersed Bodies (2 Hours)** 8.1 Expression of Drag and Lift forces on submerged Body 8.2 Drag force on a flat plate, cylindrical body and Spherical body 8.3 Drag and Lift on an airfoil 8.4 Circulation and Lift on an airfoil
• To know the importance of dimensional analysis in fluid mechanics • To understand the effects of scaling during model development	**Unit 9 . Dimensional Analysis and Similitude (3 Hours)** 9.1 System of Dimensions and Dimensional Analysis 9.2 Dimensional Homogenity and its Application 9.3 Dimensional analysis (Buckingham π -Theorem and Rayleigh Method) 9.4 Similitude, Law of Similarity, Distored and Undistord Model 9.5 Dimensionless numbers and their significance (Reynolds, Froude, Mach,Webber and Euler Number)

4. Practical : After completion of the flowing practical work in the laboratory, students should be able –

- o find the hydrostatic force in any submerged body
- To handle the different floating body stability
- To understand the applicability of Bernoulli's equation
- To know the usefulness of fluid jet
- To be able to use the different flow measuring equipments

The following Laboratory works will be performed during the course:

1. Hydrostatic force on submerged body
2. Stability of a Floating Body
3. Verification of Bernoulli's Equation
4. Impact of Jet
5. Flow Through edged Orifice

Far Western University
Faculty of Engineering
Bachelor of Engineering (Civil)
Course of Study

Course Title: Engineering Mathematics III — Credit: 3
Course Code: SH 231 — Lectures in a week: 3
Year : II Semester : III — Tutorials in a week: 2
Level: **Bachelor of Engineering (Civil)**

Course objective:

To prepare students to apply mathematical tools viz. infinite series, , integral transformation theorems, Fourier series , Fourier transform and linear programming in the field of engineering study.

1. **Infinite series [8 hours]**
   - 1.1 Infinite sequence and series
   - 1.2 Convergent, divergent, oscillating sequences
   - 1.3 Limit of a sequence
   - 1.4 Infinite series and convergence
   - 1.5 Test of convergence :Cauchy's general principle, Cauchy's integral test, comparison tests, hyperharmonic series test, D' Alembert's Ratio test, Cauchy's Root test, Logarithmic test
   - 1.6 Alternating series : Leibnitz test
   - 1.7 Absolute convergence , Radius and Interval of convergence
2. **Integral Transformation Theorems [11 hours]**
   - 2.1 Line integrals : physical meaning, independent of path
   - 2.2 Surface integrals
   - 2.3 Greens Theorem in plane and Application
   - 2.4 Stoke's Theorem (without proof) and Application
   - 2.5 Volume integrals, Gauss Divergence theorem and application
3. **Laplace Transform [8 hours]**
   - 3.1 Properties and basic formulae
   - 3.2 Inverse Laplace transform: standard formulae
   - 3.3 Theorems on Laplace transforms and inverse Laplace transforms
   - 3.4 Convolution
   - 3.5 Application of Laplace transforms to ordinary differential equations
4. **Fourier series and Fourier Transforms[11 hours]**
   - 4.1 Fourier series in the interval of length 2π
   - 4.2 Fourier series for arbitrary interval
   - 4.3 Half range Fourier series
   - 4.4 Parseval's theorem on Fourier constants
   - 4.5 Fourier integral theorem
   - 4.6 Fourier sine and cosine integrals
   - 4.7 Fourier sine and cosine transforms
5. **Linear Programming Problem[7 hours]**
   - 5.1 Introduction, basic assumptions , general statement of and formulation of LPP
   - 5.2 Graphical solution to LPP
   - 5.3 Simplex method
   - 5.4 Concept of duality

Reference books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley and Sons Inc
2. Thomas, Finney, Calculus and Analytical geometry Addison- Wesley
3. M. B. Singh, B. C. Bajrachrya, Differential calculus, Sukunda Pustak Bhandar,Nepal
4. M. B. Singh, B. C. Bajrachrya, A text book of Vectors, Sukunda Pustak Bhandar,Nepal
5. M. B. Singh, S. P. Shrestha, Applied Mathematics,
6. G.D. Pant, G. S. Shrestha, Integral Calculus and Differential Equations, Sunila Prakashan,Nepal
7. Y. R. Sthapit, B. C. Bajrachrya, A text book of Three Dimensional Geometry, Sukunda Pustak Bhandar,Nepal
8. Santosh Man Maskey, Calculus, Ratna Pustak Bhandar, Nepal

Far Western University
Faculty of Engineering
Bachelor of Engineering (Civil)
Course of Study

Course Title: Basic Mechanical Engineering
Credit: 2
Course Code: ME 232
Number of period per week=1+2
Nature of the Course: Theory +Practical
Total hours: 45
Year: First, Semester: III
Level: B.E. Civil

1. Course Introduction

The subject aims at imparting knowledge and skill components in the field of Mechanical Engineering. It deals with different hand and machine tools required for manufacturing simple metal components and articles.

2. Objectives

After the completion of the course, the student shall be able to:

- Practice workshop safety rules effectively
- Acquire knowledge and use simple hand tools
- Acquire knowledge and use simple measuring and gauging instruments
- Operate simple drilling machines for producing small holes
- Operate various machine tools for producing simple metal components and articles
- Acquire knowledge and practice on foundry, forging and welding

3. Specific Objectives and Contents

Specific Objectives	Contents
• Basic introduction and on various workshop tools. • Knowledge of safety requirements during handling of various workshop tools.	**Unit I: General safety Considerations (2 hrs)** Introduction and general safety considerations during handling of Bench Tools, Machinist's Hammers, Screw Drivers, Punches, Chisels, Scrapers, Scribers, Files, Pliers and Cutters, Wrenches, Hacksaw, Bench Vise, Hand drill, Taps and Dies, Hand Shears, Rules, Tapes and Squares, Soldering Iron, Rivets.
• Introduction on Hand working operations. • Familiar with various hand working operations.	**Unit II: Hand Working Operations (1 hr)** Brief introduction on various hand working operations - Sawing, Filing, Threading, Scribing, Shearing, Soldering, Riveting.
• Familiar with various measuring and gauging tools. • Able to use various measuring and gauging tools.	**Unit III: Measuring and Gauging (1 hr)** Introduction to measuring and gauging tools, Their types, Semi-Precision Tools - Calipers, depth Gauge, Feeler Gauge and Precision Tools - Micrometers, Vernier Calipers, Vernier Height Gauge, Telescopic Gauge, Hole Gauge, Bevel Protractor, Dial Indicator, Gauge Blocks and Surface Plate.
• Familiar with drills and drilling processes. • Able to perform drilling operation.	**Unit IV: Drills and Drilling Processes (1 hr)** Introduction, Types of Drilling Presses, Work Holding Devices and Accessories, Cutting Tools, Geometry of Drill Bits, Grinding of Drill Bits, Various Drilling Operations - Counter-boring, Counter-sinking, Reaming, Honning, Lapping, Cutting Speeds, Drilling Safety
• Familiar with various machine tools such as Lathe machine, Shapers machine, Milling machine and	**Unit V: Machine Tools (4 hr)** General Safety Considerations, Introduction, Physical Construction, types and Operations of Engine Lathe - Facing, Turning, Threading.

grinding machine. • Able to perform various machining operations.	Introduction, types, physical construction and general applications of shapers. Introduction, types and physical construction of Milling Machines. Milling Cutters - Plain, Side, Angle, End, form. Milling Operations - Plain, Side, Angular, Gang, End, Form, Keyway. Work Holding Devices and Cutter Holding Devices. Grinding Machines, Abrasives, Bonds, Grinding Wheels, Rough Grinders - Portable Grinders, Bench Grinders, Swing Frame Grinders, Abrasive Belt Grinders and Precision Grinders - Cylindrical Grinders, Surface Grinders.
• Knowledge of different metals and their use as tool material. • Knowledge of various heat treatment processes and their operation.	**Unit VI: Material Properties (2 hrs)** Tool materials – Low, medium and high carbon steels; Hot and cold rolled steels; Alloy steels; Carbide and Ceramic materials. Heat treating methods for steels – Annealing, Tempering, Normalizing, Hardening and Quenching. Non-ferrous metals – Brass, Bronze, Aluminum and their comparative Properties.
• Familiar with sheet metal tools and sheet metal works. • Able to perform sheet metal operation.	**Unit VII: Sheet Metal Works (1 hr)** Introduction to sheet metal tools and sheet metal works, Marking and Layout Operations and sheet metal operations - Bending, Cutting, Rolling
• Familiar with foundry tools and foundry practice. • Able to perform foundry operation.	**Unit VIII: Foundry Practice (1 hr)** Introduction to foundry tools and foundry process, Pattern Making, Core Making, Melting Furnace – Cupola and Sand Casting Process.
• Familiar with forging tools and forging practice. • Able to perform forging operation.	**Unit IX: Forging Practice (1 hr)** Introduction to forging tools - Forging Presses and Hammers, Forging operations – Upsetting, Drawing, Cutting, Bending, Punching.
• Familiar with various types of metal joining process. • Able to perform soldering, brazing, gas welding and arc welding operation.	**Unit IX: Metal Joining (1 hr)** Safety considerations and introduction to Soldering, Brazing and Welding – Gas Welding, Arc Welding, Resistance Welding, Tungsten Inert Gas Welding (TIG), Metal Inert Gas Welding (MIG).

Prescribed Text

- *Shop Theory*: J. Anderson and E. E. Tatro, McGraw – Hill, 5th Edition, 1942

Reference

- *Machine shop operations and setups*: O. D. Lascoe, C. A. Nelson and H. W. Porter, American Technical society, 1973
- *Machine shop Practice – Vol. I*: Industrial Press, New York, 1971
- *Technology of Machine Tools*: Mc Graw Hill – Ryerson, 3rd Edition
- *Machinery's Handbook*: Oberg, Jones and Horton, 23rd Edition, Industrial Press, New York.
- *Elements of Workshop Technology - Vol. I (Manufacturing Processes)*: S. K. Hajra Choudhury and A. K. Hajra Choudhury – Media Promoters and Publishers Pvt. Ltd., Bombay, INDIA, Tenth Edition, 1993
- *Elements of Workshop Technology - Vol. II: (Machine Tools)*: S. K. Hajra Choudhury, S. K. Bose and A. K. Hajra Choudhury – Media Promoters and Publishers Pvt. Ltd., Bombay, INDIA, Eight Edition, 1988
- *A Course in Workshop Technology - Vol. I*: Prof. B. S. Raghuwanshi – Dhanpat Rai and Co. (P) Ltd, Delhi, INDIA, Ninth Edition, 2002

- *A Course in Workshop Technology - Vol. II*": Prof. B. S. Raghuwanshi – Dhanpat Rai and Co. (P) Ltd, Delhi, INDIA, Ninth Edition, 2002
- *Workshop Technology - Vol. I*": H. S. Bawa – Tata Mc – Graw Hill publishing company Limited, New Delhi, INDIA,
- *Workshop Technology - Vol. II*": H. S. Bawa – Tata Mc – Graw Hill publishing company Limited, New Delhi, INDIA,
- *A text book of Workshop Technology* - R. S. Khurmi and J. K. Gupta - S. Chand and Company Ltd, New Delhi. INDIA

Far Western University
Faculty of Engineering
Bachelor of Engineering (Civil)
Course of Study

Course Title: **Engineering Geology**	Credit:**3**
Course No: **SH236**	Number of hours per week: **3**
Nature of Course: **Theory**	Total Hours: **45**
Year: **Second,** Semester:**Third**	Level: **Bachelor of Engineering (Civil)**

1. **Course Introduction:**
   The course intends to enable the students to be acquainted with the basic concept of engineering geology. Students will be familiarized with the fundamental of engineering geology focusing on different types of rocks, minerals, geological structures and their impacts on engineering structures.
2. **Course objectives:**
   At the end of this course the student should be able:
   - To acquire sufficient basic knowledge in engineering geological knowledge
   - To understand and analyze the geological structures
   - To understand about hydro-geology, geological geology, geological setting of Himalaya and geological structures for development of infrastructures.
3. **Specific Objectives and Contents:**

Specific Objectives	Contents
• To understand the basic definition of engineering geology and importance in different engineering projects	**1. Introduction to Engineering Geology (2 hrs)** 1.1 Definition of geology and branches of geology 1.2 Introduction of engineering geology (definition according to IAEG), role and tasks of an engineering geologist, scope and objective and its important in the context of Nepal 1.3 Engineering geological system (EGS) and engineering geological studies in different phases of EGS
• To acquire the knowledge on the internal structure of the earch • To understand the basic mechanism of plate tectonics and mountain building process	**2. Structure of the Earth (2 hrs)** 2.1 Internal structure of the Earth, its age and component 2.2 Physical features of earth surface: continental and oceanic features, mountains, plateau and shields 2.3 Plate tectonics and mountain building process and formation of Himalayas.
• To understand the crystal structure of the minerals with their physical parameter and their engineering significance	**3. Crystallography and Mineralogy (3 hrs)** 3.1 Introduction of minerals and crystal, Crystallographic axes and angle, crystal system 3.2 Physical and optical properties of minerals 3.3 Classification and identification of common rock forming minerals and their engineering significance

• To identify the different types of rocks in the field with the help of their structure, texture and uses • To understand the importance of different rocks for engineering projects	**4. Petrology (6 hrs)** 4.1 Introduction: Petrology, Petrography and petrogenesis 4.2 Rock cycle and classification of different types of rocks 4.3 Introduction, classification, structure, texture, uses and engineering significance of igneous rock, sedimentary rock and metamorphic rock 4.4 Identification criteria of different rock types in the field
• To get detail knowledge on rock deformation with its attitude. • To identify the different primary and sedimentary structures in the field and their engineering significance • To calculate the attitude of strata with the help of bore hole problems	**5. Structural geology(8 hrs)** 5.1 Introduction to Rock deformation, reason and its effect 5.2 Attitude of geological structures (Dip, Strike, Plunge, Trend) 5.3 Geological structures: Primary (bedding plane, lamination, cross bedding, ripple marks, mud cracks etc.) 5.4 secondary structures: Continuous (lineation, foliation, boudinage, crenulation cleavage, folds) and discontinuous (fracture, joints, fault and thrust) 5.5 Identification criteria of geological structures in the field and their engineering significance 5.6 Introduction of bore hole and bore hole problems
• To acquire the knowledge on the effect of different geological agents on earth surface • To understand the importance of kinematic analysis of discontinuities • To understand the importance of rock mass classification system and its implication in tunnel.	**6. Rock slope engineering and earth processes(8 hrs)** 6.1 Introduction to different geological agent: running water, ground water, GLOF, glacial, wind and sea water and landforms produced by geological agents 6.2 Study of earth processes (Weathering, erosion, subsidence, mass wasting, volcanism Earthquake and glaciation) and the effect on development of surfaces of the earth 6.3 Stereographic projection and kinematic analysis of discontinuities 6.4 Study of rock mass classification system and implication in different engineering projects.
• To understand the basic concept of hydrogeology and different acquifer system of Nepal.	**7. Hydrogeology(3 hrs)** 7.1 River channel morphology 7.2 Origin, type and movement of Groundwater, Porosity, permeability and hydraulic transmissivity of different strata, rocks and sediments 7.3 Different types of aquifer system of Nepal (Terai, hills and mountains)
• To understand the different elements	**8. Site Investigation(6 hrs)** 8.1 Elements of site investigations

of site investigations • To acquire the basic engineering geological knowledge for site selection of different engineering projects	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
• To understand the tectonic and geomorphological division of Nepal and associated different engineering geological problems.	**9. Geology of Nepal(3 hrs)** 9.1 Geological and geomorphological 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 found in different geological division of Nepal
• To know the basic concept of aggregates and construction material. • To understand the different methods of reserve estimation by using different maps.	**10. Study of reserve estimation of construction material(4 hrs)** 10.1 Types of reserves 10.2 Aggregates and construction materials: clay, sand, limestone & marbles, slates & other building stones 10.3 Introduction to methods of estimation of reserve (cross section, isopath, extended area and block method) 10.4 Use of geological, engineering geological, and topographic maps and aerial photograph in searching of the construction materials

Evaluation System

Undergraduate Programs							
External Evaluation	**Marks**	**Internal Evaluation**	**Weightage**	**Marks**	**Practical**	**Weightage**	**Mark**
End semester examination (Details are given in the separate table at the end)	60	Assignments	25%	5	Practical Report copy	25%	5
		Quizzes			Viva	25%	5
		Presentation					
		Group work			Field Work	50%	10
		Mid-Term Exam	75%	15			
Total External	60	Total Internal	100%	20	Total Practical	100%	20

External evaluation

1. **End semester examination:**
   It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

2. **External Practical Evaluation:**
   Field work will be organized during the semester and marking will be awarded accordingly. After completing the end semester theoretical examination, practical examination will be held. External examiner will conduct the practical examination according to the above mentioned evaluation. There will be an internal examiner to assist the external examiner. Three hours time will be given for the practical examination. In this examination Students must demonstrate the knowledge of the subject matter.

Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage	External exam marks
Group A: multiple choice*	20	20	20×1 = 20	20%	12
Group B: Short answer type questions	8	6	6×8 = 48	40%	24
Group C: Long answer type question	3	2	2×16 =32	40%	24
			100	100%	60

Each student must secure at least 45% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term examination: These are written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Term Paper writing

- Case study
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period.

Engineering Geology Practical

1. **Course Introduction:**

   The course intends to enable the students to be acquainted with the basic concept of engineering geology. Students will be familiarized with the fundamental of engineering geology focusing on different types of rocks, minerals, geological structures and their impacts on engineering structures.

2. **Course objectives:**

   At the end of this course the student should be able:

   - To acquire sufficient basic knowledge in engineering geological knowledge
   - To understand and analyze the geological structures
   - To analyze of the discontinuities data for kinematic analysis

Fieldwork (Three days)

Three days field trip for geological survey and study (***Attendance in Fieldwork is Compulsory)***

Text Books:

1. A Geology for Engineers, Seventh Edition, Blyth, F.G.H. and Freitas, de M.H., ELBS, 1984.
2. A Text Book of Engineering & General Geology, Singh, P., Delhi: S.K. Kataria& Sons. (2004).
3. Principles of Physical Geology: A. Holmes, ELBS English Language Society

References:

1. Geology of the Nepal Himalaya, Dhital, M.R., Springer International Published, Switzerland, (2015)
2. Geology for Civil Engineers, Poudyal, K., Oxford International Publication, 2006.
3. Handbook of Engineering geology, Tamrakar, N.K. and Bajracharya, Buddha Publication, 2011.
4. Engineering Geology, Ghimire, P.K., and Dhar, M. S., Spectrum offset press, 2006.
5. Principles of Engineering Geology:Jonson, R.B., Degraff, J.V, John Wiley and Sons Inc.
6. Billings, M.P. Structural Geology,New Delhi: Prentice Hall of India Private Limited.

Far Western University
Faculty of Engineering
Bachelor of Engineering (Civil)
Course of Study

Course Title: Basic Electrical and Electronics Engineering Credit: 3

Course Code: EX 234 Number of periods/week=3+1+4

Nature of the Course: Theory +Practical Total hours: 45

Year: Second, Semester: III

Level: B.E. Civil

The main objective of the course is to provide students with fundamental concept of ELECTRICAL AND ELECTRONICS Engineering.

Objective of the Chapter:

- Review of concept of electricity, concept of voltage, current, resistance.
- Relationship between current and voltage, determination of resistance and its dependence on temperature.
- Voltage and current relationship in meshed networks, series parallel combination; power and energy concept

1. General Electric System (6 hours)

1.1 Introduction
1.2 Current flow in a circuit
1.3 Electromotive force and potential difference
1.4 Electrical units
1.5 Ohm's law
1.6 Resistors, resistivity
1.7 Temperature rise & temperature coefficient of resistance
1.8 Voltage & current sources
1.9 Series circuits
1.10 Parallel networks
1.11Krichhhof's laws
1.12 Power and energy

Objective of the section:

To provide knowledge on analysis of complex networks using different approaches and methods.
To understand the need for different network analysis methods and their applications.

2. Network Theorems (8 hours)

2.1. Nodal Analysis
2.2 Mesh analysis
2.3 Star-delta & delta-star transformation
2.4 Superposition theorem
2.5Thevninn's theorem
2.6Nortan's theorem
2.7 Maximum power transfer theorem
2.8 Reciprocity theorem

Objective of the section:

To understand the origin of capacitance and inductance.
To understand the factors affecting the capacitance and inductance.

3.Inductance& Capacitance in electric circuits (3 hours)

3.1 General concept of capacitance
3.1.1 Charge & voltage
3.1.2 Capacitors in series and parallel
3.2 General concept of inductance

3.2.1 Inductive & non-inductive circuits
3.2.2 Inductance in series & parallel

Objective of the section:

To understand fundamental concept of ac current and voltages.
To understand concept of impedance, relationship between V, I and Z
To understand concept of active, reactive and apparent power and techniques to evaluate these quantities.

4. Alternating Current Circuits (8 hours)

4.1 AC systems- waveform, various terms and definitions
4.2 Average and rms values of current & voltage
4.3Phasor representation
4.4 AC in resistive circuits
4.5 Current & voltage in an inductive circuits
4.6 Current and voltage in an capacitive circuits
4.7 Concept of complex impedance and admittance
4.8 AC series and parallel circuit
4.9 RL, RC and RLC circuit analysis &phasor representation
4.10 Power in resistive, inductive and capacitive circuits
4.11 Active and reactive power
4.12 Power factor, its practical importance

Objective of the section:

To understand three phase ac circuits, relationship between V, I and power.

5.Three-Phase Circuit Analysis (3 hours)

5.1 Basic concept & advantage of Three-phase circuit
5.2 Phasor representation of star & delta connection
5.3 Phase and line quantities
5.4 Voltage & current computation in 3-phase balance & unbalance circuits
5.5 Real and reactive power computation

Objective of the section:

To understand semiconductors devices Diode and it's applications.

6. **Diodes (3 hours)**

6.1 Semiconductor diode characteristics
6.2 Modeling the semiconductor diode
6.3 Diode circuits: clipper; clamper circuits
6.4 Zener diode, LED, Photodiode, varacters diode, Tunnel diodes
6.5 DC power supply: rectifier-half wave, full wave (center tapped, bridge), Zener regulated power supply

Objective of the section:

To understand about construction, operation and applications of transistors.

7. Transistor (5 hours)

7.1 BJT configuration and biasing, small and large signal model
7.2 T and μ model
7.3 Concept of differential amplifier using BJT
7.4 BJT switch and logic circuits
7.5 Construction and working principle of MOSFET and CMOS

Objective of the section:

To understand basics about op-amp and oscillators.

8. The Operational Amplifier and Oscillator (4 hours)

8.1 Basic model; virtual ground concept; inverting amplifier; non-inverting amplifier; integrator; differentiator, summing amplifier and their applications
8.2 Basic feedback theory; positive and negative feedback; concept of stability; oscillator
8.3 Waveform generator using op-amp for Square wave, Triangular wave Wien bridge oscillator for sinusoidal waveform

Objective of the section::

To understand the basic functioning of digital electronis : logic gates, circuits an and the operations combinatorial circuits

9. **Digital Electronics (5 hours)**

9.1 Number systems, Binary arithmetic

9.2 Logic gates: OR, NOT, AND NOR, NAND, XOR, XNOR gate; Truth tables

9.3 Multiplexers; Demux, Encoder, Decoder

9.4 Logic function representation

9.5 Combinational circuits: SOP, POS form; K-map;

Practical:

1. Measurement of Voltage, current& power in DC circuit
   Verification of Ohm's Law
   Temperature effects in Resistance
2. Krichoff's Voltage & current Law
   Evaluate power from V & I
   Note loading effects of meter
3. Measurement amplitude, frequency and time with oscilloscope
   Calculate & verify average and rms value
   Examine phase relation in RL & RC circuit
4. Measurements of alternating quantities
   R, RL,RC circuits with AC excitation
   AC power, power factor, VARs, phasor diagrams

5. Familiarization with Three-phase AC circuits
6. Familiarization with passive components, function generator and oscilloscope

Diode characteristics, rectifiers, Zener diodes

Bipolar junction transistor characteristics and single stage amplifier

Voltage amplifiers using op-amp, Comparators, Schmitt

Wave generators using op-amp

Combinational and sequential circuits

References:

1. J.R Cogdell, "Foundations of Electrical Engineering", Prentice Hall, Englewood Chiffs, New Jersy.
2. I.M Smith," Haughes Electrical Technology", Addison-Wesley, ISR Rprint.
3. Robert Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory" PHI
4. Thomas L. Floyd, "Electronic Devices" Pearson Education, Inc.
5. A.S. Sedra and K.C. Smith, "Microelectronic Circuits", Oxford University Press.
6. B.L Theraja, A.K Theraja ," A text Book of Electrical technology "

Far Western University

Faculty of Engineering

Bachelor of Engineering (Civil)

Course of Study

Course Title: Strength of Materials
Course Code : CE 235
Year/Semester: II/III
Level: Bachelor of Engineering (Civil)

Number of lectures/ week: 3
Tutorial/ week: 2hrs
Total Hours: 48

1. Course Introduction

The aim of the course is to familiarize thestudents with basic understanding of material behavior, stress-strain relations, typesand their analysis. Review of geometrical properties and internal forces in the structures. Students shall familiarize with the basic concepts on theory of flexure and column buckling.

2. CourseObjectives

At the end of the course the students should be able to

- identify the material behavior
- evaluate stress-strain and draw their relationship
- evaluate geometrical properties of plane figures
- evaluate internalstresses in the determinate structural members
- evaluate critical load in columns

3. Course Outline

Specific Objectives	Contents	Duration
• Scope of the subject • Load types • Differentiate between determinate and indeterminate structures	**Chapter 1: Introduction** Type of loads: static, dynamic, dead, imposed, wind, earthquake etc. Supports used in the structures and their types. Statically determinate and indeterminate structures, degree of static indeterminacy. Stability of structures: external, internal, geometrical.	2hrs
• Distinguish between CG and MI • Geometrical properties of plane figures	**Chapter 2: Geometrical properties of sections** Revision of previous work. Centre of gravity (CG) of plane figures, axis of symmetry, center of gravity: built-up plane figures, built-up standard steel sections. Moment of inertia (MI) of plane figures, polar moment o inertia, radius of gyration, product of inertia, principal axes and principal moment of inertia, Mohr's circle for moment of inertia, moment of inertia for standard and built-up sections.	5hrs
• Distinguish between beams and frames • Understand internal forces developed in the beams and frames	**Chapter 3: Axial, shear forces and bending moment diagrams** Revision of previous work. Plotting axial force, shear force and bending moment diagrams for determinate beams and frames. Concept of superposition of internal forces for various combinations of loads. Maximum shear force and bending moments and their positions for determinate beams and frames. Relationship between loads, shear forces and bending moments.	7hrs
• Differentiate rigid and deformable bodies.Understand deformations in the structures • Understand direct stress and strain • Analyze direct stresses and strains in	**Chapter 4: Simple stress and strain** Rigid and deformable bodies. Stresses and strains and their types: normal stress-strain, shear stress-strain, bearing stress, volumetric stress-strain. Poisson's ratio. Hooke's law based on direct stress and strain, Young's modulus of elasticity, stress-strain diagram for mild steel, modulus of rigidity, shear stress-strain diagram, bulk modulus.Stress-strain diagrams for structural steel, timber, concrete and RCC. Principle of superposition, multi-axial loading and generalized Hooke's law, relationship between three moduli of	9hrs

the structures	elasticities. Ultimate stress, allowable stress, factor of safety. Saint-Venant's principle.Stress concentrations. Elongations of bars: varying cross-sections, tapered cross-sections. Compound/composite bars subjected to axial tension and compression. Thermal stresses: single bar, compound/composite bars.	
• Analyze stresses in the inclined planes • Understand principal stresses and their necessicity in structural design	**Chapter 5: Principal stresses** Stresses on an inclined plane subjected to two mutually perpendicular normal stresses, stresses on an inclined plane subjected to two mutually perpendicular normal and shear stresses. Principal stresses and principal planes, maximum shear stress and corresponding plane, Mohr's circle for stresses.	5hrs
• Understand the pressure distribution in thin-walled pressure vessels • Analyze stresses and strains in thin wall pressure vessels	**Chapter 6: Thin wall pressure vessels** Definition and characteristics of thin walled pressure vessels. Types of stresses in thin-walled pressure vessels, calculation of stresses and strains in thin-walled vessels.	3hrs
• Understand the torsion phenomenon in circular and rectangular shafts	**Chapter 7: Torsion** Introduction and assumptions, derivation of trosional equation, torsional rigidity, power transmitted by a shaft. Calculation of torsional moments in series and parallel combination of shafts, calculations of torsional stresses.	3hrs
• Differentiate between direct and flexure stress • Necessicity to find deflectionsin beams	**Chapter 8: Theory of flexure** Coplanar and pure bending, assumptions, derivation of bending equation, bending stress diagram for different sections. Introduction to elastic and plastic bending. Radius of curvature, flexural stiffness. Analysis of beams of symmetric cross-section. Shear stress variation in rectangular and thin wall I-beam. Analysis of composite beams. Elastic curve, concept of deflection in beams, analysis of deflection in cantilever, simply supported and overhang beams with different loading conditions.	7hrs
• Understand eccentricity • Analyze failure theories	**Chapter 9: Compound stresses and failure theories** Load acting eccentrically in one and both axes, condition for no tension in the section. Introduction to failure theories.	3 hrs
• Understand buckling of columns, effective length. • Analyze critical loads	**Chapter 10:Column Theory** Definition of buckling, effect of support conditions, effective length, critical load for different end conditions, long column by Euler's formula, limitations of Euler's formula, intermediate columns.	4 hrs

Books:

1. R.K. Rajput, Strength of Materials
2. G.B. Motra, Strength of Materials
3. Timoshenko, Strength of Materials

Far Western University
Faculty of Engineering
Bachelor of Civil Engineering (Civil)
Course of Study

Course Title: **Surveying I** | Number of lecture/ week: 2

Course Code:GE 233 | Number of Tutorial/ week: 1

Year/Semester: II/III | Number of Practical/ week: 4

Level: Bachelor of Civil Engineering (Civil) | Total Hours: 45 hrs

4. Course Introduction

The aim of the course is to familiarize the students with basic understanding of surveying.

5. Course Objectives

At the end of the course the students should be able to

- Understand the objectives and principles of surveying.
- Understand the way of linear measurements, the scales, accuracy, precision and errors, the offset methods surveying.
- Understand the horizontal control of surveying, computation of angles and bearings.
- Understand the vertical control of surveying, and the setting out of grade points.
- Understand the horizontal control with respect to national.
- Understand the graphical control of surveying.
- Understand the methods of measurements of horizontal and vertical angles.

Specific Objectives	**Contents**
Understand the objectives and principles of surveying.	**Unit 1: Introduction (4 hrs)** 1.0 Definition and objectives 2.0 Fundamental Principles of surveying **3.0** Disciplines of surveying and their significance
Understand the way of linear measurements. Understand the scales, accuracy, precision and errors.	**Unit 2: Linear Measurements (10 hrs)** 2.1 Methods of linear measurements 2.2 Units of distance and area measurements 2.3 Principles of various linear distance measurements 2.4 Methods of distance measurement on horizontal and sloping ground 2.5 Accuracy, precision and errors 2.6 Introduction of scales (Plain, Diagonal and Vernier) used in Surveying. 2.7 Construction of plane and diagonal scales 2.8 Various corrections for linear distance measurements
Understand the offset methods of surveying.	**Unit 3: Chain Survey (3 hrs)** 3.1 Introduction 3.2 Principles of chain survey 3.3 Obstacles in ranging and chaining 3.4 Field instruction of chain survey
Understand the horizontal	**Unit 4: Compass Survey (7 hrs)**

control of surveying. Understand the computation of angles and bearings.	4.1 Introduction 4.2 Meridian, bearing and azimuth 4.3 System of bearing and conversion rules 4.4 Calculation of angles and bearings 4.5 Types of magnetic compass 4.6 Magnetic declination and variation in magnetic declination 4.7 Local attraction and its elimination 4.8 Field work and booking method 4.7 Computation, plotting and error adjustment by graphical method.
Understand the vertical control of surveying. Understand the setting out of grade points.	**Unit 5: Levelling (8 hrs)** 5.1 Basic definition and importance of leveling 5.2 Principle of leveling 5.3 Types of level instruments and leveling rods 5.4 Temporary and permanent adjustment of level 5.5 Methods of booking and calculation of reduced level 5.6 Balancing backsight and foresight 5.7 Curvature, refraction and their correction 5.8 Classification of leveling: Fly leveling, Check leveling, Profile leveling, Cross sectioning, Reciprocal leveling and precise levelling 5.9 Adjustment of level circuits 5.10 Sources of error in levelling
Understand the graphical control of surveying.	**Unit 6: Plane Table Survey (6 hrs)** 6.1 Principle and methods of plane tabling 6.2 Advantages and disadvantages of plane table survey
Understand the methods of measurements of horizontal and vertical angles.	**Unit 7: Theodolite (7 hrs)** 7.1 Basic definition 7.2 Construction principles and parts of theodolite 7.3 Common terms of theodolite 7.4 Types and classification of theodolites 7.5 Temporary adjustment of theodolite 7.6 Measurement of horizontal angles 7.7 Measurement of zenith angle/vertical angles 7.8. Computation of horizontal and vertical angles 7.9 Errors in theodolite
	Field works: (Practical works) 1. Methods of Linear measurement technique in plane and sloping ground 2. Field survey using chain, tape and compass 3. Two peg test and fly levelling 4. Profile levelling and cross sectioning 5. Measuring two sets of horizontal angles by theodolite 6. Measuring one set of zenithal angles/vertical angle

Reference Books:

1. Surveying and Levelling Volume I; Dr BC Punmia

2. Surveying and Levelling; R Agor

3. Surveying Volume I; SK Duggal

4. Basic Surveying I, N Basnet and M. Basnet

Far Western University
Faculty of Engineering
Bachelor of Engineering (Civil)
Course of Study

Course Title: Communication English ll **Credit: 3**
Course Code: SH 241 **Number of hours per week: 3**
Nature of the Course: Theory/Practical **Total hours: 45**
Year: Second, Semester: IV **Level: Bachelor of Engineering (Civil)**

4. Course Introduction

'Communication English II' is a compulsory course designed for the students of bachelor of civil engineering studying on second year fourth semester. This course is structured with the assumption that the learners already have mastery over basic English. So this course is structured in such a way that it aims to equip the learners with the communication skills of advanced level required for their professional competence in English.

5. Course Objectives

After completion of this course the student should be able to:

- Interpret and analyze texts based on listening
- present brief oral reports and do presentations
- Interpret and analyze texts based on reading
- Write informal reports, formal reports , proposals and research articles

3. Specific Objectives with Contents in Detail

Specific Objectives	Contents
• Analyze and respond to the texts both technical and nontechnical from personal viewpoint as an individual listener • Reason critically and interpret the texts both technical and nontechnical	**Unit 1: Listening (5hrs)** 1.1 Evaluating listening texts • listening for personally agreed and clashed views • listening for finding out challenged views • listening for finding out new views • listening for telling why and why not the text is likeable and enjoyable 1.2 Listening for critical and logical reasoning • listening for conclusion/main idea/central idea or thesis • listening for premise: facts/evidence mentioned in the text • listening for assumption: facts/evidence not mentioned in the text • listening for supporting information: further detail regarding premise
• Present brief oral reports • Deliver talk/Power point presentation	**Unit 2: Speaking (5 hrs)** 2.1 Preparing and telling reports a. Research: organizing report b. Rehearse: practicing telling report c. Report: delivering report 2.2 Preparing and delivering talk • Writing out talk • Rehearsing talk • Delivering talk using a multimedia approach
• Develop comprehension of the interpretative abilities	**Unit 3: Reading (10 hrs)** 3.1 Interpreting reading texts

• Develop ability to read with understanding, insight and discrimination • Develop skill of analyzing and evaluating reading material • Develop skill of synthesizing information obtained from reading material	• Reading for conclusion/main idea/central idea or thesis • Reading for premise: facts/evidence mentioned in the text • Reading for assumption: facts/evidence not mentioned in the text • Reading for supporting information: further detail regarding premise 3.2 Evaluating reading texts • Reading for personally agreed and clashed views • Reading for finding out challenged views • Reading for finding out new views • Reading for telling why and why not the text is likeable and enjoyable
• Prepare plan for short reports • Prepare format of short reports • Write short reports	**Unit 4: Informal Report Writing (4hrs)** 4.1 Structure of short reports • Memo format • Letter format 4.2 Types of short reports • Progress report • Field report • Feasibility report
• Prepare plan for formal technical report • Draft and document properly • Prepare format of formal technical reports • Write formal technical reports	**Unit 5: Formal Technical Report Writing (8hrs)** 5.1 Preliminary Section • Letter of Transmittal or Preface • Cover Page/Title Page • Executive Summary or Abstract • Table of Contents and List of Figures and Tables 5.2 Main Section • Introduction and Thesis Sentence • Body/Description • Summary and/or Conclusion • Recommendations • Tables and Figures(if not included in the body) 5.3 Documentation • Notes(footnotes or endnotes, if needed) • Bibliography • Appendix
• Decide objective and audience of proposal • Prepare plan for proposals • Prepare format of proposals • Write proposals	**Unit 6: Proposal Writing (6 Hours)** 6.1 Parts of the proposal • Title/Title Page • Abstract or Summary • Problem statement or rationale • Objectives • Procedure -The technical plan -The management plan • Evaluation or Follow-up • Budget

• Prepare format of research articles • Present own interpretation or evaluation or argument and relate it to what other experts think about it • Write research articles	**Unit 7: Writing Research Articles (7 Hours)** 7.1 Parts of a research article • Title : Descriptive/Conclusive • Abstract • Introduction • Method: Participants, Materials. Procedure • Results • Discussion • Conclusion • References

Prescribed Text

1. Adhikari, Usha,Yadav, Raj kumar and Yadav,Vijay(2012).A Course Book of Communicative English.Trinity Publications: Kathmandu.

References

1. Rutherfoord, Andrea J. (2001).Basic Communication Skills for Technology. Pearson Education Asia: India
2. Gerson,Sharon J, Gerson, Steven M. (2001). Technical Writing Process and Product. Pearson Education Asia: India

Far Western University
Faculty of Engineering
Bachelor of Engineering (Civil)
Course of Study

Course Title: Building Drawing **Credit: 2**

Course No: AR 242 **No. of periods per week: 1+ 3**

Nature of the Course: Theory + Practical **Year: Second, Semester: IV**

Level: B. E.(Civil).

1. Course Objectives:

The main objective of the course is to understand building drawings. Other objectives are; to introduce about the basic terminology, components and elements of building; to familiarize the students with the standard drawings used by architect/engineers. Emphasis is placed to understand the detail drawings and be able to produce/reproduce the detail drawings of a residential building includes; architect's, structural, service, municipality drawings etc.

2. Specific objective and Contents:

Specific Objectives	Contents
To familiar with building vocabulary.	**Unit 1: Introduction to building and building drawing (1 hour)** 1.1 Anatomy of building 1.2 Structural system of building 1.3 Elements of building 1.4 Scale conversion
To familiar with visual signs and symbols used for building drawings.	**Unit2: Symbols and conventional signs for building drawings (1 hour)** 2.1 Building/Engineering materials symbols and 2.2 Architectural drawing symbols 2.3 Water supply and sanitary fixtures 2.4 Electrical installations
To understand the types of standard view of building according to imaginary cutting plane.	**Unit3: Standard views used in building drawings (4 hours)** 2.1 Location plan 2.2 Site plan 2.3 Floor plans 2.4 Elevations/Facades 2.5 Cross sections 2.6 Detail drawings
To acquire general knowledge about building bye-laws.	**Unit 4: Introduction to building bye-laws (2 hours)**
To know how to prepare measured drawings of existing building.	**Unit 5: Types of building drawings (7 hours)** 5.1 Measured drawing

To familiar with stages adopted while designing the building. To prepare municipal drawing, comprising of views and followed by building bye-laws. To understand the importance of working drawing on construction industries. Able to compare and contract working drawing with as built drawing.	5.2 Existing drawing/proposed drawing 5.3 Stages of designed drawing 5.3.1 Concept drawing 5.3.2 Preliminary drawing 5.3.3 Final drawing 5.4 Municipality drawing 5.5 Working/ detail drawing 5.5.1 Architect's drawing 5.5.2 Structural drawing 5.5.3 Service drawing 5.6 Record drawing 5.7 As Built drawing

Drawing sheets to be prepared by students are as follows.

Sn	Description	Sheets	Hours
1	Structural and envelop system of building, conventional signs and symbols	2	6
2	Measured drawing	1	3
3	Location plan, Site plan, Floor plans, Roof plan	2	6
4	Elevations and cross sections	1	3
5	Working/ detail drawings		
5.1	Architects drawings: trench plan, wall details (foundation to parapet), staircase details, door/window details, etc.	2	9
5.2	Structural drawings: footing, pillar, beam, slab etc.	2	9
8	Electrical power and circuit drawings; Sanitary drawings i.e. water supply and drainage, toilet/ bathroom layout ,etc.	2	9
Total		12	45

References:

1. Building bye-laws.
2. Suraj Singh, 2011, *Civil Engineering Building Practice, 1st edition.* CBS Publisher and Distributors P Ltd.
3. William J. Harnung,1982, *Matrix Architectural Construction Drafting and Design Fundamentals*
4. John Molner, 1986, *Building Construction Drafting and Design*, Van Nostrand Reinhold.
5. William J. Hornung, 1971, *Architectural Drafting, 5th edition,* Prentice-Hall.
6. John D. Bies, 1983, *Architectural Drafting: Structure and Environment,* Macmillan Publishing Company.
7. Thomus, Marvin L.1978, *Architectural Working Drawing,* McGraw-Hill Inc, United States.

Far Western University
Faculty of Engineering
Bachelor of Engineering (Civil)
Course of Study

Course Title: Probability and Experimental Design **Credit: 3**
Course No.: SH 244 **Nature of the Course: Theory**
Year/Part: II/IV **Total hours: 45**
Level: Bachelor of Engineering (Civil) **Lecture: 3**

1. Course Introduction:

This course is aimed to prepare students to understand and apply statistical tools viz. measures of location, dispersion, probability distributions, estimation and hypothesis testing, correlation and regression analysis in their current study and in professional carrier .

Course Objectives:

After the completion of this course the student will be able to understand and apply key tools of statistics in research, conclusion drawing and decision making.

2. Specific Objectives and Contents:

Specific Objectives	Contents
• To provide the concept of basic statistical operations. • To impart the knowledge of measures of location and dispersion and to make the students understand their differences.	**UNIT:1 [5 hours]** **1. Descriptive statistics** 1.1 The meaning and role of the statistics in engineering 1.2 Describing statistical data : The population and sample, frequency distribution- relative and cumulative frequency distribution, histogram and frequency curves, Pie diagram 1.3 Measures of location : statistics and parameters, mean, median, mode 1.4 Measures of variability : meaning and importance, the range, mean deviation, standard deviation, difference between measures of location and measures of variability
• To provide the idea of basic probability	**UNIT:2 [4 hours]** **2. Probability** 2.1 Basic concept and role of probability : Terminologies related to probability, sample spaces and events, different types of events, counting principle 2.2 Probability of an event, addition law 2.3 Dependence and independence, conditional probability, multiplicative law 2.4 Baye's theorem and its application
• To introduce the concept of random variables and make familiar with most frequently used discrete probability distributions	**UNIT:3 [6 hours]** **3. Discrete probability distributions** 3.1 Discrete random variables, probability mass function and probability distribution function, expected values 3.2 Binomial distribution 3.3 Poisson distribution 3.4 Negative binomial distribution 3.5 Hypergeometric distribution

• To introduce the concept of random variables and make familiar with most frequently used continuous probability distributions	**UNIT:4 [6 hours]** 4. Continuous probability distribution 4.1 Continuous random variable and probability densities, cumulative distribution functions and expected values 4.2 Normal distribution, properties of normal distribution ,standard normal distribution, normal approximation to binomial distribution 4.3 Gamma distribution 4.4 Exponential distribution 4.5 Chi-squared distribution
• To provide a knowledge of joint probability and central limit theorem	**UNIT:5 [4 hours]** 5. Joint probability distribution 5.1 Joint p.m.f for two discrete random variables, joint probability table, marginal probability mass function 5.2 Joint p.d.f for two continuous random variables, marginal probability density functions 5.3 Dependent and independent random variables 5.4 Conditional probabilities 5.5 Expected values, covariance and variance 5.6 Central limit theorem
• To provide the skill of inference drawing by means of point and interval estimation	**UNIT:6 [4 hours]** **6. Estimation** 6.1 Meaning and importance of estimation 6.2 Criteria of a good estimator 6.3 Point estimation, methods of point estimation: method of moments, method of maximum likelihood estimation, method of least squares **6.4** Interval estimation, confidence interval, basic properties of confidence intervals, confidence limit for mean, confidence interval for proportion, interval estimates of the variance
• To provide the knowledge of conclusion drawing by means of test of hypothesis for both large and small samples	**UNIT:7 [7 hours]** **7. Hypothesis Testing** 7.1 Hypotheses and test procedures, test statistics and critical region, errors in hypothesis testing 7.2 Large sample test: single proportion, double proportions (difference between proportions), single population mean, double population means (difference between means) **7.3** Inference from small samples : Student's t-distribution and assumptions behind it, small sample inferences concerning a population mean, the difference between two population means (independent random samples and paired difference test), inferences concerning a population variance and comparing two population variances
• To make students able to understand collection of experimental situations and statistical procedures for the analysis of quantitative responses from experimental units.	**8. Analysis of Variance (ANOVA) [4 hours]** 8.1 The design of an experiment, meaning and assumptions for an ANOVA 8.2 Completely randomized design, One-way (single factor) ANOVA, F distribution and the F test 8.3 Two way ANOVA

• To make students to understand the cause and effect relationship between/ among the variables and to estimate unknown values of dependent variable from independent variable by the use of regression line.	**9. Correlation and regression analysis [5 hours]** 9.1 Covariance, simple ,multiple and partial correlation coefficients, properties of correlation coefficients, 9.2 Simple regression, regression lines, scatter diagram , least square method, regression equations, coefficients of regression and properties, using regression equations for predictions, inferences concerning least square method, confidence interval for the intercept and slope 9.3 Relation and difference between correlation and regression 9.4 Multiple regression

Reference Books:

1. *"Probability and Statistics for Engineers"* , Richard A. Johnson , Prentice Hall of India Private Limited
2. *"Introduction to Probability and Statistics"* , William Mendenhall. Robert J. Beaver and Barbara M. Beaver, Thomson Learning, Inc, Printed and bounded in India by Baba Barkha Nath Printers, Delhi
3. *"Probability and Statistics for Engineers and Scientists"* Ronald E. Walpole, Sharon L. Myers, Keying Ye, Pearson Prentice Hall
4. *"Probability and Statistics for Engineering and Sciences"* Jay L. Devore, Duxbury Press, California .
5. *" Probability and Statistics for Modern Engineering"* Lawrence L. Lapin, PWS Publishers, Boston

Far Western University
Faculty of Engineering
Bachelor of Engineering (Civil)
Course of Study

Course Title: Building Technology — Credit: 3
Course Code.: AR 246 — Number of hours per week: 3
Nature of the Course: Theory — Total hours: 45
Year: Second, Semester: Fourth — Level: Bachelor of Engineering (Civil)

1 Introduction:

The students will learn theoretical concept of building elements as well as traditional and modern construction techniques. The fundamental principle of building construction will be presented weakly in lecture and the students through wide variety of assignments and a semester long project both focusing on developing free hand sketching and hand drafting as well as CAD drawing skills. Emphasis is placed on reading, understanding, interpreting drawings and construction techniques.

2 Objectives:

Upon completion of this course the students will be able to prepare a complete working drawing of a residential building detailed drawing as required by the municipality of Nepal. The student will understand the different building elements, modern construction techniques and materials used. Study the cutting-edge developments of innovative structures, new materials and processes.

3 Specific Objectives and Contents:

Specific Objectives	Contents
Students will be able to understand • History of development of buildings. • Site selection criteria. • Space planning and orientation of building. • Different components of sub-structure and super-structure. • Building components and functions. • And practice and prepare freehand drawing sketches of building components. • Students are prepared to make able to produce CAD drawing at the end of the semester.	**UNIT 1. Introduction. 3 Hrs** **1.1 Buildings.** • History, introduction, types of buildings. • Functional planning of buildings: principles of site selection, site plan, • Set-back, floor space index, size of spaces, open space, principles of planning. • Orientation of building. • Building codes of Nepal **1.2 Various building components and their functional requirements.** • Explain the term building components. • Enumerate the building components, foundation, floor, wall, ceiling, roof, etc • Fenestrations, doors, windows, etc. • Identify the different requirements of building components. • Drawings of various building components
Understand details of • Foundation and its construction. • Typical methods of soil exploration. • Foundation protection during construction using timbering method. • Method of setting out of foundation. • Students will be able to improve knowledge and skills through preparing detailed sketches of foundation components.	**UNIT 2. Foundation 4 Hrs** 3.1 Introduction 3.2 Essential requirements of a good foundation. 3.3 Construction method of shallow foundation: Pad foundation, Strip foundation, stepped foundation for sloping sites, raft foundation. Timbering of foundation trench. 3.4 Deep foundation: Introduction, problems of deep excavations, timbering and precaution to be taken during timbering, dewatering of foundation trenches, types of pile, methods of installation of piling. 3.5 Basement: Introduction, purpose, types, drainage

	consideration, water proofing (types, vertical and horizontal). 3.6 Introduction on bearing capacity of foundation soil: types of soil, soil exploration (by inspection, load test and augur method). Methods of improvement of bearing capacity of foundation soil. 3.7 Geo textile: Definition, types, function and application method. 3.8 Causes of failure of foundations and preventive measures 3.9 Methods of setting out foundation trenches. 3.10 Drawings of different types of foundations
• Chapter deals with different types of brick and stone masonry, types solid and cavity walls, mortars used. • Damp proofing material types and method of construction in basement, walls, and roofs. • Opening construction details. • Able to prepare sketches of different types of wall details.	UNIT 3. **Walls and Damp proofing** **5 Hrs** 4.1 Brick masonry walls: Brick type, size, weight and strength of bricks. Bonding of bricks. Brick wall types (solid bearing, curtain, cavity or hollow walls). Brick footings, piers. Mortars used in brick work. 4.2 Other walls: Blocks of stone, cinder concrete, cut stone, or combinations of these. 4.3 Damp proofing, treatment of damp on existing basement walls. Use of water proofed cement concrete and indigenous materials. 4.4 Brick cladding. 4.5 Partition walls 4.6 Stone, timber, concrete, and RCC wall construction. 4.7 Openings on walls: Sills and lintels (types and materials used). 4.8 Damp, Water, and Termite proofing • Introduction, types, materials, and methods of application. • Drawings of vertical and horizontal damp and water proofing 4.9 Drawings of different types of walls and damp proof.
• Students will be able to prepare design and drawings of different types of staircases.	**UNIT 4. Stair, lifts and escalator** **2 Hrs** 4.1 Function, types and design of staircase 4.2 Types and function of ladders, ramps, lifts and escalators.
• Prepare and understand detailed drawings of solid and suspended floor. • Construction methods and materials used.	**UNIT 5. Floors and ceilings** **2 Hrs** 5.1 Solid and suspended floor. 5.2 Finishes applied to floors, and ceilings. 5.3 Drawings of floor and ceilings finishes
• Understands type of roof structures, roof finishes, methods of construction, materials, and details of drawings (fine sketches).	**UNIT 6. Roofs** **3 Hrs** 6.1 Introduction and types of roofs. 6.2 Flat roofs; roof supports; water proofing; types of roof coverings; roof drainage. 6.3 Slope roofs; types; low, common and high slope; timber and steel (angles, tubular) trusses; ultra light high strength metal roof trusses; types of roof coverings (thatch, timber plank, corrugated sheets, slates, clay tiles, metal tiles, and insulations). 6.4 Drawings of roofs and roof finishes.
• Able to prepare and sizing of openings, materials used, elevations and sectional details of timber frames	**UNIT 7. Doors, windows, ventilations and skylights openings 3 Hrs** 7.1 Requirements of opening, sizing of opening, materials (timber, aluminium).

and panels.	7.2 Energy efficient doors and windows. 7.3 Drawings of details of timber doors and windows openings.
• Learn need of expansion and construction joints, materials used, and construction details. • Understand requirement of fireplaces to keep warm rooms in winter, cooking purposes, materials used, sizing of fireplaces and flue chambers.	**UNIT 8. Joints and fire place 3 Hrs** **8.1 Joints in buildings** • Introduction, types, need of joints, construction and materials used in joints. • Detailed drawings of construction and expansion joints in buildings **8.2 Fireplace** • Design of fire place; access and size of flue, stacks. • Insulation for surface protection. • Design and drawings of fire-place.
• Understand importance of scaffolding, shoring, underpinning, and formworks during construction, with sizing, quality of materials, and erection methods of advanced technology. • Able to prepare relevant design.	**UNIT 9. Temporary construction: 4 Hrs** 9.1 Scaffolding: Introduction; types; materials; basic scaffolding: foundations, ties, putlog, standard scaffolds. 9.2 Shoring: Introduction, materials, shoring techniques. 9.3 Under-pinning: Introduction, methods, materials, techniques. 9.4 Formworks: Form works for reinforced concrete structures. Materials and erection of formworks. 9.5 Drawings of Scaffolding, Shoring, Under-pining, and formworks.
• Understand requirement of testing of existing structure, equipments used, methods. • Able to analyse cracks in buildings and its protection. • Understand and apply seismic retrofitting with appropriate technique.	**Unit 10. Protection works of building 3 Hrs** 10.1 Introduction, techniques, solution of seismic retrofitting of building and materials. 10.2 Destructive and non-destructive test. 10.3 Causes and prevention of cracks in different component of buildings (walls, roofs, floors, plasters, windows, RCC, Joints etc) . 10.4. Drawings of different retro-fitting and NDT test.
• Understand purpose of materials used, and construction process of internal and external wall finishes.	**Unit 11. External and internal wall finishing 2 Hrs** 11.1 Decorative brick, flag stone, tile cladding. 11.2 Load bearing and non load bearing exposed masonry works, water protection works and colour paintings. 11.3 Plastering and pointing 11.4 Paintings in masonry walls, metal and wooden surfaces.
• Able to design of water storage, water supply system, surface and subsurface drainage system, septic tank, soak pit, sanitary fittings etc. • Collection, treatment, and supply through rain water harvesting for domestic purposes. • Prepare drawings of system and structure.	**Unit 12. Water supply and sanitary works 3 Hrs** 12.1 Design of water storage reservoir for domestic use; hot and cold water supply pipe layout. 12.2 Surface water drainage; subsoil drainage; sewage disposal; septic tanks and soak-pit; drain pipes and traps; gradients of drain pipes; internal soil and waste pipe work; gully trap, inspection and intercepting chamber. 12.3 Rain water harvesting methods for domestic purpose. 12.4 Drawings of septic tank, soak pit, drainage chamber, rain water collection and treatment.
• Understand theoretical and practical knowledge of thermal and sound insulation	**Unit 13. Thermal and sound insulation 3 Hrs** a. Moisture and its movement through building components; b. Condensation and its reasons; Effects of moisture and condensation on building components and materials; c. The use of vapour barriers and other damp proof courses in buildings; Thermal properties of building components and materials; d. Thermal insulation, thermal resistance and thermal

	capacity; e. Acoustic properties of building materials, absorptive and reflective materials; f. Noise control and constructional precautions to reduce noise.
• Acquire knowledge of terms used in electrical works, obtain ideas of wiring system. • Provide knowledge of network system of telephone, CCTV, • Provide knowledge of heating, cooling, A/C system.	**Unit 14. Building Services 5 Hrs** **14.1 Electrical works:** • Introduction; Power supply, light, and network installation; • Electrical Design & Construction;, Switchboard and metering alterations; • Wiring systems; Trunking, busbars and ducts for electrical distribution; • Earthing and lightning systems. **14.2 Ventilation; cooling and heating systems; Air-conditioning.** • Ventilation; cooling and heating systems; Air-conditioning. • Telephone network; • CCTV; • Fire fighting; and • Solar lighting.

Prescribed text book:

S.C.Rangawala, "Building Construction", Charotar Publishing House, Pvt. Ltd.

References:

1. WB Mckay, ELBS Publication "Building Construction".
2. Reid E.,"Understanding Buildings", , MIT press
3. National Building Code(NS)
4. Ching, FDK, "Building construction Illustrated"
5. Chudey & Greeno, Butterworth & Heinemann, "Building Construction Handbook", 1998
6. Shushil Kumar, “Building Construction” Standard Publishers Distributors.
7. Punmia B.C. “Building Construction”, Luxmi Publications (P) Ltd.
8. Course Manual/Class note prepared by University Faculty

Far Western University
Faculty of Engineering
Bachelor of Engineering (Civil)
Course of Study

Course Title: Structural analysis-I
Course Code: CE 243
(Bachelor of Civil Engineering)

Number of lecture/week: 3
Year/Semester: II/IV Level: BCE
Lab/week: 2/2 hrs
Total Lectures: 48 hrs

Course Introduction

The main aim of this course is to provide a basic knowledge for the analysis of determinate structures, and understand behavior of common structural forms under different loading conditions. Energy principles will be emphasized. At the end of course students should be able to perform analysis of determinate structures both by manual calculation as well as matrix method of analysis using computer application.

6. Course Objectives

At the end of the course the students should be able to

- differentiate structural forms based on structural behavior and differentiate determinate and indeterminate structures
- perform analysis of determinate structures
- evaluate deformations in the determinate structural members
- draw influence line diagrams (ILD) for determinate structures
- apply structural analysis techniques to analyze the behavior of structures so that students shall be able to design civil engineering structures properly

7. Course Outline

Specific Objectives	Contents	Duration
• Scope of the subject • Structural forms/type • Understand the methods of structural analysis • Linearity/nonlinearity in structural analysis • Superposition	**Chapter 1: Introduction** Concept of Structure; History of Structural Engineering; Type of Structures; Structural Forms, Simplification for the purpose of Analysis; Methods of Structural Analysis; Choice of a Method; Linearly Elastic Structures, Non-linearity in Structural Analysis; Principle of Superposition; Computer Based Methods	4 hrs
• Differentiate work and complementary work • Understand the scope of deformation calculation in structures • Importance of virtual work method • Virtual work for rigid and deformable bodies • Differentiate between different effects in deformation calculation	**Chapter 2: Virtual Work Method** Work and Complementary Work; Displacement of Beams and Frames by Method of Real Work, Calculation of Real Work from Bending, Limitations of the Method of Real Work; Principle of Virtual Displacements, Virtual Work/Complimentary Virtual Work for a Deformable Body; Displacements by the Methods of Virtual Work/Unit Load Method; Direct Axial and Bending Effects, Axial and Bending Stiffness; Displacements in Beams/Frames due to Temperature Effects, Length Adjustments and Misfits in Truss Elements and Temperature Effects, Combination of Different Effects	6 hrs
• Differentiate strain energy and complimentary strain energy • Differentiate gradually and suddenly applied loads; dynamic effects due to loads • Strain energy due to axial	**Chapter 3: Strain Energy Method** Principle of Stationary Total Potential Energy and Total Complimentary Potential Energy; Strain Energy and Complementary Strain Energy; Strain Energy due to Gradually and Suddenly Applied Direct Loads/Impact Loads: Dynamic Multipliers; Strain Energy due to Bending, shear and Torsion; Displacement of Beams and Frames by the Method of Strain Energy.	4 hrs

forces, shear forces, bending, torsional moments		
• Elastic deflections in beams and frames • Understand moment curvature relation • Understand the area of application of different deformation calculation methods • Importance of graphical method to obtain deformations	**Chapter 4: Deflection of Beams and Frames** Introduction; Flexural Force Deformation Relationships (Curvature, Slope and Deflection), Flexural Stiffness Matrix; Double Integration method; Theorems on Moment Area Method; Macaulay's Method; Deflection of Cantilever beams; Deflections in Simply Supported Beams; Mid-span Deflections; Deflection Curves for Different Structures; Conjugate-Beam Method; Deflections by the Method of Superposition; Deformations due to Shear and Torsion Effects and Their Comparison with Flexural Deformations; Graphical Method of Integration; Application to Beams and Frames to calculate deflections	12 hrs
• Understand the effect of static and moving loads • Position of load and response function • Influence lines for reaction, AF, SF, BM in different structural elements • Maximum/absolute values of response functions in different structures • Influence lines using virtual work	**Chapter 5: Influence Lines** Introduction; Moving Static Loads; Variation in Response Function with Position of Load: Influence Line Diagrams (ILD) by Equilibrium Methods; Influence Lines for Statically Determinate structures: Moving Loads on Statically Determinate Beams, Use of Influence Lines: Determination of Reactions, Bending Moments and Shear Forces from Influence Line Diagrams due to different loadings as Point Load, Distributed Load, Couple; Influence Line Diagrams for the Case of Indirect Load Applications (Panel Loadings), Influence Lines for Statically Determinate Trusses, Influence Lines for: Support Reactions, Support Moment, Shear Force, Bending Moment; Muller-Breslau Principle; Loading of Influence Line Diagrams using Standard Load Trains; Most Critical Position of a Load on a Beam Span (Maximum Response Functions)	10 hrs
• Understand the effect of three-hinged systems • Analyze three-hinged systems to obtain internal stresses/forces • Importance of graphical method • ILD for arches and three hinged systems	**Chapter 6: Statically Determinate Arches** Three-Hinged Systems; Types of Arches; Three-Hinged Structures with Supports at Same and Different Levels; Determination of Support Reactions, Normal Thrusts, Shearing Forces, and Bending Moments by Analytical/Numerical Methods; Analysis of Three-Hinged Arches by the Graphical Method; Influence Line Diagrams for Reactions, Bending Moments, Shearing Forces and Normal Thrusts in Three-Hinged Arches	6 hrs
• Differentiate suspended and suspension systems • Suspension bridges • Three-hinged stiffening girder • ILD for cable systems	**Chapter 7: Suspension Cables** Introduction to Cables and Cable Bridges; Catenary and Parabolic Cables; General Cases of Parabolic Cables; Elements of a Simple Suspension Bridges; Stress Determination in Three-Hinged Stiffening Girder; Influence Line Diagrams; Introduction to Tower Structures, Wind Cables and Ties	6 hrs

Experments/Laboratory Works

Analysis of plane beams/frames

Measurement of reactions in three-hinged arches under different loading arrangements

Deflection of beam subjected to point and uniformly distributed loads

Experimental analysis of suspension bridges

Influence lines for beams

Simulation of Influence lines for beams and girders

Simulation of displacement measurement in statically determinate plane frame

References:

1. S. Utku, C.H. Norris and J.B. Wilbur, "*Elementary structural Analysis*", 3rd Edition, New York: McGraw-Hill Book Co., 1991
2. Wong Y. et al., *"Applied Numerical Methods using MATLAB",* John Willey & Sons, 2005
3. William Weaver, JR., James M. Gere, *"Matrix Analysis of Frames Structures",* 2nd Edition, CBS Publishers and Distributers, India
4. A. Darkov, "*Structural Mechanics"*, Mir Publishers, Moscow,1966
5. R.C. Hibbeler, "*Structural Analysis",* Pearson Education Asia, 2002
6. C.S. Reddy, "*Basic Structural Analysis",* Tata McGraw-Hill Publishing Company Limited, New Delhi, 1981

Far Western University
Bachelor of Engineering
(Civil)

Course of Study 2071

Course Title: Surveying II	Credit: 3
Course No.: GE 245	Number of hours per week: Lecture: 2, Tutorial: 1
Nature of the Course: Theory/Practical	Number of hours per week: Practical: 4
Year: Second, Semester: Second	Level: Bachelor of Engineering (Civil)

1. Course Introduction:
   This course is aimed to provide the students with the basic knowledge of land measurements and surveying techniques relevant to the civil engineering fields.

2. Course Objectives:
   On completion of this course the students will be able to:
   - Understand the precise method of horizolital control surveying, and grid coordinate system.
   - Understand the method of measurement of horizontal control and vertical control of surveying.
   - Understand the concept of indirect leveling, ground relief representation.
   - Undei'stand the concept of transfer of grid coordinates, setting out horizontal and vertical curves.
   - Understand the bathymetric control, aerial viewing and mapping, and remote control.
   - Undei stand the concept of astionomy and GPS, integrated data recording system, computerized standard cartographic approach.

Specific Objectives	Contents
Understand the precise method of horizontal control surveying, and grid coordinate system.	Unit 1: Traversing (8 hrs) 1.1 Needs and significance of traversing 1.2 Specification for horizontal and vertical control of traverse 1.o Closing error and precision I.4 Reduction of reading to angle and bearing 1.5 Angle distance relationship in traversing I.6 Adjustment of angles and bearings Computation of latitudes and departures Balancing the traverse by Bowditch's rule and Transit rule Computation of independent coordinatesl.10 Omitted measurements 1.II Instruction on field works
Understand the concept of rapid method of measurement of horizontal and vertical control surveying.	Unit 2: Tacheometry (4 hrs) 1 Principle o1 optical distance measurements System of tacheometry: Stadia method, subtense bar method, tangential method Measurement of horizontal and vertical distance Field procedure and plotting
Understand the concept of indirect leveling.	Unit 3: Trigonometrical Levelling (3 hrs) 3.1 Problems of heights and distances Reciprocal trigonometrical leveling Instruction on field application
Understand the concept of ground relief representation.	Unit 4: Contouring (4 hrs) Definition of basic terns Factors affecting contour interval Characteristics of contour Methods ot locating contours

	Interpolation and plotting of contours L ses of contour maps
Understand the concept of transfer of grid coordinates.	Unit 5: Orientation (4 h rs) 5. I I ntroduction, uses and importance A na1 tical intersection A na1 tical resection: Two point and three point resection Instruction on field application
Understand the concept of setting out horizontal and vertical curves.	Unit 6: Curves (8 h rs) 6. I Types of curves and their uses Elements of simple circular curves Setting out of simple circular curve by I inear and angular methods Geometry and elements of transition curves Computation and setting out of transition curve Equation of vertical curves and calculation of reducedlevel of points on curve Instruction on field application of curves
Understand the concept of bathymeti ic conti ol.	Unit 7: **Hydrographic Survey** (2 h rs) Needs of h ydrographic survey Measurement of cross section Measurement of velocity of flow, depth and discharge ofwater bodies Echo sounding, sounding rods and cables
Understand the concept of aerial viewing and mapping, and remote control.	Unit 8: **Photogram metry and Remote Sensing (4** hrs) Introduction to photogrammetry as a branch of surveying Scale of vertical photograph Rel ief displacement Merits and limitation of photogrammetry Types of remote sensing Electromagnetic radiation Uses of remote sensing in civil engineering and mapping
Understand the concept of Astronomy and GPS.	Unit 9: **Field** Astronomy and GPS System (4 h rs) Introduction, definition of terms Geographic coordiliate system Use of astronomy in surveying and mapping Introduction of GPS Components of GPS Working principle and uses of GPS Differential positioning system Introduction to field applications
U nd er st an d	Unit **10: Total** Station(2 **hrs)** Components of Total Station Electronic data recording Uses of Total Station

Field Works:

1. Traverse sui'vey. computation and plotting
2. Application of taclieometry to measure distance and elevation by using stadia system including detailing, computation and plotting
3. Intersection and resection using theodolite
4. Trigonolnetrical 1eve11 ing
5. Contouring- Indirect Method
6. Setting out of simple circular curve, transition curve and vertical curve
7. Demonstration and application of Total Station
8. Demonstration and application of GPS

References:

1. B C Punmia, "Surveying Volume II", Laxmi Publication, New Delhi.
2. S K Duggal, "Surveying Volume II", Me Graw Hill Education Private Limited New Delhi.
3. R. Agor, "Surveying and Levelling" Khanna Publishers, New Delhi.
4. Naraayan Basnet and Madhukar Basnet, "Basic Surveying - II", Benchmark Education Support Pvt. Ltd.
5. A. Banister and S. Raymond, "Surveying", ELBS.

Far Western University
Faculty of Engineering
Bachelor of Engineering (Civil)
Course of Study

Course Title : Hydraulics — Credit : 4
Course No :CE 247 — Total Hours : 60
Nature of the Course : Theory + Tutorial — Practical : 1.5 / 2 hour each week
Year : Second, Semester : Fourth
Level: Bachelor of Engineering (Civil)

1. **Course Introduction:**
   This course is aimed to deliver the knowledge to the Civil Engineering Student of Second Year Second Part at Bachelor Level about the basic knowledge in Hydraulics and their application in the field of Civil Engineering. The basic knowledge in fluid flow includes pipe flow and open channel flow and their characteristics, which helps to understand and able to solve the problems arise in the civil engineering field. It helps to understand the advance level water resources courses like Water Supply Engineering, Irrigation Engineering, Hydropower Engineering and Hydraulics Structures in subsequent semesters. The course is divided into two parts: a) Close-Conduit flow, and b) Open Channel flow. The first part has 40% weightage and 2nd part has 60% weightage to the course structure.
2. **Course Objectives:**
   At the end of this course the students should be able -
   - To understand the fundamental terms used in Pipe flow and Open Channel flow.
   - To know the basic applicability of Hydraulics in advance water resources related courses.
   - To know the head loss and its effects
   - To know the Principle of fluid energy and its importance.
   - To know the quantitative and qualitative analysis of fluid flow in pipe networks.
   - To know the water hammer and its characteristics
   - To know the nature of fluid flow in open channel
   - To know the formulation of computer codes for simple problems on the related topics

3. **Specific Objectives and Contents:**

Specific Objectives	**Contents**
PART - A :	**Fluid flow in Close-Conduit [40%]**
➢ To know the concepts in fluid flow in close-conduit and open channel ➢ To know the different between laminar and turbulent flow and their characteristics ➢ To know the few experimental works in pipe flow ➢ To know the solution methodology in pipe flow problems considering different losses	**Unit 1 . Basics in Pipe flow (8 Hours)** 1.1 Basic concepts in pipe flow and open channel flow 1.2 Flow based on Reynolds's Number (with concept on Reynold's experiment), Dynamic similarity of flow, Concept on steady incompressible flow in pipe 1.3 Laminar flow in pipe and its characteristics (Shear stress and velocity distribution, Head loss, Hagen-Poiseuille equation, Langhaar formula) 1.4 Turbulent flow in pipe and its characteristics (Shear stress, Prandtl's mixing length theory, velocity distributions, velocity deficiency in large Reynold's Number, Nikuradse's experiment with sand-roughened pipes) 1.5 Resistance to turbulent flow in pipe (Head loss due to friction, Darcy-Weisbach equation, Colebrook

	Equation, Moody's Diagram) 1.6 Minor head losses (Entry loss, Exit loss, losses is sudden enlargement, losses in sudden contraction, losses in bends, and losses in different pipe fittings) 1.7 Hydraulic Grade line and Total Energy lines in pipe flow
➢ To know the basic pipe flow problems and their solution techniques ➢ To know the principle of Siphon and its engineering applications ➢ To know the pipe network systems and their solutions and engineering applications ➢ To know application of 'Hardy Cross Method' in pipe network solutions	**Unit 2 . Pipe Flow Problems (10 Hours)** 2.1 Simple pipe flow problems and solutions for i. To find head loss, ii. To find discharge iii. To find pipe diameter 2.2 The Siphon and its engineering applications 2.3 Flow through branched pipes (Pipes in Series, Concept of equivalent pipes, Pipes in parallel, Equivalent Electrical network for flow through pipes) 2.4 Branching pipes (Solution of three interconnected reservoirs) 2.5 Pipe network: Solution by Hardy Cross Method (Single and double loop) 2.6 Power transmission by a pipeline
➢ To know the unsteady pipe flow problems and its solutions ➢ To know the water hammer phenomena and pressure variation in pipe during water hammering	**Unit 3 . Unsteady flow in Pipe (6 Hours)** 3.1 Basic equations in pipe flow (Continuity equation and Euler's equation) 3.2 Oscillation of liquid in a U-tube 3.3 Surge control 3.4 Description of the water hammer phenomena and its effects 3.5 Pressure variation (in different places) due to sudden closure/opening of valve in pipe
PART - B :	**Fluid Flow in Open Channel [60%]**
➢ To know the meaning of open channel flow ➢ To know the possible types of flows in real world in open channel ➢ To understand partial filled pipe flow	**Unit 4 . Basic of Open Channel flow (2 Hours)** 4.1 Geometrical Terminologies (Flow depth, Top width, Flow area, Wetted perimeter, Hydraulic radius, Hydraulic depth, bed slope, hydraulic slope, energy slope) 4.2 Classification of Open channel (Natural and artificial channel, Rigid and mobile boundary channel, Prismatic and non-prismatic channel) 4.3 Types of flow in open channel (Uniform and non-uniform flow, Steady and unsteady flow, Laminar and turbulent flow, Sub-critical, critical and super critical flow, tranquil and rapid flow, and Spatially varied flow) 4.4 Flow in closed circular conduits only party full
➢ To understand the shear stress and velocity distribution in	**Unit 5 . Uniform Flow (8 Hours)**

open channel flow ➢ To be able to apply the Mannings and Chezy's equation to solve the open channel problems ➢ To be able to select the best channel sections in practical engineering field	5.1 Definition of uniform flow and its conditions in open channel 5.2 Shear stress and velocity distribution 5.3 Chezy's equation, Ganguillet-Kulter equation and Manning's equation for steady uniform flow and normal depth 5.4 Conveyance, section factor and hydraulic exponent of the uniform flow in channel 5.5 Best hydraulic cross-section for different geometrical shapes (Rectangular, triangular, trapezoidal and circular sections)
➢ To understand the energy and momentum principle in open channel flow ➢ To know the specific energy and critical depth ➢ To be able to handle the open channel problems in transition cases	**Unit 6 . Principle of Energy and momentum and their Application in Open channel flow (12 Hours)** 6.1 Definition of specific energy 6.2 Specific energy diagram, critical velocity and its physical implication 6.3 Critical depth computations for prismatic as well as non-prismatic channel sections 6.4 Definition of tranquil and rapid flow 6.5 Discharge depth relationship 6.6 Application of Specific energy diagram in channel transition (for width reduction, bed rise) 6.7 Definition of venture flume and broad crested weir with application of energy principle 6.8 Introduction to momentum principle and its application to open channel flow, Specific force diagram and conjugate depths
➢ To understand the GVF and open channel bed types hydraulically ➢ To be able to draw the water surface profiles for various case including mixed slopes	**Unit 7 . Gradually Varied Flow (GVF) (9 Hours)** 7.1 Definition of GVF, Basic assumptions, Dynamic equation and its physical meaning 7.2 Bed slope characteristics (mild, critical, steep, horizontal and adverse) 7.3 Water surface profiles and its characteristics 7.4 Computations of water surface profiles (the direct step method, the standard step method and a numerical integration method) 7.5 Combined water surface profiles
➢ To understand the RVF and its engineering significance ➢ To know the hydraulic jump and its applications in engineering problems	**Unit 8 . Rapidly Varied Flow (RVF) (5 Hours)** 7.1 Definition of RVF 7.2 Hydraulic jump in rectangular channel and its representation in specific energy diagram 7.3 Conjugate depths and their relationship 7.4 Jump variables and their relationships (conjugate depths, length of jump and efficiency) 7.5 Loss of mechanical energy in hydraulic jump 7.6 Types of Hydraulic jump (based on tail water and Froude's number)

	7.7 Application of hydraulic jump (spillway, stilling basin etc.)

Note: Students are advised to write the computer codes for simple problems related to above topics where as applicable.

8 Practical :

After completion of the flowing practical work in the laboratory, students should be able –

- To be familiar with Reynold's experimental analysis
- To understand the headless and methodology to find headloss
- To understand the applicability of Manning's equation
- To know the nature of flow under sluice gate
- To know the nature of flow under different constriction in rectangular channel
- To the hydraulic jump and its nature

The following Laboratory works will be performed during the course:

1. Verification of Reynold's Experiment
2. Head Loss in Pipe (including contraction, enlargement and valves).
3. Determination of Manning's Coefficient (Different surfaces i.e. roughness).
4. Flow analysis under Sluice Gate.
5. Flow analysis in rectangular channel (with Hump and Constricted shape).
6. Analysis of Hydraulic Jump

References:

1. Bansal, P. K., "A Text Book of Fluid Mechanics", Laxmi Publishers, 2000.
2. Chow, V. T., "Open Channel Hydraulics", McGraw-Hill, Inc. Singapore, 1973.
3. French, R. H., "Open Channel Hydraulics", McGraw-Hill, Inc. Singapore, 1985.
4. Husain, Z., Abdullah, Z., and Alimuddin, Z., "Basic Fluid Mechanics and Hydraulic Machines", BS Publications, Hyderabad, 2008.
5. Kumar, D. S., "Fluid Mechanics and Fluid Power Engineering", S. K. Kataria & Sons, Delhi, 2012.
6. Kumar, K. L., "Engineering Fluid Mechanics", Eurasia Publishing House, New Delhi, 2000.
7. Modi, P. N, and Seth, S. M., "Fluid Mechanics and Hydraulics", Standard Book House, 2009.
8. Prasuhn, A. L., "Fundamentals of Hydraulic Engineering", Saunders College Publishing, Tokyo, 1987.
9. Ramamrutham, S., "Hydraulics of Fluid Mechanics and Fluid Machines", Dhanpar Rai Publishing Company (P) Ltd., New Delhi, 7th Ed. 2006.
10. Ranga Raju, K. G., "Flow Through Open Channel", Tata McGraw-Hill Pub. Co. Ltd., New Delhi, 2nd ed. 1993.
11. Som, S. K. and Biswas, G., "Introduction to Fluid Mechanics and Fluid Machines", Tata McGraw-Hill Pub. Co. Ltd., New Delhi, 2nd ed., 2008.
12. Streeter, V. L. and Wyle, E. B., "Fluid Mechanics", McGraw-Hill Book Co, Singapore, 1983.

Far Western University
Faculty of Engineering
Bachelor of Engineering (Civil)
Course of Study

Course Title: Computer Methods in Civil Engineering **Credit: 3**
Course No.:CT 351 **Number of hours per week: 3**
Nature of the Course: Theory,Tutorial **Total hours: 45**
Year: Third, Semester: Fifth **Level: Bachelor of Engineering (Civil)**

3. Course Introduction:

The course is aimed to preparing students to understand how numerical problems can be solved through computer methods. People have been numerical computations to solve engineering and scientific problems for a very long time. After the invention of the computers the solution to numerical problems has been easier because we are able to write the computer programs to solve the numerical problems. This cource provides various solutions and algorithms to solve the numerical problems.

4. Course Objectives:

After successful completion of this course the studentswill be able to

- Identify errors and precision in numerical computation.
- Solve linear and non linear equations
- Interpolate data based on given condition with different methods
- Perform numerical differentiation and integration
- Solve ordinary and partial differential equation

5. Specific Objectives and Contents:

Specific Objectives	Contents
• Understand number repentation of computer. • Understand the computer methods in solving numerical problems. • Understand error propagation and review calculus and taylor series and numeric approximation.	**UNIT 10. Introduction to Machine-Based Numerical Computations (4 hours)** 1.1 Importance of Computer Methods in Solving Numerical Problems 1.2 Review of Calculus, Taylor Series 1.3 Approximation and Errors in Computation 1.4 Error Propagation 1.5 Floating Point Numbers
• Understand the concept of finding roots for nonlinear equation • Understand how larger iterations are difficult to process manually and computer methods will solve efficiently • Know how different methods can be used to find roots.	**UNIT 11. Solution of Nonlinear Equations (5 hours)** 2.1 Bisection Method 2.2 Newton-Raphson Method 2.3 False Position and Secant Method 2.4 Fixed Point Iteration Method 2.5 Comparison of Methods
• Understand how we can calculate the values of the system of linear algebraic equation. • Understand how different methods can be used to solve the system of linear algebraic equations	**UNIT 12. Solution of Linear Algebra (8 hours)** 3.1 Overview of Linear Algebra 3.2 Gaussian Elimination 3.3 Gauss-Jordan Method 3.4 Gauss-Seidel Method 3.5 LU Decomposition 3.6 Singular Value Decomposition

• Understand the concept of Interpolation. • Understand how we can interpolate date with the given condition using different method • Know the concept of curve fitting	**UNIT 13. Interpolation (8 hours)** 4.1 Introduction to Interpolation 4.2 Direct Method of Interpolation 4.3 Newton's Divided Difference Method 4.4 Lagrangian Interpolation 4.5 Spline Interpolation 4.6 Linear and Nonlinear Curve Fitting with Least Square Method
• Understand the concept of numerical differentation. • Know how maxima and minima can be calculated	**UNIT 14. Numerical Differentiation (4 hours)** 5.1 Review of Differentiation 5.2 Differentiation of Continuous Functions 5.3 Differentiation of Discrete Data 5.4 Maxima and Minima
• Understand the concept of Numerical integration. • Know the different techniques for numerical integration	**UNIT 15. Numerical Integration (4 hours)** 6.1 Review of Integral Calculus 6.2 Trapezoidal and Simpson Integration 6.3 Romberg Integration **6.4** Gaussian Quadrature Rules
• Understand the concept of ordinary differential equation. • Know how different methods can be used to find the solution of ordinary differential equation • Know how to solve the boundary value problem	**UNIT 16. Numerical Solution of Ordinary Differential Equations (6 hours)** 7.1 Review of Ordinary Differential Equations 7.2 Euler's Method 7.3 Runge-Kutta Methods 7.4 Solution of Boundary Value Problem
• Understand the types of partial differential equation • Know how to find the solution of different partial differential equations	**UNIT 17. Numerical Solution of Partial Differential Equations (6 hours)** 8.1 Introduction to Partial Differential Equation 8.2 Solution of Laplace Equation 8.3 Solution of Poisson Equation 8.4 Solution of Elliptic Equation

Evaluation System

Undergraduate Programs				
External Evaluation	**Marks**	**Internal Evaluation**	**Weight age**	**Marks**
End semester examination (Details are given in the separate table at the end)	60	Assignments	25%	10
		Quizzes		
		Presentation		
		Group work		
		Mid-Term Exam	75%	30
Total External	60	Total Internal	100%	40

External evaluation

End semester examination

It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage	External exam marks
Group A: multiple choice*	20	20	20×1 = 20	20%	12
Group B: Short answer type questions	8	6	6×8 = 48	40%	24
Group C: Long answer type question	3	2	2×16 =32	40%	24
			100	100%	60

Each student must secure at least 45% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term & Pre-board examination: These are written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Term Paper writing
- Case study
- Quizzes

- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period.

References:

1. Richard L. Burden, J. Douglas Faires, *"Numerical Analysis 9th edition"*,Brooks Cole
2. Dr. B.S.Grewal, *"Numerical Methods in Engineering and Science"*, Khanna Publication, 10th Edition.
3. Robert J Schilling, Sandra L. Harries, *"Applied Numerical Methods for Engineers using MATLAB and C"*, Brooks Cole.

Far Western University
Faculty of Engineering
Bachelor of Engineering (Civil)
Course of Study

Course Title: Structural analysis-II **Number of lecture/week: 3**
Course Code: CE353 **Tutorial/week: 2 hrs**
Year/Semester: III/V **Lab/week: 2/2 hrs**
Level: Bachelor of Engineering (Civil) **Total Lectures: 48 hrs**

Course Introduction

The main aim of this course is to provide a basic knowledge for the analysis of indeterminate structures, and understand the effect of redundancy in structures so that students will be able to design civil engineering structures properly later on. Analyze the basic concepts of theorems on displacements. Use flexibility, stiffness matrices in the analysis of indeterminate structures. At the end students should be able to perform analysis of simple indeterminate structures both by manual calculation as well as matrix method of structural analysis using computer applications.

Course Objectives

At the end of the course the students should be able to

- differentiate static and kinematic indeterminacies in the structures
- evaluate deformations/internal stresses in the simple indeterminate structural members/structures
- draw influence line diagrams (ILD) for simple indeterminate structures
- analyze the indeterminate structures using matrix/force/displacement methods
- perform plastic analysis of structures
- apply structural analysis techniques to analyze the behavior of structures so that students shall be able to design civil engineering structures properly

Course Outline

Specific Objectives	Contents	Duration
• Scope of the subject • Understand conditions to be fulfilled by the structures • Understand structural idealization, local and global coordinates • Static versus kinematic indeterminacies • Understand the redundancies in the structural system	**Chapter 1: Introduction to Indeterminate Structures** Functions of the structural systems; requirements and limitation of equilibrium; conditions to be fulfilled, i.e., strength, stiffness and stability of a system; types of indeterminate structures; boundary conditions, partial restraints. Structure idealization, local and global coordinate systems. Indeterminacy of structural systems its physical meanings and its types; degree of static indeterminacy of a system: static indeterminacies; use of formula, necessity of visual checking for plane systems (truss, frame and arch); redundancies; requirements and limitations of compatibility; degree of freedom and degree of kinematic indeterminacy of a system: use of formula, necessity of visual checking for plane systems (truss, frame and arch); redundancies.	4 hrs
• Understand the force and displacement as cause and effect in structural systems • Derive the theorems on deformations and understand physical meaning • Analyze indeterminate	**Chapter 2: Theorems on Displacements** Force and displacements as cause and effects; Betti's law and Maxwell's reciprocal theorem, their uses and the limitations; Castigliano's two theorems: use of second theorem for determination of displacements in statically determinate and solution of statically indeterminate simple systems: beam, truss, frames; use of first theorem. Flexibility and stiffness; flexibility matrix; stiffness matrix; relationship between flexibility and stiffness matrices.	4 hrs

structures • Differentiate flexibility and stiffness matrices	Force and displacement methods to analyze indeterminate structures.	
• Consistent deformation method & limitations • Appropriate choice of unknowns • Compatibility equations • Generation of flexibility matrices • Graphical method to obtain flexibility coefficients • Physical interpretation of three moment equations • Understand the effect of temperature change • Effect of settlement of supports • Analyze the two hinged arches • Influence line diagrams for two-hinged arches	**Chapter 3: Force/Compatibility/Flexibility Method** General principle, definitions, special features of force method and its limitations; primary systems, choice of unknowns for force quantities and its limitations, unit force diagrams; appropriate choice of redundant and effects in the solution process. Compatibility equations in matrix form; system specific matrix, its dependency upon choice of redundants; generation of flexibility matrix. Use of graphical method for calculation of coefficients of flexibility matrix; derivation of formula for the standard case of parabola and straight line. Applications to beams and frames; three moment theorem, determination of redundant reactions/member forces in a beam up to three spans and frames limited to one storey two bay/two storey one bay; support settlements; effect of temperature change in beams up to two spans and portal frames; normal thrust, shear force and bending moment diagrams. Applications to trusses; effects of temperature change and misfits. Applications to two hinged parabolic and circular arches including yielding of supports and temperature effects; normal thrust shear force and bending moment diagrams; influence line diagrams for two hinged arches; Introduction to fixed (hingeless) arches.	12 hrs
• Understand difference between force and displacement methods • Choice of primary systems and their effect in the solution process • Understand the solution process of equilibrium equations in matrix form • Derivation of slope deflection equation • Interpretation of slope deflection equation • Stiffness and relative stiffness; carry-over/ distribution factors for different boundary conditions • Application to beams and frames with different boundary/ support conditions	**Chapter 4: Displacement Method** General principle, definitions, specialties of displacement method and its limitations; primary system: kinematic indeterminacy and unit displacement system, unit displacement diagrams and their applications; choice of unknowns and its uniqueness in comparison with force method; equilibrium equations in matrix form; formulation of stiffness matrix: properties. **Slope deflection method**: Fixed end moments, rotational and translational effects in beams; derivation of slope deflection equation, physical interpretation of slope deflection equation. Applications to beams and frames, effects of settlement of supports and temperature variation; normal thrust, shear force and bending moment diagrams. Applications to trusses, effect of temperature change. **Moment distribution method**: Principle of the method, absolute stiffness, relative stiffness for different boundary conditions, distribution of unbalanced moment in a rigid joint, carry-over and distribution factors. Application of moment distribution method to continuous beams with different end conditions and support settlements; applications to frames with different end conditions; frames with side sway conditions for simple cases (one bay and two storeys or two bays and one storey); normal thrust, shear force and bending moment diagrams.	18 hrs
• Response functions • Indeterminate structures	**Chapter 5: Influence Line Diagrams for Continuous Beams** Definitions: Response function (support reaction, shear force, bending moment etc.); influence line diagrams (ILD) by direct	4 hrs

and influence lines • Obtain maximum/ absolute values for indeterminate structures	method; Mueller Breslau principle, its interpretations and application to draw influence lines for reaction, shear force and bending moment in various sections of continuous beams up to three spans; loading of the influence line diagrams by point, distributed loads and couples to obtain reaction, shear force and bending moment at a section of a continuous beam.	
• Importance of plastic analysis: elasto-plastic and plastic bending • Formation of plastic hinge and mechanism • Failure mechanism of determinate and indeterminate/ redundant structures	**Chapter 6: Introduction to Plastic Analysis** Definitions; stress-strain curve for a rectangular section; moments in elastic, elasto-plastic and plastic stages; plastic section modulus. Plastic bending; plastic hinge, its mechanism and length; moment-curvature relation, load factor; shape factor and determination. Plastic analysis: methods of plastic analysis; collapse loads: partial collapse, complete collapse; lower and upper bound theorems. Plastic analysis of simple statically indeterminate beams and frames.	6 hrs

Experments/Laboratory Works

1 Experimental analysis of continuous beams (propped cantilever, two spanned beams with various end conditions)
2 Experimental analysis of two hinged arches: symmetrical and unsymmetrical
3 Experimental analysis of symmetrical portal frame
4 Experimental analysis of unsymmetrical portal frame

References:

7. S. Utku, C.H. Norris and J.B. Wilbur, "*Elementary structural Analysis*", 3rd Edition, New York: McGraw-Hill Book Co., 1991
8. A. Darkov, "*Structural Mechanics"*, Mir Publishers, Moscow,1966
9. R.C. Hibbeler, "*Structural Analysis",* Pearson Education Asia, 2002
10. A. K. Jain, *"Advanced Structural Analysis with Computer Applications",* Nem Chand and Bros, Roorkee, India, 1996
11. G.S. Pandit, S.P. Gupta, "*Structural Analysis, A Matrix Approach"*, Tata McGraw-Hill Publishing Company Limited, New Delhi, 1981
12. C.S. Reddy, "*Basic Structural Analysis",* Tata McGraw-Hill Publishing Company Limited, New Delhi, 1981
13. C.K. Wang, "*Intermediate Structural Analysis",* McGraw-Hill International Editions, Civil Engineering Series, 1983
14. Wong Y. et al., *"Applied Numerical Methods using MATLAB",* John Willey & Sons, 2005
15. William Weaver, JR., James M. Gere, "Matrix Analysis of Frames Structures", 2nd Edition, CBS Publishers and Distributers, India
16. A. Ghali, A.M. Neville, " *Structural Analysis, A Unified Classical and Matrix Approach",* Chapman and Hall, 1989

Far Western University
Faculty of Engineering
Bachelor of Engineering (Civil)
Course of Study

Course Title: Transportation Engineering **Credit: 3**
Course No.:CE 355 **Number of hours per week: 3-1**
Nature of the Course: Theory **Total hours: 45**
Year: Third, Semester: Fifth **Level: Bachelor of Engineering (Civil)**

6. Course Introduction:

The main objective of this course is to make students familiar with the transportation modes focusing on road transportation in the context of Nepal.

7. Course Objectives:

At the end of this course the student should be able to

- understand the fundamentals of transportation engineering
- plan, survey, design the road alignment
- know the requirements of road construction materials, their testing
- gain knowledge regarding road construction techniques, their maintenance

8. Specific Objectives and Contents:

Specific Objectives	Contents
• To know the the modes of transportation and their relative advantages and disadvantages • To understand the development process of road transportation • To know the road classification system in Nepal and its importance • To gain the knownledge of factors affecting highway alignment • To know the basic survey procedure of road alignment survey	**UNIT 18. Introduction to Transportation engineering and Highway alignment (4 Hours)** 1.6 Introduction 1.7 Modes of transportation and comparison between them 1.8 History and development of road transportation 1.9 Transportation planning, need, road planning in Nepalese contxt 1.10 Road classification in Nepal (NRS, NRRS) 1.11 Highway alignment and its requirement 1.12 Factors controlling highway alignment 1.13 Engineering survey for highway alignment
• To understand the geomectric elements of highway • To design the various geometric elements of highway	**UNIT 19. Geometric Design of Highway (12Hours)** • Introduction and Scope • Basic design control and criteria • Cross sectional elements • Radius of horizontal curve • Superelevation • Extra widening • Transition curves • Sight distances • Setback distances • Gradients, grade compensation • Design of vertical curves
• To Understand the importance of	**UNIT 20. Highway Drainage (2**

drainage in road • To classify the highway drainage system • To design the road side drains • To understand the function of different energy dissipating structures	**Hours)** • Introduction and importance • Causes of moisture variation in subgrade soil • Surface drainage system including design of side drains • Subsurface drainage system • Cross drainage system • Energy dissipating structures
• To Understand the type, properties and uses of road materials • To know the tests procedure of soil, aggregegate and binder.	**UNIT 21. Highway Materials (4 Hours)** • Introduction and classification of road materials • Soil, desirable properties, CBR test • Road aggregates, desirable properties, different tests on road aggregates • Bituminous binders, classification, tests
• To know the construction acvities, tools and equipment needed • To understand the process of road construction • To know the type of failures in highway • To understand different remedial measures.	**UNIT 22. Road Construction and Maintenance (6 Hours)** • Road construction activities, tools, equipment and plants • Construction of earthen roads, gravel roads, WBM roads • Construction of Soil stabilized roads • Construction of bituminous roads (interface treatment, surface dressing, Otta seal, grouted macadam, bituminous carpet, mastic asphalt, bituminous contrete) • Construction of cement concrete pavement • Classification of highway maintenance • Maintenance priorities • Pavement distress evaluation (Benkelman beam test) • Flexible and rigid pavement failures, causes and remedial measures
• To be familiar with the concept of hill roads • To know the special considerations required in the design of hill roads • To design the hair pin bends	**UNIT 6. Hill Roads (2 Hours)** • Definition • Design and construction problems • Selection of gradient in hill roads • Design of hair pin bends • Typical cross sections in hill roads • Special structurs in hill roads
• To be familiar with the traffic operation, control and management	**Unit 7 Traffic Engineering (9 Hours)** • Introduction and scope, traffic characteristics • Traffic studies (volume, speed, speed and delay, O-D, parking, accident) • Traffic control devices (signs, signals, markings) • Road Intersectiosn (at grade intersection, grade separated intersection) • Road lighting
• To know the different types of pavement • To design the flexible pavement by simple methods	**Unit 8: Road Pavement (6 Hours)** • Definition and types • Difference between flexible and rigid pavements • Factors controlling pavement design

	• Flexible pavement design methods (CBR method, Road Note 31 method, Nepalese guidelines, IRC method, AI method)

Laboratories:

(a) Los Angeles Abrasion Value and Crushing Value of Aggregates
(b) Penetration Value; Viscosity; Softening Point and Ductility of Bitumen
(c) Marshall Stability Test and Asphalt Mix Design
(d) Extraction of Bitumen from Mix and Gradation of Aggregate after Extraction
(e) CBR test of Subgrade Soil
(f) Spot speed measurement by manual or automatic method
(g) Traffic volume study at road intersection

Far Western University
Faculty of Engineering
Bachelor of Engineering (Civil)
Course of Study

Course Title: Water Supply Engineering **Credit: 3**
Course Code.: CE 354 **Number of lecture/week:4**
Year/Semester: Third/Fifth **Tutorial/week: 1**
Level: Bachelor of Engineering (Civil) **Total Hours: 45**

Course Introduction:

The main aim of this course is to provide a basic knowledge to the students to understand the fundamentals of the water supply system and water supply engineering

Course Objectives:

At the end of this course the student should be able to:

- Understands of watersupply system and functions of the various components , water sources and their utilization, determination of quantity,quality , water demand, selection of souces and water treatment technology.
- Construction of intake water mains and distribution.

Specific Objectives and Contents:

Specific Objectives	Contents
• Be aware about water • Understand water cycle • Realize importance of water • Understand type of water • Be familiar about historical development of water supply • Be able to explain objectives of watersupply system • Understand role of water in public health and environment • Know to draw and expalin typical water supply system diagaram • Be able to explain about function and importantce of different elements of water supply system	**1.INTRODUCTION (2 hours)** 1.1. Water is life 1.2. Water hydrology 1.3. Importance of water 1.4. Definition of Types of water 1.4.1.Pure and impure water 1.4.2.Potable and wholesome water 1.4.3.Polluted and contaminated water 1.5. Historical development of water supply system 1.6. Objectives of water supply system 1.7. Water ,sanitation, health and environment 1.8. Schematic diagram of typical water supply system 1.9. Components of water supply system and their functions
• Understand about sources • Be able to know classification of sources • Understand different types of surface source • Know the numerical method for sizing the capacity of impounded reservoir • Understand different types of Ground source	**2. SOURCES OF WATER (4 hours)** 2.1. Classification of sources of water 2.2. Surface sources 2.2.1.Rivers 2.2.2.Streams 2.2.3.Lakes 2.2.4.Ponds 2.2.5.Impounded reservoir 2.2.6.Numerical on capacity determination of impounded reservoir 2.3. Ground sources 2.3.1.Subsurface geological formation 2.3.2.Confined and unconfined aquifers 2.3.3.Springs

• Understand subsurface Geolocical formation below ground suface • Understand different types of misecellaneous water source • Importance of water Consevation and conservation pond • Understand selection of sources and criteria • Be able to undersatand Water right issue and role of community	2.3.4. Wells 2.3.5. Infiltration galleries and wells 2.4. Miscellaneous sources 2.4.1. Rain water , fogs, reuse water 2.4.2. conservation pond 2.4.3. water conservation and Recharges 2.5. Selection of water sources 2.5.1. Factors affecting for source selection 2.5.2. water right problems and role of community 2.5.3. sources protection
• Understand about water demand • Know about different termilnolgy used in water demand • Know about different types of demand and required quantity • Be able to explain about variation of demand, importance of variation in W/S , factor governing on demand of water • Understand importance of Population forecasting • Know the different method of forecast of future population and choose appropriate methods for forcast •	**3. WATER DEMAND AND QUANTITY DETERMINATION (5 hours)** 3.1. Per capita demand of water 3.2. Design and base periods 3.2.1. Typical design and base periods 3.2.2. Selection basis 3.2.3. Design and base years 3.3. Types of water demand 3.3.1. Domestic demand 3.3.2. Livestock demand 3.3.3. Commercial demand 3.3.4. Public/municipal demand 3.3.5. Industrial demand 3.3.6. Fire fighting demand 3.3.7. Loss and wastage 3.3.8. Total water demand 3.4. Variation in demand of water 3.4.1. Peak factor 3.4.2. Factors affecting demand of water 3.4.3. Importance of variation in water supply system 3.5. Population forecasting - necessity and methods 3.5.1. Arithmetical increase method 3.5.2. Geometrical increase method 3.5.3. Incremental increase method 3.5.4. Decrease rate of growth method 3.5.5. Numerical on population forecasting and water demands
• Undersatand concept of quality, its scientific definition, • Know about impurities and their types and way of classifiactin of impurities • • undersatand what is hardness in water • alakalinitie and relationship hardness and alakalinities • know computation method of hardness	4. **QUALITY OF WATER (5 hours)** 4.1. Impurities in water, their classification and effects 4.1.1. Classification according to its characteristics 4.1.2. Classification according to its states 4.1.3. Suspended impurities 4.1.4. Colloidal impurities 4.1.5. Dissolved impurities 4.2. Hardness and alkalinity 4.2.1. Types of hardness 4.2.2. Types of alkalinity

and alkalinity • understand role of living organism, their types and effects • • know water related diseaes and their types • know about transmission routes of disease and preventative measures (f diagram) • undersatand determination of water characteristics, • types purpose and method of examination • • • • undersatand concept of water quality standard, national, WHO standards	4.2.3. Relation between hardness and alkalinity 4.2.4. Numerical on hardness and alkalinity 4.3. Living organisms in water 4.3.1. Algae 4.3.2. Bacteria 4.3.3. Viruses 4.3.4. Worms 4.4. Water related diseases 4.4.1. Water borne diseases 4.4.2. Water washed diseases 4.4.3. Water based diseases 4.4.4. Water vector diseases 4.4.5. Transmission routes 4.4.6. Preventive measures 4.5. Examination of water 4.5.1. Physical examination of water(tests for temperature, color and turbidity) 4.5.2. Chemical examination of water (tests for pH, suspended, dissolved and total solids) 4.5.3. Biological examination of water(multiple tube and membrane fermentation method), most probable number 4.6. Water quality standard for drinking purpose
• To know about intakes • Know to selection of sources • Know to classification • Understand to describe the different intakes	**5. INTAKES [3 hours]** 5.1. Definition 5.2. Factors governing Site selection of an intake 5.3. Classification of intake 5.3.1. Important Elements of intake 5.3.2. Typical skectch of intake 5.4. Characteristics of intake 5.4.1. River intakes 5.4.2. Reservoir intake 5.4.3. Spring intake
• To know define to treatments • Understand objectives of treatments • Understand types and arrangement of different treatment process • To know about the principles of sedimentation, purpose • To know Design ST and derivation of stokes law of settling • Understand temperature effects in settlings • Understand and know numerical solution of ST design • Know about cogulation and it necessary • Know about Types of coagulants and	**6. TREATMENT OF WATER [14 hours]** 6.1. Objectives of water treatment 6.1.1. Treatment processes and impurity removal 6.1.2. Screening 6.1.3. Purpose 6.1.4. Coarse ,medium and fine screens 6.2. Plain Sedimentation 6.2.1. Purpose 6.2.2. Theory of settlement 6.2.3. Derivation of Stoke's law 6.2.4. Temperature effect on settlement 6.2.5. Ideal sedimentation tank 6.2.6. Types of sedimentation tank 6.3. Design of sedimentation tank 6.3.1. Numerical on theory and design of sedimentation tank 6.4. Sedimentation with coagulation 6.4.1. Purpose 6.4.2. Coagulants (types and their chemical reactions)

characteristics • To know flocculation , flocculation tanks • To know dose calculation of cogulant • To know about filtration • To know purpose • Understand and explain theory of filtration • Know about Types of filter • Understand mechanism of slow sand fliter • Understand to compute dimension and unit of filters • Understand concept of disinfection • To know different types of disinfectant • To know methods of disinfection • Understand what is chlorinisation • Understand types of chlorine • Understand forms of chlorine • Factors affecting in chlorination • To know define hardness of water and softening process • Understand different reoval process of hardnes (both) • Understand different miscellaneous treatments • Understand Methods of aeration •	6.4.3. Mixing devices (purpose and types) 6.4.4. Flocculation tanks 6.4.5. Clarifier 6.4.6. Dorr clariflocullator 6.4.7. Dose calculation of coagulants (Jar test) 6.5. Filtration 6.5.1. Purpose 6.5.2. Theory of filtration 6.5.3. Types of filters 6.5.4. Slow sand filter 6.5.5. Rapid sand filter 6.5.6. Pressure filter 6.6. Numerical on dimensions and units of filters 6.7. Disinfection 6.7.1. Purpose 6.7.2. Methods of disinfection (introduction only) 6.7.3. Chlorination (theory, chlorine demand, chlorine dose, residual chlorine, contact time 6.7.4. Types of chlorine (hypochlorites, chloramines, liquid/gas chlorine) 6.7.5. Forms of chlorination (plain chlorination, pre chlorination, post chlorination, double chlorination, multiple chlorination, breakpoint chlorination, super chlorination, dechlorination) 6.7.6. Factors affecting efficiency of chlorination 6.8. Softening 6.8.1. Purpose 6.8.2. Removal of temporary hardness 6.8.3. Boiling method 6.8.4. Lime treatment method 6.8.5. Removal of permanent hardness 6.8.6. Lime soda method 6.8.7. Zeolite method 6.8.8. Ionizaton method 6.9. Miscellaneous treatments 6.9.1. Aeration 6.9.2. Purpose 6.9.3. Methods of aeration 6.9.4. Removal of iron and manganese 6.9.5. Removal of color, odor and taste
• Understand and able to explain supply system and its components • Types of supply system • Understand reservoir • Types and function of reservoir • Understand to determine the capacirty of reservoir Numerical exercise • Understands and explain Different layout , characteristics and merits and	7. **RESERVOIRS AND DISTRIBUTION SYSTEM [6 hours]** 7.1. System of supply 7.1.1. Continuous system 7.1.2. Intermittent system 7.2. Resorvior 7.2.1. Clear water reservoirs 7.2.2. Service reservoirs 7.2.3. Purpose and Construction 7.2.4. Types of service reservoirs 7.2.5. Numerical on capacity determination of service reservoirs 7.3. Layout of distribution system

demetis of different layout system • Understands and design distribution system • Understands pipe hydrolics and design using hardy cross method • Understands and able to solve numerical on design of distribution system (branched looped)	7.3.1. Tree system 7.3.2. Grid iron system 7.3.3. Ring system 7.3.4. Radial system 7.3.5. Design of distribution system 7.3.6. Pipe hydraulics 7.3.7. Design criteria 7.3.8. Design steps 7.3.9. Hard cross method 7.3.10. Numerical on design of branched and looped water distribution systems
• To know about water conveyance system, • To know different types material used for conveyance • Understand stresses in pipes • To know appurentance used in water supply • Understand and able to used concept of headloss through pipes • To know connection of pipes • To know Pupose of joint • To know types of different kinds of Joints • To know about repair , O & M • To know laying of pipes	**8. CONVEYANCE OF WATER [3 hours]** 8.1. Pipe materials 8.1.1. Requirements of good material 8.1.2. Types of pipe material 8.1.3. Cast Iron Pipes 8.1.4. Ductile Iron Pipes 8.1.5. Galvanized Iron Pipes 8.1.6. Steel Pipes 8.1.7. Cement Concrete Pipes 8.1.8. PVC, PPR and others pipes 8.2. Stresses in pipes 8.2.1. Corrosion in Pipes 8.2.2. Pipes appurtenances 8.2.3. Headloss through pipes 8.3. Pipe joints 8.3.1. Purpose 8.3.2. Types – socket and spigot, flanged, expansion, collar and screwed socket joints 8.3.3. Repair and maintenance of pipes networks and joints **8.4.** Laying of pipes
• To know about valves • To know Pupose of valves • To know different kinds of valves • To understands public standpost location • To understands concept of head , residual head , gradelines and use • • • To understands O and M • To understands institutional arrangement • To understands BPT and function design • Understand community participant • To understands users committee and its importances	**9. VALVES AND FITTINGS [3 hours]** 9.1. Valves 9.1.1. Purpose 9.1.2. Types – sluice, reflux, safety, air and drain valves 9.2. Fittings 9.2.1. Purpose 9.2.2. Types – stop cocks, water taps, bends, reducers, tees 9.3. Break pressure tank – purpose and construction 9.4. Public standpost , 9.4.1. Purpose 9.4.2. Location, Flow ,Construction & sizing 9.4.3. Cocept of residual head 9.5. Maintenance of water supply system 9.5.1. Operation and maintenance 9.5.2. Necessity 9.5.3. Methods-regular and emergency 9.6. Institutional arrangements 9.6.1. Community participation in water supply system **9.6.2.** Users committee

Evaluation System

Undergraduate Programs				
External Evaluation	**Marks**	**Internal Evaluation**	**Weight age**	**Marks**
End semester examination (Details are given in the separate table at the end)	60	Assignments	25%	10
		Quizzes		
		Presentation		
		Group work		
		Mid-Term Exam	75%	30
Total External	60	Total Internal	100%	20

External evaluation

End semester examination

It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage	External exam marks
Group A: multiple choice*	20	20	20×1 = 20	20%	12
Group B: Short answer type questions	8	6	6×8 = 48	40%	24
Group C: Long answer type question	3	2	2×16 =32	40%	24
			100	100%	60

Each student must secure at least 45% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term & Pre-board examination: These are written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Term Paper writing
- Case study
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period.

Prescribed Text:

4. BC. Punmia, Ashok Kuamr Jain and Arun Kumar Jain, "Water Supply Engineering", Laxmi Publications (P) Ltd., New Delhi, 1998
5. Arun Parajuli:

References:

1 P.N. Modi, "Water Supply engineering", Standard Book House, Delhi, 1998
2 G.S. Birdie and J.S. Birdie, "Water Supply and Sanitary Engineering", Dhanpat Rai Publishing Company (P) Ltd,. New Delhi, 2002
3 K.N. Duggal, "Elements of Environmental Engineering"' S. Chand and company Ltd.., New Delhi, 1997
4 B.R. Kansakar, "Water Supply Engineering" Prakash Man Shakya, Kathmandu, 2015

Practical:

1. Determination of temperature, color, turbidity and pH
2. Determination of suspended, dissolved and total solids
3. Determination dissolved oxygen by Winkler method
4. Determination of optimum dose of coagulant by jar test apparatus

Field Visit Practical:

1. Field observation of suitable intakes of water supply
2. Field observation of treatment plants and quality control in water supply distribution system

Far Western University
Faculty of Engineering
Bachelor of Engineering (Civil)
Course of Study

Course Title: Survey Camp **Credit: 2**
Course No.:GE357 **Total hours: 10days (10 x 13 Periods) Field Work**
Nature of the Course: Practical **Level: Bachelor of Engineering (Civil)**
Year: Third; Semester: Fifth

Course Introduction:

Ten days field survey camp (closed camp) will prodide exposure to the students to tackle with real field problems in civil engineering surveying.

After completion of the field works, students should have to prepare and submit a detailed report of survey camp including original data recorded in the field book, reference sketches, original plotted drawings and printed report. All the original data and drawings must be compiled and presented as final report during external examination (final viva-voce).

As far as possible, number of students in each group should not be more than 5 (five) and use modern surveying equipment such as Total Station, Theodolite, Auto level etc.

Course Objectives:

- The main objectives of the survey camp is to consolidate and update sudents practical and theoretical knowledge in civil engineering surveying for planning, designing and execution of the works.
- Students get real field based exposure to learn and apply different surveying methods, modern surveying instruments, computational practices and ways of presentation in their final reports.

9. Specific Objectives and Contents:

Specific Objectives	Contents
• Understand reconnaissance survey, establishment of horizontrolcontrol stations, pegging of major traverse and minor traverse stations. • Able to draw reference sketch of survey stations and index sketch of the area to be surveyed. • Understand the process of measurement of horizontal circle readingand vertical circle reading; • Be able to compute horizontal angles and horizontal distances. • Understand the computational procedures of X, Y and Z coordinates in the Gales Table.	**UNIT 1. Horizontal Control for Major Traverse**: **(2 Days)** A closed Major Traverse shall be performed at about 1.2 km periphery area with approximately**11-15** stations.If possible, coordinates of those traverse points shall be controlled with reference to National Grid System.Coordinates X and Y shall be controlled by Total Station and coordinate Z must be controlled by Auto Level. **Norms:** • Two sets of horizontal angles (o° set and 90° set). • Traverse leg ratio 2:1 (Max: Min) • Linear measurement accuracy 1:5,000 for Total Station and 1:2,000 for Tape measurement. • Difference between FL and FR reading =180°±30' for Total Station and 180°±01' for Theodolite.

	• Angular Accuracy (LC√N) = (**45" √N**) for Total Station and (**1.5'√N**) for Theodolite. • Relative Accuracy Ratio = 1:5,000.
• Be able to perform Two Peg Test before Fly Levelling. • Collimation precision of Two Peg Test should be better than 1:7,500. • Understand Fly Levelling to Transfer RL from the permanent BM (or given BM) to the TBM; • Know the process to be followed in Fly Levelling such as: observe three wire readings: distance between BS and FS should be within the tolerance of ± 1m (sight balance); mean BS and mean FS must be compatible with mid BS and mid FS within a tolerance of ±3mm; • Turning Plate must be used in each Changing/Turning points; • Staff readings be observed above 0.6m and below 2m for fly levelling.	**UNIT 2. Horizontal and Vertical Control for Minor Traverse inside/outside the Major Traverse. (5 Days)** Detailed topographic survey shall be conducted within the perimeter of the semi built up area (about 750mperimeter). Coordinates (X, Y, and Z) of these traversestations including details shall be controlled by using Total Station and Auto level. Link traverse exercise is utmost mecessary. **Time Allocation:** • 1 Day for fly leveling and RL transfer • 2.5 Days for detailing in minor traverse • 1.5 Days for computation and plotting of traverse etc. **Norms of Horizontal Control:** • One set of horizontal angles (o° set). • Traverse leg ratio 3:1 (Max: Min) • Linear measurement accuracy 1:3,000 for Total Station and 1:1,000 for direct Tape measurement. • Difference between FL and FR reading =180°±30"for Total Station and 180°±01' for Theodolite. • Angular Accuracy (LC√N) = (**1'0"√N**) for Total Station and (**2'0"√N**) for Theodolite. • Relative Accuracy Ratio = 1:3,000. **Norms of Vertical Control:** • Collimation precision of Two Peg Test should be better than 1:7,500. • Circuit must be closed while transfering RL in Major and Minor Traverse stations. • Misclosure in all Vertical Control job should be within the tolerance of **± 24√K** mm, where K= Loop distance in KM.
• Understand to determine the length of Bridge Axisby forming two Base Triangles. • Understand the process of Reciprocal Levellingto transfer RL from one bank of the river to another bank of the Bridge Axis point.	**UNIT 3. Bridge Site Survey(1.5 Days)** Detailed topographic survey of suitable bridge site area (150m*75m) shall be conducted by which Topographic map, L- section, X section etc shall be prepared at standard scale. Use Theodolite to measure two sets of horizontal angles in base triangles and one set of horizontal angles in other control stations. Use Total Station forDetailing and Auto Level for Vertical control. **Norms:** • While choosing control stations of triangulation,

• Understand to perform the detailed topographic survey of bridge site. • Be able to plot the topographic map of Bridge Site Survey, L - Section along the flow direction and X-Sectionsacross the flow direction. • Understand to plot Index contour by precise Arithmetic Mean method, then remaining contours either by Graphical method or by Estmation method.	Triangles should be in well condition. • Two sets of horizontal angles (o° set and 90° set) in Base Triangles. • One set of horizontal angles (o° set) in other Triangles. • Linear measurement accuracy 1:2,000 for Base line of in Base Triangles. • Difference between FL and FR reading =180°±01' for Theodolite. • Angular Accuracy (LC√N) = (**1'√N**) for Base Triangles and (**1.5'√N**) for other Triangles Theodolite. • In Reciprocal Levelling, mean BS and mean FS must be compatible with mid BS and mid FS within a tolerance of ±3mm, and Misclosure = **± 24√K** mm, where K= Loop distance in KM (2 x length of Bridge Axis). • Perform Fly Levelling and close the circuit to transfer RL in all control stations. • Relative Accuracy Ratio = 1:2,000.
• Understand the selection of Intersection Points (IP). • Be able to measure clockwise angle withrespect to previous IP and forward IP. • Understand to compute chainage along the center line of road alignment. • Be able to establish points in the simple circular curve like BC, MC, and EC . • Understand to take L – Section by Level; and X– Section by both Level instrument and by Stepping method (staff and Tape). • Be able to draw Road corridor plan, L - section, X - section etc shall be drawn at standard scale.	UNIT 4. **Road Alignment Survey (1.5 Days)** Length of road alignment survey shall be at least 500m. Road corridor plan, L - section, X - section etc shall be drawn at standard scale including selection of grades and formation levels etc. **Norms:** • As far as possible, select IP in such a way that deflection angles be less than 90°. • Gradient between adjacent Intersection Points (IP to IP) should not exceed by 12%. • Minimum Radius of the curve should be greater than 12m.; choose the Radius of the curve in the multiple of 10m or 5m > 12m. • Successive curve must not be overlapped. • Observe only face left horizontal circle reading by Theodolite and measure deflection angles at each Intersection Point. • L - Section and X – Section should be taken at chainagepoints of 15m interval (multiple of 15 m)and at BC, MC and EC points. • In case of deflection angles being less than 3°, MC need not be established as External Distance become very small near to Vertex (IP points). • While transferring RL, TBM should be established after covering a tentative length of 500m, and Level Circuit must be closed; misclosure should be within the tolerance of **± 24√K** mm, where K= Loop distance in KM.

Evaluation System

Undergraduate Programs				
External Evaluation	**Marks**	**Internal Evaluation**	**Weightage**	**Marks**
External examination	50	Regular evaluation in the field throughout the 10 days, and viva-voce in the survey field. Field survey work, computation and plotting of major traverse, minor traverse be completed for internalviva-voce.	50%	50
Total External	60	Total Internal	100%	20

Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

Each student must secure at least 45% marks in both internal and external evaluation.

Attendance in Field Survey Camp: Students should regularly attend and participate in the orientation class and field survey camp. Eighty percent class attendance is mandatory for the students. Below 80% attendance in the field survey camp will signify NOT QUALIFIED (NQ), may attend survey camp with junior batch after one year.

Far Western University
Faculty of Engineering
Bachelor of Engineering (Civil)
Course of Study

Course Title: Engineering Economics	**Credit: 3**
Course Code.:CE 352	**Number of lecture/week: 3**
Nature of the Course: Theory	**Tutorial/week: 1**
Year/Semester: Third/Fifth	**Total hours: 45**

Course Introduction:

The main aim of this course is to provide a basic knowledge to the students to understand the fundamentals of simple economic studies.At the end of this course, students will be able to evaluate engineering projects and make project investment decisions.

Course Objectives:

At the end of this course the student should be able to:

- understand the basic knowledge of simple economic studies.
- evaluate engineering projects on the basis of returns from the alternative projects.
- make project investment decisions.

Specific Objectives and Contents:

Specific Objectives	Contents
• Understand meaning and scope • Understand market • Understand Demand and Supply • Understand Principles of Engineering Economy • Understand Cash Flow Diagram	**UNIT 1: Introduction (6 hrs)** 1.1 Definition of Economics 1.2 Scope of the Subject 1.3 Role of Engineers in Economic Decision Making 1.4 Competition, Monopoly, and Oligopoly Market 1.5 Demand, Law of Demand 1.6 Supply, Law of Supply 1.7 Law of Supply and Demand 1.8 Principles of Engineering Economy 1.9 Cash Flow Diagram
• Understand rate of interest and interest formulas • Be able to know the time value of money	**UNIT 2: Interest and Time Value of Money (6hrs)** 2.1 Concept of Time Value of Money 2.2 Simple Interest and Compound Interest 2.3 Economic Equivalence 2.4 Development of Interest Formulas 2.5 Five Types of Cash Flows 2.6 Single Cash Flow Formula 2.7 Uneven Payment Series 2.8 Equal Payment Series 2.9 Linear Gradient Series 2.10 Geometric Gradient Series Nominal Rate of Interest. 2.11 Compound Rate of Interest 2.12 Effective Rate of Interest

	2.13 Continuous Compounding
• Understand Minimum Attractive Rate of Return • Understand equivalent worth • Be able to determine internal and external Rate of Return • Understand Benefit Cost Ratio	**UNIT 3: Basic Methods of Engineering Economic Analysis (6hrs)** a. Minimum Attractive Rate of Return (MARR) b. Payback Period Method c. Accounting Rate of Return d. Equivalent Worth Method: Present Worth Method, Future Worth Method, Annual Worth Method e. Rate of Return Method: Internal Rate of Return, External Rate of Return f. Simple Benefit Cost Ratio
• Understand the comparative analysis of alternatives having same useful life and different useful life • Understand the repeatability assumption and capitalized worth method	**UNIT 4: Comparative Analysis of Alternatives (6hrs)** 4.1 Mutually Exclusive Alternatives having Same Useful Life: Methods of Equivalent Worth, Rate of Return, and Benefit Cost Ratio. 4.2 Mutually Exclusive Alternatives having Different Useful Life: Repeatability Assumption, Co-terminated Assumption, and Capitalized Worth Method 4.3 Comparing Combination of Mutually Exclusive, Contingent and Independent Projects.
• Understand the concept of depreciation • Understand the methods of depreciation	**UNIT 5: Depreciation (4hrs)** 5.1 Introduction and Terminology of Depreciation 5.2 Methods of Depreciation: Straight Line Method, Sinking Fund Method, Sum of the Year Digit Method, Declining Balance Method, Modified Accelerated Cost Recovery System (MACRS)
• Understand the sources of project risks • Understand the sensitivity analysis, breakeven analysis, and scenario analysis • Understand the concept of economic analysis • Be able to understand decision tree and sequential investment decision	**UNIT 6: Risk Analysis (6 hrs)** 6.1 Introduction 6.2 Sources of Project Risks 6.3 Methods of Project Risks: Sensitivity Analysis, Breakeven Analysis, Scenario Analysis 6.4 Probability Concept of Economic Analysis 6.5 Decision Tree and Sequential Investment Decision
• Understand the concept of stock and bonds	**UNIT 7: Capital Investment (4 hrs)** 7.1 Introduction to Capital 7.2 Types of Capital: Common Stock, Preferred Stock, and Bonds 7.3 Bond Amortization and Retirement
• Understand the concept of inflation	**UNIT 8: Inflation (4 hrs)** 8.1 Introduction 8.2 Measuring Inflation 8.3 Equivalence Calculation under Infalation

• Understand the concept of taxation, VAT, and After Tax cash flow estimate	**UNIT 9: Taxation (3 hrs)** 9.1 Introduction to Corporate Income Tax, Property tax, Sales Tax, Excise Tax. 9.2 Types of Taxes: Direct Tax, Indirect Tax, and Value Added Tax 9.4 After Tax Cash Flow Estimate

Evaluation System

Undergraduate Programs				
External Evaluation	**Marks**	**Internal Evaluation**	**Weight age**	**Marks**
End semester examination (Details are given in the separate table at the end)	60	Assignments	25%	10
		Quizzes		
		Presentation		
		Group work		
		Mid-Term Exam	75%	30
Total External	60	Total Internal	100%	20

External evaluation

End semester examination

It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid. Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage	External exam marks
Group A: multiple choice*	20	20	20×1 = 20	20%	12
Group B: Short answer type questions	8	6	6×8 = 48	40%	24
Group C: Long answer type question	3	2	2×16 =32	40%	24
			100	100%	60

Each student must secure at least 45% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

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Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.
Mid-term & Pre-board examination: These are written examination and the questions will be asked covering all the topics in the session of the course.
Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.
Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Term Paper writing
- Case study
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period.

Prescribed Text:

"Engineering Economy";E. Paul De Garmo, William G. Sullivan, and James A. Bontadelli; Pearson Education Asia.

"Contemporary Engineering Economics"; Chain S. Park; Prientice Hall of India Pvt. Ltd.

References:

1. *"Engineering Economics";* James L. Riggs, David D. Bedworth and Sabah U. Randhawa; Tata Mc Graw Hill Education Private Limited.
2. *"Engineering Economics";* R. Panneerselvam;
3. *"Principles of Economics";*KK Dwett;

Transportation Engineering

Prescribed Text:

6. *"Transportation Engineering Volume I", Dinesh Kumar Shrestha and Anil Marsani, Prakash Man Shakya, Kathmandu, 2014*
7. *"Transportation Engineering Volume II", Dinesh Kumar Shrestha and Anil Marsani, Heritave Publishers and Distributors Pvt, Ltd, Kathmandu, 2016*

References:

1. *"Highway Engineering" Dr. S.K. Khanna and Dr. C.E.G.Justo, Nem Chand & Bros Roorkee (U.P.)*
2. *"Highway Engineering" C.A. Flaherty, Edward Arnold (Publishers) Ltd.*
3. *"Principles, Practice and Design of Highway Engineering", S.K. Sharma, S. Chand and Co. Publishers Ltd., New Delhi*
4. *"Principles and Practices of Highway Engineering", L. R. Kadiyali, N. B. Lal, , Khanna Publishers, Delhi, India, 2008*

Far Western University
Faculty of Engineering
Bachelor of Engineering (Civil)
Course of Study

Course Title : Hydrology and River Engineering **Credit : 3**
Course No :CE 356 **Number of Hours per week : (2+1)**
Nature of the Course : Theory + Tutorial **Total Hours : 45**
Practical : 1.5 / 2 Hour each week **Level : Bachelor of Engineering (Civil)**
Year : Third, Semester : Fifth

Course Introduction:
This course is aimed to deliver the knowledge to the Civil Engineering Student of Third Year/Fifth Semester at Bachelor Level about the basic knowledge in Hydrology and River Engineering and their application in the field of Civil Engineering. The basic knowledge in fluid mechanics is pre-requisite to study this course. This course aims to help the students to know about hydrological phenomena and maintaining hydrological cycle in the nature, which helps to understand and able to solve the problems arise in the civil engineering field. It helps to understand the advance level water resources courses like Water Supply Engineering, Irrigation Engineering, Hydropower Engineering and Hydraulics Structures in subsequent semesters.

Course Objectives:
At the end of this course the students should be able -

- To understand the fundamental terms used in Hydrology and River Engineering.
- To know the applicability of Hydrology in advance water resources related courses.
- To know the water cycle and mass balance in nature
- To know the principle of hydrology and river engineering.
- To know the quantitative and qualitative analysis of hydrological data.
- To know the hydrographs and its uses in real field
- To know the reservoir routine and its importance
- To know the formulation of computer codes for simple problems on the related topics

Specific Objectives and Contents:

Specific Objectives	Contents
➢ To know the concepts in Hydrology ➢ To know the necessity of Hydrology for engineering field ➢ To know Hydrological Cycle and water balance in the world	**Unit 1 . Introduction (3 Hours)** 1.8 Concept of Hydrological Science 1.9 Engineering Application and its scope 1.10 The Hydrological Cycle 1.11 The concept of Hydrological System 1.12 Water Balance Equation 1.13 Development of hydrological study in Nepal
➢ To know Basic Hydro-metrological parameters ➢ To know the the method of finding evaporation and evapo-transpiration	**Unit 2 . Hydro-Metrology(3 Hours)** 2.7 Radiation 2.8 Temperature 2.9 Humidity 2.10 Wind Speed 2.11 Evaporation 2.12 Evapo-transpiration 2.13 Pennman's Equation
➢ To know the basic phenomena of physical hydrology ➢ To know the surface and sub-surface properties of water flow	**Unit 3 . Physical Hydrology(9 Hours)** 3.6 Reynolds Transport Theorem 3.7 Continuity Equations 3.8 Precipitation, its causes, classification and measurement

➢ To know the concept of double mass curve and its application ➢ To know the methods of point rainfall analysis ➢ To know the snow fall and its measurement and contribution to stream discharges	3.9 Rain Gauges, types and errors in measurement 3.10 Double Mass Curve Method of adjustment 3.11 Analysis of point rainfall 3.12 Intensity Duration Curve 3.13 Snow fall and its measurement 3.14 Infiltration and its role in distributing water to ground water 3.15 Interflow and percolation infiltration rate 3.16 Factors affecting infiltration rate and capacity 3.17 Green-Ampt Method 3.18 Ponding Time
➢ To know the measurement of surface runoff ➢ To know the contribution of surface runoff ➢ To know the velocity in a river ➢ To know the catchment characteristics and possible flow contributions ➢ To know the discharge at certain cross sections of a river	**Unit 4 . Surface Runoff(6 Hours)** 4.5 Source of Stream flow 4.6 Rainfall-runoff correlation and rating curves 4.7 Factors affecting runoff from a catchment 4.8 Stream gauging, selection of site and selection of gauges 4.9 Excess rainfall and direct runoff 4.10 Stream flow measurement by the velocity area method 4.11 Flow depth and velocity 4.12 Travel Time 4.13 Current meters, their use and calibration 4.14 Cross-section selection for flow measurement on a river 4.15 Velocity measurement by floats and by surface and subsurface velocity rods 4.16 Scope area method of computing discharge 4.17 Discharge measurement by using notches and weirs 4.18 Stream Networks
➢ To understand the Unit Hydrographs ➢ To know the application of unit hydrographs ➢ To know the peak flow from empirical and rational methods	**Unit 5 . Analysis of Hydrograph (8 Hours)** 5.6 General Hydrologic System Model 5.7 Response Functions of Linear Systems 5.8 Unit hydrographs and their limitations 5.9 Unit HydrographDerivation 5.10 Unit HydrographApplication 5.11 Derivation of unit hydrographs from storms 5.12 Unit Hydrograph for Different Rainfall Durations 5.13 Peak flow estimation using empirical methods 5.14 The rational method and its limitations
➢ To understand the basic hydrologic statistics ➢ To know the Frequency analysis in Hydrology ➢ To be able to fit the suitable distribution for hydrologic data	**Unit 6 . Hydrologic Statistics(6 Hours)** 6.9 Probabilistic Treatment of Hydrologic Data 6.10 Frequency and probability concepts 6.11 Statistical Parameters 6.12 Fitting Probability Distributions 6.13 Frequency analysis and recurrence interval 6.14 Probability Distributions for Hydrologic Variables (Gamma distributions, Student's Distributions, Gumbel's Distribution fitting)
➢ To understand the Ground water hydrology and its importance	**Unit 7 . Ground Water Hydrology(5 Hours)** 7.6 Occurrences and distribution of ground water aquifers, and artesian wells

➢ To be able to test the availability of ground water using well test ➢ To know the contribution of ground water in irrigation of Nepal	7.7 Ground water wells and their types and classifications 7.8 Testing of Well (Using different devices) 7.9 Irrigation development using ground water 7.10 Well hydraulics 7.11 Ground water recharging 7.12 Using of Ground water using pump
➢ To understand the flood hydrology ➢ To know the methods of flood estimation ➢ To know the design flood and its importance	**Unit 8 . Flood Hydrology(5 Hours)** 8.1 Definition, causes and effects of floods 8.2 Hydro-geomorphologic characteristics of rivers 8.3 Estimation of Peak flood 8.4 Design flood and its applicability 8.5 Flood mitigation methods

Note: Students are advised to write the computer codes for simple problems related to above topics where as applicable.

9 Practical : **

After completion of the flowing practical work in the laboratory, students should be able –

- To be familiar with Current-meter
- To be understand the discharge measurement in a river

The following Laboratory works will be performed during the course:

7. Use of current meter in determining flow velocity in the laboratory
8. Discharge measurement of stream, by float method in the field
9. Discharge computation by velocity-area method (Hypothetical and real case)

**** One day field visit will carry to the students to demonstrate the application of current meter to measure the discharge of a typical river**

Evaluation System

External Evaluation	Marks	Internal Evaluation	Weightage	Marks	Practical	Marks
End Semester Examination (Details are given at the end)	60	Assignments	50%	10	Lab Reports	5
		Quizzes				
		Presentation			Field Report	5
		Group work				
		Mid-term Exam	50%	10	Lab Exam	10
Total External	60	Total Internal		20	Total	20

External Evaluation

End Semester Examination

It is a written examination at the end of the semester. The questions will be asked covering all the units as per their allocated lecture duration. Following table shows the question model with full marks.

Full Marks: 100, Pass Marks: 45, Time: 3 hours

Nature of Questions	Total Questions to be asked	Total Questions to be Answered	Total Marks	Weightage	External Exam Marks
All Numerical type Questions	10	10	100	100%	60

Note: Each student must secure at least 45% marks in internal evaluation in order to appear in the end semester examination.
The students unable to secure 45% marks in internal examination, will not be eligible to appear in the End Semester Examination

Internal Evaluation

Assignments

Each Student must submit the assignments individually within specified time.

Quizzes

Pre-informed and surprises quizzes / tests will be taken by the respective subject teachers at least two times within each semester. The students will be evaluated accordingly.

Presentation and Group work

Depending upon the topics taught in the class, respective subject teacher may form the group and ask for group presentation. In this presentation, student performance will be marked accordingly.

Mid-Term Exam / Minor Tests

The midterm written examination will cover all the topics that already taught at the time of examination date. It will be evaluated individually.

Practical Work

All prescribed practical works should be done as per class routine at the well equipped Laboratory. Each Student must submit the Lab report within prescribed time frame. And Lab report will be evaluated individually for marking.

Instruction Techniques

- Lecture and discussions
- Group work and Individual assignments
- Class tutorial
- Assignments at home
- Term paper writing
- Presentation by students
- Case study
- Quizzes
- Guest Lecture

Note: Students are advised not to leave any classes at optimum. If a student does not attend the class/es, it is his/her sole responsibility to carryout self study the topics that taught at his/her absence.

References:

13. Chow, V. T., Maidment, D.R., and Mays, L.W. “Applied Hydrology”, Tata McGraw-Hill Education (P.) Ltd., New Delhi, 2012.
14. Deodhar, M. J., “Elementary Engineering Hydrology”, Pearson Education India, 2008.
15. Eslamian, S., “Handbook of Engineering Hydrology: Environmental Hydrology and Water Management”, CRC Press, Taylor and Francis, 2014.
16. Reddy, P.J. R., “AText Books on Hydrology”,Laxmi Publications, India, 2005.
17. Subramanya, K., “Engineering Hydrology”, Tata McGraw-Hill Publishing Ltd., New Delhi, 2013.
18. UNESCO, “Text Books on Hydrology”, UNESCO, 1970.

Far Western University
Faculty of Engineering
Bachelor of Engineering (Civil)
Course of Study

Course Title: Concrete Technology and Masonry Structures **Credit: 3**
Course Code:CE 368 **Number of lecture/week: 3**
Year/Semester: Third / Sixth **Tutotial/week: 1**
Level: BCE (Bachelor of Civil Engineering) **Lab/week: 2/2**
Total Lectures: 45hrs

Course Introduction

The main aim of this course is to providetheoretical as well as practical information on concrete technology and masonry structures. The first part of the course deals with concrete technology. In this part student will learn properties of ingredients of concrete and will be able to know concrete mix design. The students will also study properties of green and hardened concrete, factors affecting these properties and will learn the tools and techniques of quality control and quality assurance in different stages of their use. The second part deals with Masonry structures and in this part students will learn classification, construction technologies and behavior of masonry structures. The students will be able to analyze and design masonry structures for gravity loads and lateral loads. And at last they able to perform test for concrete as well as masonry works.

Course Objectives

At the end of the course the students should be able to

- Different types of cements and its use, properties of concrete ingredients.
- Structure of concrete, concrete mix design and quality control.
- Properties of green and hardened concrete and its testing including nondestructive tests.
- Factors responsible for concrete durability.
- Classification of masonry, construction technology and behavior of masonry structure under gravity and lateral loads.
- Design of masonry wall for vertical load and lateral load.
- Testing of masonry units and walls.

Course Outline

Specific Objectives	Contents	Duration
	Part A: Concrete Technology	
• Use of concrete and its type. • Properties of concrete ingredients • Types of cement and its use. • Classification of admixture and its use.	**1. Introduction to concrete and concrete materials** 1.1. Use of concrete in structure and types of concrete 1.2. Concrete materials - Role of different materials (Aggregates, Cement, Water and Admixtures) 1.2.1. Aggregates –Types and properties of aggregates and their gradation 1.2.2. Cement - Manufacturing of cement, Compound composition of Portland Cement, Structure and reactivity of compounds 1.2.3. Different types of cements and its use 1.2.4. Use of water in concrete 1.2.5. Admixtures - Classification of admixtures, Uses of admixtures in concrete	4hrs
• Structure of concrete • Concrete structure as three phase system	**2. Structure of concrete** 2.1. Concrete as three phase system 2.2. Structure of aggregate phase 2.3. Structure of the hydrated cement paste phase 2.4. Transition zone in concrete	3hrs

• Properties of concrete • Testing for workability • Quality control at site	**3. Property of green concrete** 3.1. Workability and its test 3.2. W/C ratio in concrete 3.3. Segregation and bleeding 3.4. Batching, Mixing, handling, placing, compaction and curing for quality concrete	3 hrs
• Nominal mix • Mix design	**4. Mix design of concrete** 4.1. Probabilistic concept in mix design approach 4.2. Introduction to nominal mix 4.3. Concrete mix design by DOE, ACI and IS Method	4 hrs
• Properties of hardened concrete • Shrinkage & creep • Fatigue strength • Porosity in concrete • Formation of gel	**5. Properties of hardened concrete** 5.1. Deformation of hardened concrete and Modulus of elasticity 5.2. Shrinkage and creep in concrete 5.3. Strength against fatigue, impact and dynamic loading 5.4. Effect water-cement ratio and aggregate size on porosity 5.5. Effect of gel/space ratio	4 hrs
• Strength and weakness of concrete • Test for different strength • Acceptance criteria • Non destructive test in concrete	**6. Testing of concrete and quality control** 6.1. Various strength of concrete: Tensile, Compressive, Shear and Bond 6.2. Compressive strength test 6.3. Tensile strength test 6.4. Variability of concrete strength and acceptance criteria 6.5. Non-destructing testing of concrete	4 hrs
• Factors affecting durability of concrete • Causes of concrete deterioration	**7. Concrete durability** 7.1. Effect of water and permeability on concrete durability 7.2. Physical and chemical causes of concrete deterioration 7.3. Carbonation and corrosion of steel in concrete 7.4. Concrete in extreme temperatures	3 hrs
Part B: Masonry Structures		
• Use of masonry as structure • Construction technology • Masonry units • Reinforcement in masonry	**8. Introduction to masonry structures** 8.1. Use of masonry structures 8.2. Construction technology - English bond, Flemish bond, Rat-trap bond 8.3. Hollow block and compressed earth block 8.4. Masonry as infill walls 8.5. Reinforced and un-reinforced masonry	4 hrs
• Design of masonry wall for gravity loads	**9. Design of masonry walls for gravity loads** 9.1. Introduction to codal provisions 9.2. Design example for gravity loads Solid wall, wall with openings, walls with eccentric loadings and walls acting as columns	6 hrs
• Performance of masonry wall under lateral loads • Design for lateral loads • Ductility in masonry structure	**10. Masonry structures under lateral loads** 10.1. Performance of masonry structures in lateral loads 10.2. Failure behavior of masonry structures in lateral loads 10.3. In-plane and out-of-plane behavior of masonry structures 10.4. Ductile behavior of reinforced and unreinforced masonry structures 10.5. Calculation of stresses for lateral loads	6 hrs

	10.6. Elements of lateral load resisting system	
• Testing of masonry units • Testing for compressive and shear strength of walls	**11. Testing of masonry elements** 11.1. Compressive strength of bricks and walls 11.2. Diagonal shear test 11.3. Non-destructive tests - Elastic wave tomography, Flat-jack, Push shear test and others	4 hrs

Experments/Laboratory Works

Part I : Concrete Technology

1. Grading and Properties of aggregates
2. Concrete Mix design: Nominal mix, DoE, ACI and IS Method
3. Test of concrete cubes, cylinders, prisms
4. Non-destructive testing

Part II : Masonry Structures

5. Test of bricks on Compression
6. Test of wall on Compression

Demonstration of Non-destructive test

References:

1. A.M. Neville, J.J. Brook, Concrete Technology, International Students' Edition
2. M. S. Shetty, Concrete Technology: Theory and Practice, S. Chand, New Delhi, 2005
3. P.K. Mehta, Paulo j. M. Monteiro, Concrete, Microstructure, Properties and Materials, University of California, Berkley (Indian Edition)
4. A.S. Arya, Masonry and Timber Structures including earthquake resistant Design, Nem Chandra and Bros, Roorkee, 1987
5. A.W. handry, B.P. Sinha, S.R. Davies, An Introduction to Load Bearing Brick Design, University of Edinburgh, 1981
6. P. Dayaratnam, Brick and Reifnorced Brick Structures, Oxford and IBH Publishing Co. Pvt. Ltd. 1987
7. Ns 511:2060, NS 512 :2060, NS 513:2060, NS 516:2060 andNS 517:2060 OR Related NBC
8. IS 456:2000,IS 383:1970 (Reaffirmed 1997), IS 516:1959 (Reaffirmed 1999), IS 1905:1987 (Reaffirmed 2002), IS 4326:1993 (Reaffirmed 2003),IS 2212:1991 (Reaffirmed 2005)
9. SP 20:1991 and SP 23:1982

Far Western University
Faculty of Engineering
Bachelor of Engineering (Civil)
Course of Study

Course Title: Airport and Railway Engineering **Credit: 3**
Course Code::CE 365 **Number of lecture/week:3**
Year/Semester: Third/Sixth **Tutorial/week: 1**
Level: Bachelor of Engineering (Civil) **Total hours: 45**

Course Introduction:

The main aim of this course is to provide a basic knowledge to the students to understand the fundamentals of Airport and Railway Engineering.At the end of this course, students will be able to design the basic elements of railway and airport engineering.

Course Objectives:

At the end of this course the student should be able to:

- understand the basic knowledge of railway and airport engineering.
- Be able to design the basic elements of railway and airport.

Specific Objectives and Contents:

Specific Objectives	Contents
• Understand transportation system components • Differentiate railway and airport engineering from highway engineering • Know the scope of railway and airport engineering	**UNIT 23. Introduction to railway and airport engineering (4 hours)** 1.1 Introduction to Transportation System 1.2 Scope of Railway Engineering 1.3 Scope of Airport Engineering
• Know the basic terminology of railway engineering • Recognize the components of railway and its requirements	**UNIT 24. Railway Engineering (8hours)** 2.1 Gauges 2.2 Problems with multigauge system 2.3 Permanent way 2.4 Wheels and Axles 2.5 Track resistance, Hauling capacity, Stresses in tracks and its components 2.6 Rails, creep in rails, failures in rails 2.7 Sleepers, Ballast, Fastenings
• Understand basic design elements of railway track • Design the basic components of geometrics of railway track • Know the state of the art technology used at present in railway engineering	**UNIT 25. Geometric Design of Railway Track (12hours)** g. Railway track alignment h. Horizontal curves and superelevation i. Safe speed j. Transition curve and extrawidening k. Gradient and vertical curves l. Turnouts and its design, crossings, junctions m. Signals n. Trains control system o. Advancement in railway technology

• Understand the importance of air transportation • Know the concerned organizations and their scope	**UNIT 26. Introduction to Airport Engineering (2hours)** 4.1 Introduction to air transport 4.2 Organizations invoved in air transport (national and international) and their functions
• Know the basic elements of airport and aircrafts • Design the fundamental geometric elements of airport • Know the details of elements for airport planning and site selection • Understand the design concept of airport pavement	**UNIT 27. Airport Engineering (19hours)** 5.1 Airport classification 5.2 Aircraft characteristics 5.3 Aircraft controls, airport site selection, obstructions 5.4 Runway orientation, length, geometric 5.5 Taxiway 5.6 Aprons and aircraft parking 5.7 Terminal area and building 5.8 Hangers 5.9 Visual aids-markings, signals and signage 5.10 Airport pavement

Prescribed Text:

- Satish Chandra, M.M. Agarwal, Railway Engineering, Second Edition, Oxford University Press.
- Norman Ashford, Paul H. Wright (2003), Airport Engineering, Third Edition, John Willey and Sons

Far Western University
Faculty of Engineering
Bachelor of Engineering (Civil)
Course of Study

Course Title: Sanitary and Environmental Engineering **Credit: 3**
Course Code: CE364 **Number of lecture/week: 3**
Year/Semester: Third / Sixth **Tutorial/week:**
Level: BCE (Bachelor of Civil Engineering) **Total Lectures: 45hrs**

Course Introduction

The main aim of this course is to provide a basic knowledge to the students to understand the fundamentals of the sanitary and environmental engineering. The students will also study relationship of sanitary system and environment, fundamental principle of wastewater, quantification, quality assess and safe waste collection and disposal. The course covers the basic definition of terminology and design principle. The students will be able to analyze and design the different component of sanitary engineering and treatment works.

Course Objectives

At the end of this course the student should be able to:

- Understand sanitary system and functions of the various components, knowledge of wastewater on collection, conveyance, treatment, safe disposal, methods and design consideration.
- Have knowledge about rural sanitation, sludge management and introduction of solid waste management.

Course Outline

Specific Objectives	Contents	Duration in hours
· Introduction to fundamental of terms · Importance of environmental and sanitary engineering · Introduction of sanitation and sewerage system	**Unit 1. Introduction to sanitary and environmental engineering**	**2**
	1.1. The impact of humans upon the environment and the impact of the environment upon humans	
	1.2. Definitions of common terms -Sewage/Wastewater, Domestic sewage, industrial sewage, Sanitary sewage, Storm water, Sullage, Sewer, Sewerage, Rubbish, Garbage, Refuse/Solid waste, environment , pollution	
	1.3. Importance of Wastewater and Solid Waste Management	
	1.4. Wastewater and Solid waste management methods Collection, Conveyance, Treatment and Disposal	
	1.5. Objectives of sewage disposal	
	1.6. Sanitation systems	
	1.6.1. Conservancy system with merits and demerits	
	1.6.2. Water carriage system with merits and demerits	
	1.7. Sewerage systems and types	
	1.7.1. Separate system	
	1.7.2. Combined system	
	1.7.3. Partially separate system	
	1.7.4. Comparison between separate and combined systems	
	1.8. Role of environmental Engineer	
· Knowledge to quantity estimation, role of rainfall in	**Unit 2. Quantity Estimation of Wastewater**	**3**
	2.1. Dry Weather Flow (DWF) and Wet Weather Flow (WWF)	
	2.2. Sources of sanitary sewage	
	2.2.1. Private and public water supplies	

Specific Objectives	Contents	Duration in hours
quantity and other influence factors · Numerical exercise	2.2.2. Groundwater infiltration	
	2.2.3. Unauthorized connections	
	2.3. Factors affecting quantity of sanitary sewage	
	2.3.1. Population , rate of water supply, Groundwater infiltration ,Unauthorized connections	
	2.4. Determination of quantity of sanitary sewage, peak factor, peak flow	
	2.5. Different method of Determination of quantity of storm water	
	2.5.1. Rational method and its limitation, Overall runoff coefficient, British ministry of Health formula for intensity 0f rainfall , Time of concentration	
	2.5.2. Numerical exercise on determination of quantity of wastewater for separate combined and partially separate systems	
· Knowledge to design of sewer, sewer material and construction procedure · Numerical exercise	**Unit 3. Design and Construction of Sewers**	**4**
	3.1. Criteria for sewer design	
	3.1.1. Necessary terms and terminology for design: Specific gravity of wastewater , Design period Minimum and Maximum velocities, Self-cleansing velocity ,Sewer size range, Sewer gradient, Hydraulic formulae for design Manning's, Chezy's and Hazen Williams formulae , Hydraulic elements of sewers for partial flow condition, Partial flow diagrams	
	3.2. Shapes of sewers : Circular and non-circular sections with merits and demerits	
	3.3. Common materials use for sewer : Requirements of sewer materials , Types of sewer materials salt glazed stoneware, cement concrete, cast iron	
	3.4. Design of sewers of separate and combined systems ,Numerical exercises on design of sewers	
	3.5. Construction of sewers	
	3.5.1. Setting out, Alignment and gradient fixing, Excavation method of trench, Timbering of trench, Dewatering of trench, Laying and jointing, Testing of sewer Straightness, Obstruction , air tightness and water test, Steps of Backfilling of trench	
· Knowledge about appurtenances and material use and construction	**Unit 4. Sewer Appurtenances**	**3**
	4.1. Necessity of sewer appurtenances 4 2 Construction of sewer appurtenances	
	4.2. Main sewer appurtenances construction	
	4.2.1. Manhole ,Drop manhole, Lamp hole ,Street inlets, Catch basin, Flushing device , Sand, grease and oil traps , Inverted siphon, Sewer outlet	

Specific Objectives	Contents	Duration in hours
· Knowledge of wastewater examination, sampling collection, characteristics of wastewater, and concept of BOD, COD etc.	**Unit 5. Examination of waste water**	**5**
	5.1. Characteristics of wastewater :	
	5.1.1. Physical Characteristics (colour, temperature, odour, turbidity}	
	5.1.2. Chemical Characteristics {pH, organic and inorganic solids, nitrogenous compounds}	
	5.1.3. Biological Characteristics { Bacteria}	
	5.2. Sampling of wastewater	
	5.2.1. Grab and composite samples, Preservation and storing,	
	5.3. Decomposition of wastewater-process,	
	5.3.1. Aerobic and anaerobic decomposition, Stale sewage , Biochemical Oxygen Demand (BOD) ,Definition of BOD and its significance, Derivation of BOD equation, Rate reaction, ultimate BOD and relation with temperature, Numerical on BOD, Chemical oxygen Demand (COD) Definition and significance , Examination of wastewater ,Necessity of wastewater examination, Examination of volatile, fixed and total solids, settleable and non-settleable solids, BOD with and without dilution, COD, Numerical on BOD test	
· Knowledge about safe waste water disposal, its necessity and safe disposal methods. natural purification theory of river	**Unit 6. Wastewater Disposal**	**5**
	6.1. Necessity and objectives of wastewater disposal	
	6.2. Wastewater disposal methods Dilution and Land treatment	
	6.3. Wastewater disposal by Dilution process and essential condition for dilution	
	6.4. Self-purification of rivers and streams	
	6.5. Factors affecting self-purification Dilution, Current Sunlight Sedimentation, Temperature, Oxidation, Reduction,	
	6.6. Oxygen sag curve, introduction of Streeter Phelp‘s equation (Derivation not required), Numerical on self-purification of rivers/stream	
	6.7. Wastewater disposal by land treatment	
	6.7.1. Suitability of land treatment,	
	6.7.2. Methods of land treatment -irrigation, overland flow and rapid infiltration, Broad irrigation and sewage farming, Methods of application of sewage on land flooding, surface irrigation, ridge and furrow method, subsurface irrigation and spray irrigation,	
	6.7.3. Sewage sickness and its prevention	
· Knowledge about treatment objectives and different types. · Design	**Unit 7. Wastewater Treatment Method**	**12**
	7.1. Objectives of wastewater treatment	
	7.2. Treatment process types and impurity removal	
	7.3. Primary treatment process	
	7.3.1. Racks and Screens purpose and types	

Specific Objectives	Contents	Duration in hours
consideration of different treatment process	7.3.2. Skimming tank purpose and construction	
	7.3.3. Grit chamber ~ purpose, construction and design criteria	
	7.3.4. Sedimentation purpose, types and design criteria	
	7.3.5. Chemical precipitation purpose, mixing and flocculation (introduction only)	
	7.3.6. Numerical on design of Grit chamber and Sedimentation tank	
	7.4. Biological (Secondary) treatment process	
	7.4.1. Objectives of biological treatment process, Principles of biological treatment process, Attached and Suspended growth processes, Types of biological treatment process	
	7.5. Sewage filtration	
	7.5.1. Filter types	
	7.5.2. Intermittent sand filter purpose, construction, working and cleaning with merits and demerits	
	7.5.3. Contact bed purpose, construction, Working and cleaning with merits and demerits	
	7.5.4. Trickling filter purpose, construction, working and cleaning with merits and demerits, types, design criteria, Numerical on design of trickling filters	
	7.5.5. Activated sludge process	
	7.5.5.1. Principles of activated sludge process, Construction and process description, Aeration methods, Design criteria, Advantages and disadvantages, Sludge volume index, Numerical on activated sludge process	
	7.5.6. Oxidation ponds	
	7.5.6.1. Purpose of oxidation ponds,Theory of oxidation ponds, Construction of oxidation ponds, Commissioning, Operation and maintenance, Advantages and disadvantages, Design criteria, Numerical on oxidation ponds	
· Know about sludge and its ultimate disposal methods · Design consideration	**Unit 8. Sludge Treatment and Disposal**	**4**
	8.1. Sources of sludge, Necessity of sludge treatment, Characteristics of sludge, Determination of sludge volume, Volume - Moisture relation	
	8.2. Sludge treatment methods	
	8.2.1. Grinding and blending, Thickening ,Gravity thickener, purpose, construction and loading criteria, Digestion Aerobic and anaerobic digestion, digestion process, control of digestion, construction and design criteria of digester, Dewatering Vacuum filtration (purpose and construction), Drying Sludge drying beds (purpose and construction) Composting ~ purpose, principles, types (windrow and mechanical) incineration purpose and construction	

Specific Objectives	Contents	Duration in hours
	8.3. Numerical on sludge volume determination and design of digester	
	8.4. Sludge disposal methods	
	8.4.1. Dumping, Land filling, Lagooning, Spreading on land	
· Knowledge about, onsite sanitation, using it in emergency, disposal of sewage from isolated building Concept of rural sanitation, Eco sanitation, pit latrine · Design consideration	**Unit 9. Disposal of Sewage from Isolated Buildings**	**4**
	9.1. Necessity	
	9.2. Introduction of Rural sanitation	
	9.3. House Drainage , general principles , Pipes and Traps, classification of traps , introduction to system of plumbing	
	9.4. On site sanitation Definition and types, concept of using it in disaster (emergency)	
	9.5. Pit privy purpose and construction	
	9.6. Ventilated Improved Pit (VIP) latrine purpose, construction, design criteria, types (single pit, double pits and multiple pits), advantages and disadvantages	
	9.7. Pour flush latrine purpose, construction and design criteria	
	9.8. Septic tank purpose, construction, design criteria, working and maintenance	
	9.9. Septic tank effluent disposal methods	
	9.9.1. Drain field - purpose, construction and design criteria	
	9.9.2. Soak pit ~ purpose, construction and design criteria	
	9.9.3. Evapotranspiration mound ~ purpose and construction	
	9.9.4. Leaching cesspool purpose and construction	
	9.10.Numerical on design of VlP latrine, Pour flush latrine, Septic tank, Drain field and Soak pit	
	9.11.Introduction to Concept of Eco sanitation, concept of reuse of wastewater	
	9.12.Introduction to constructed wetland	
· Knowledge of Introduction to solid waste and safe disposal · Know about different component and its ultimate disposal methods	**Unit 10. Solid Waste Disposal**	**3**
	10.1.Introduction of solid waste ,Characteristic of solid waste	
	10.2.Quantity of solid waste	
	10.3.Collection and transportation of solid waste	
	10.4.Solid waste disposal methods	
	10.4.1. Dumping, Sanitary landfill, Incineration, Composting	

References

1. B. C. Punmia and Ashok lain, "Wastewater Engineering", Laxml Publications (P) Ltd., and New Delhi.
2. P N. Modi, "Sewage Treatment & Disposal and Wastewater Engineering", standard Book House, Delhi.
3. G S Birdie and J S, Birdie, "Water Supply and Sanitary Engineering", DhanpatRai Publishing Company (P) Ltd" New Delhi.
4. KN. Duggal, "Elements of Environmental Engineering Ltd., New Delhi. S Chand and Company
5. Howard S. Peavy,Donald R. Rowe and George Tchobanoglous, "Environmental Engineering" McGRAW-Hill International Edition .

Far Western University
Faculty of Engineering
Bachelor of Engineering (Civil)
Course of Study

Course Title : **Irrigation Engineering** Credit : 3
Course No :CE362 Number of Hours per week : (2+1)
Nature of the Course : Theory + Tutorial Total Hours : 45
Practical : 1.5 / 2 Hour each week Level : Bachelor of Engineering (Civil)
Year : Third , Semester : Sixth

Course Introduction:

This course is advance course for Bachelor students. Before teaching this course, students should know the basic knowledge in fluid mechanics and hydraulics engineering. This course aimed to deliver the knowledge to the Civil Engineering Student of Third Year Second Part at Bachelor Level about the application of fluid mechanics, hydraulics engineering and hydrology inducing its own fundamental understanding. This course aims to deliver the knowledge to the students for demand analysis, planning, design, operation and maintenance of irrigation structures and its system components.

Course Objectives:

At the end of this course the students should be able -

- To understand the fundamental terms used in Irrigation Engineering.
- To know the behavior of Irrigation Engineering.
- To know the problems arise in Irrigation Engineering.
- To know the Overall design in irrigation Engineering (Design of individual components in irrigation engineering).

Specific Objectives and Contents:

Specific Objectives	Contents
➢ To know the concepts of irrigationengineering ➢ To know thenational cropping pattern ➢ To know the irrigation methods (current practice and possible extension in future)	**Unit 1. Introduction (3 Hour)** 1.14 History of Irrigation Engineering 1.15 Scope and advantages and disadvantages of irrigation 1.16 Cropping pattern in Nepal and cropping intensity 1.17 Command areas and Irrigation intensity 1.18 Field irrigation methods and their uses 1.19 Planning of irrigation projects
➢ To know the irrigation functions ➢ To know the terms duty, delta and cropping period and their relation and understanding ➢ To know the methods of irrigation water requirement ➢ To know the canal discharge necessary for irrigation	**Unit 2 .Crop Water Requirements(5 Hours)** 2.14 Functions of irrigation water 2.15 Duty, Delta and Crop periods 2.16 Factor affecting duty 2.17 Penman's Methods of crop water estimation 2.18 Soil-moisture-irrigation relationship 2.19 Consumptive use of Water (Evapo-Transpiration) and effective rainfall 2.20 Irrigation efficiencies and soil fertility 2.21 Discharge requirement in irrigation canals
➢ To know the irrigation by canals ➢ To know the types of canals use in irrigation ➢ To know the necessity of different types of canals	**Unit 3 .Canal Irrigation System (3 Hours)** 3.19 Principle of Canal irrigation 3.20 Classification of canals and their components 3.21 Alignment of different canals 3.22 Alluvial and non-alluvial canals 3.23 Necessity of main and branch canals
➢ To know the canal capacity use for irrigation ➢ To know the canal design principles and stability ➢ To know the canal design theory ➢ To know the economical canals use for irrigation	**Unit 4 .Design of Canals(6 Hours)** 4.19 Design of Canal Capacity 4.20 Sediment transport in canals 4.21 Tractive force approach of canal design 4.22 Design of stable canal 4.23 Design of Alluvial canals (Kennedy's and Lacey's Theory) 4.24 Design of lined canals with economical analysis
➢ To fix the position of irrigation headwork ➢ To know the headwork and its scope ➢ To understand the strength of headwork ➢ To be able to design the weir, and silt related structures	**Unit 5 .Diversion Head works (7 Hours)** 5.15 Necessity of Headwork and its location in irrigation 5.16 Weir/ Barrage with components with details 5.17 Causes of failure of weirs and their remedies 5.18 Seepage theory (Bligh's, Lane's and Khosla's theory) 5.19 Design of sloping glacis weir (crest, length and thickness of bed) 5.20 Design of Head Regulator, devide wall and fish lader 5.21 Design of under-sluice and silt excluder

Specific Objectives	Contents
	5.22 Design of silt ejector
➢ To understand the canal and off taking canals ➢ To know functions of regulating structures and its design ➢ To know the outlet and escape and its design principles ➢ To know the drops and its importance	**Unit 6 .Water Regulating Structures(6Hours)** 6.15 Difference between main canal and off-taking canals 6.16 Alignment of off-taking canals 6.17 Functions of regulating structures: Head regulator, Cross regulator, Outlet, Drop and Escapes 6.18 Design of Regulating structures and escapes (crest, length and thickness of floor) 6.19 Types of outlet and design of pipe outlet (free and submerged) 6.20 Types of drop, Design of vertical drop (crest, length and thickness of floor)
➢ To understand the cross drainage structures and its importance ➢ To be able to design the cross drainage structures	**Unit 7 .Cross Drainage Structures(4 Hours)** 7.13 Introduction of cross-drainage structures 7.14 Types of cross-drainage structures with drawing 7.15 Selection of cross-drainage structures 7.16 Design of Aqueducts and Syphon aqueducts (Detail drawing, drainage water way, barrel, canal water way, and transition, length and thickness of floor bed)
➢ To understand the basic of river engineering ➢ To know the nature of river flow path ➢ To now the river training works and its necessity in irrigation ➢ To be able to design the river training structures like Guide bunds, spurs etc.	**Unit 8 .River Engineering and River Training (4 Hours)** 9.1 Classification of River 9.2 Meandering and its causes 9.3 General features of meandering 9.4 River training and its necessity 9.5 Types of River training 9.6 Design of Guide bunds and launching apron 9.7 Design of Spurs (layout, length, spacing and cross section)
➢ To understand the drainage engineering ➢ To know water logging problems and its remedies ➢ To be able to design the surface and sub-surface drainage structures	**Unit 9 .Draining Engineering (5Hours)** 9.1 Introduction of Drainage engineering 9.2 Water logging in irrigation areas and importance of drainage 9.3 Causes, effects and preventative measures of Water logging 9.4 Surface design system and their design (layout of drainage, internal and external drainage, slope and cross section of drainage, re-structuring of existing drainage to improve for better drainage) 9.5 Sub-surface design system and their design (layout of drainage, slope and cross section of drainage)
➢ To understand the irrigation system ➢ To know the organization structure of irrigation ➢ To know the hill irrigation and its importance in Nepal	**Unit 10 .Planning of Irrigation System (2 Hours)** 10.1 Irrigation engineering systems planning 10.2 Irrigation Engineering system organization and management 10.3 Development of Small Irrigation projects 10.4 Introduction to Hill Irrigation

8 Practical / Tutorials :

The following Laboratory works or Tutorials will be performed during the course. If possible, practical work should be carried out in fully equipped laboratory, if not, concepts should be given through suitable tutorial works.

1 Exercise on Duty, Delta and Crop period
2 Exercise on crop water requirement
3 Exercise on soil-moisture-irrigation relation with irrigation interval
4 Exercise on economical canal design
5 Exercise on stable canal design and lined canal design
6 Exercise on design of Guide bunds and launching apron
7 Exercise on Khosla's theory for design of hydraulic structures
8 Exercise on design of sloping glacies weir bay
9 Exercise on Cross and head regulator design
10 Exercise on design of pipe outlet, vertical drop, siphon aqueduct
11 Exercise on surface and sub-surface drain design

9 Field Visit :

Two day field visit should be carried out to the students in suitable irrigation field.

After the field visit, students should submit the field visit report which includes:

1 Irrigation water requirement using CROPWAT software
2 Detail report of field visit study should be prepared individually and group presentation at the end

Instruction Techniques

- Lecture and discussions
- Group work and Individual assignments
- Class tutorial
- Assignments at home
- Term paper writing
- Presentation by students
- Case study
- Quizzes
- Guest Lecture

Note: Students are advised not to leave any classes at optimum. If a student does not attend the class/s, it is his/her sole responsibility to carryout self study the topics that taught at his/her absence.

References:

19. Garg, S. K., “Irrigation Engineering and Hydraulic Structures”, Khanna Publication, New Delhi, 2016.
20. Novak, P., Moffat, A.I.B, Nalluri, C., and Narayan, R. , “Hydraulic Structures”, Taylor and Francis, 2014.
21. PDSP, “Design manual for Irrigation Projects in Nepal”, PDSP, 1990.
22. Punmia, B. C. and Lal, P. B.B., Jain, A.K. and jain A.K. “Irrigation and Water Power Engineering”, Laxmi Publications, Delh , 2009.
23. Singh, B., “Fundamentals of Irrigation Engineering”, Nem Chand and Bros ,Rorkee, 1983.
24. Singh, G., “Irriagation Engineering”, Standard Book House, 2010.
25. Varshney, R. S., Gupta, S. C. and Gupta, R. L., “Theory and Design of Irrigation Structures Vol. I and II”, Nem Chand & Bros, Roorkee, 1979.
26. WECS, “Design Guidelines for Surface Irrigation in Terai and Hills in Nepal”, Vol I and II, WECS, Kathmandu, 1988.

Far Western University
Faculty of Engineering
Bachelor of Engineering (Civil)
Course of Study

Course Title: Design of Steel and Timber Structure
Course Code: CE 363
Year/Semester: III/VI
Level: Bachelor of Engineering (Civil)

Number of lecture/ week: 4
Tutorial/ week: 2hrs
Total Lectures: 58hrs

Course Introduction

It is assumed that completion of this course student can design and supervise construct of general steel structures. They can design simple bolted/riveted and welded connections, flexure members, tension members, compression members and roof trusses. They also get the brief knowledge about timbers and timber structures.

Course Objectives

At the end of the course the students should be able to

- identify the steel and timber material behavior
- design and supervise of simple steel and timber structure; flexure members, tension members, compression members and roof trusses along with joints

Course Outline

Specific Objectives	Contents	Duration
Scope of the subject, Steel types, properties and use, Design philosophy and analysis	**Chapter 1: Introduction** • Types and properties of structural steels: standard quality, general structural steel, high tensile structural steel, grade designation, chemical composition, physical properties, mechanical properties • Use of steel as a structural member: Rolled steel sections, built-up sections • Stress-strain characteristics of structural steels: yield stress, ultimate stress, percentage elongation • Types of steel structures: Buildings, bridges, tower etc. • Method of Analysis and Design • Method of design, Design considerations, Simple design, semi-rigid design, fully rigid design & experimentally based design • Codes of practices and load combinations	4hrs
Basic design philosophy and application of working stress method	**Chapter 2: Working Stress Design Method** • Basic Assumptions in Working Stress Design • Service Load and Permissible Stresses • Design in Tension, Compression, Bending and Shear	2hrs
Basic design philosophy and application of working stress method	**Chapter 3: Limit State Design Method** • Safety and Serviceability Requirements of Structure • Different Limit States for Steel Design • Design Strength of Materials and Design Loads	3hrs

Specific Objectives	Contents	Duration
	• Limit State of Strength • Limit State of Serviceability	
Basic principles and design of joints	**Chapter 4: Connections in Steel Structures** o Types of Connections o Welded Connections ▪ Welds and welding ▪ Design of simple welded connections ▪ Design of eccentric welded connections o Bolted Connections ▪ Bolts and bolting ▪ Design of simple bolted connections ▪ Design of eccentric bolted connections ▪ Introduction and design of Riveted Connection	10hrs
Basic principles and design of tension member	**Chapter 5: Tension Members** • Types of Tension Members • Sectional Area of Tension Membe • Design of Tension Members of Simple and Built-Up Section • Design of Lug Angle • Tension Splice	4hrs
Basic principles and design of compression member and its base, Basic design on joint of beam section	**Chapter 6: Compression Members** o Types and typical cross-section of compression member: column, stanchion, strut, standard section, built-up section o Buckling Behavior of Column - End conditions, effective length, slenderness ration and permissible stresses: Euler formula, Gordon-Rankine Formula o Strength of axially loaded compression member o Design of Column of Simple and Built-Up Section o Design of Lateral Bracing of Compression Member o Design of Eccentrically Loaded Column o Compression member subjected to bending. o Design of Column Bases ▪ Axially loaded column bases ▪ Eccentrically loaded column bases o Design of Column Splices	10hrs
Basic principles and design of flexure member and elements	**Chapter 7: Flexure Members** • Types of Beams • Design of Simple Beam -Effective span of beam, effective length of compression flange, allowable stresses in bending, bearing and shear. o Design of laterally supported beams& laterally	13hrs

Specific Objectives	Contents	Duration
	unsupported beams: standard section, symmetrically built-up section and unsymmetrical built-up sections. o Design of Plate Girder ▪ Element of plate girders ▪ Preliminary design ▪ Design for bending, shear, deflection and lateral stability ▪ Curtailment of plate ▪ Design of beam end connection: framed connection and seated connection ▪ Design of web and flange splice	
Wind load and codal provision, Basic principles and design of roof truss and member	**Chapter 8: Design of Roof Trusses** • Types of Roof Truss and Components of Roof Truss • Basic wind speed, design wind speed, design wind pressure and wind load • External and internal wind pressure for slope roof, dead load and imposed load on roof, self weight of purlins, roof truss and wind bracing. • Loads on Roof Truss • Design of Roof Components - purlins: angular section, tubular section and I-sections • Design of angular and tubular truss members: strut, rafter and tie.	4hrs
Scope of the subject, Timber types, properties and use Design philosophy and analysis	**Chapter 9: Timber Structures and Design Methods** • Introduction to Timber Structures • Timber types and properties • Structural Timber and Factors Affecting the Strength of Timber • Design Methods and Basis for Design	2 hrs
Basic principles and design of different types of joints	**Chapter 10:Joints in Timber Structures** • 10.1. Types of Joints • 10.2. Design of Bolted Joints • 10.3. Design of Nailed Joints	2 hrs
Basic principles and design of compression and elements, Design of column base	**Chapter 11: Design of Timber Compression Members** • 11.1. Types of Timber Columns • 11.2. Design of Timber Column • 11.3. Introduction to Column Bases	3 hrs
Basic principles and design of flexure, member	**Chapter 12: Design of Timber Flexure Member** • Types of Beams	3 hrs

Specific Objectives	Contents	Duration
and elements	• Design of Timber and Flitched Beam	
Project work	**Course Project:** A Course Project on integrated design of a simple building structure	

Reference Materials:

1. "Limit State Design of Steel Structures" S.K. Duggal Tata McGraw-Hill Publishing Com.
2. "Design of Steel Structures" K.S. Sai Ram, PEARSON Education
3. "Design of Steel Structures" L.S. Negi, Tata McGraw-Hill Publishing Com.
4. "Design of Steel Structures" Ram Chandra, Standard Book House

Far Western University
Faculty of Engineering
Bachelor of Engineering (Civil)
Course of Study

Course Title: **Estimation, Costing and Valuation**	Credit: 3
Course Code.: CE 366	Number of lecture/week: 3
Nature of the Course: Theory	Tutorial/week: 1
Year/Semester: Third/Sixth	Total hours: 60

Course Introduction:

The course is aimed to provide the basic knowledge of Estimation, Costing and Valuation of civil engineering works.

Course Objectives:

At the end of this course the student should be able:

- To understand the fundamentals of estimation, costing and valuation of civil engineering works.
- To estimate the quantities of item of works involved in buildings, water supply and sanitary works, road works and irrigation works,
- To do rate analysis of different items of work.
- To estimate the cost of various construction work.
- To do valuation of properties and preparation of reports for estimation of various items.

Specific Objectives and Contents:

Specific Objectives	Contents
• Understand the purpose of estimating, estimated cost and actual cost. • Understand the principle of units, measurement and payment of items of works.	**Unit 1. Introduction (3 Hours)** 1.1 Definition. 1.2 Purpose of estimating. 1.3 System of units. 1.4 Principle of units, measurement and payment for various items of works and materials.
• Know to estimate various types of estimate. •	**Unit 2. Types of Estimate(5 Hours)** 3.1 Approximate estimate 3.2 Detailed estimate 3.3 Revised estimate 3.4 Supplementary estimate 3.5 Annual repair and maintenance estimate 3.6Complete estimate 3.7Split up of cost of building and road works, water supply and sanitary works.
• Understand the purpose, importance, and requirement of analysis of rate. • Understand the factors affecting	**Unit 3. Analysis of Rates (10 Hours)** 4.1 Introduction 4.2 Purpose analysis of rate 4.3 Importance analysis of rate

analysis of rate. • Know the factors affecting the analysis of rate. • Be able to prepare analysis of rate for building works, road works, irrigation works, water supply and sanitary works.	4.4 Requirement analysis of rate 4.5 Factors affecting the analysis of rate 4.6 Method of preparing analysis of rate for 4.6.1 Building works 4.6.2 Road works 4.6.3 Irrigation works 4.6.4 Water supply and Sanitary works
• Be able to estimate building, road, irrigation, water supply and sanitary works. • Be able to estimate joineries for panelled and glazed doors, windows, ventilators, handrails etc. • Be able to estimate Slab culvert, Retaining wall, Septic tank and Soak pit.	**Unit 4. Detailed Estimate (20 Hours)** 5.1 Estimate of two storied building: Calculation of quantities of Brick work, PCC, RCC, Plastering, Colouring, Painting, and Varnishing of flat and sloped roof. 5.2 Estimate of road works, irrigation works, water supply and sanitary works. 5.3 Estimate of joineries for panelled and glazed doors, windows, ventilators, handrails etc. 5.4 Estimate of Slab culvert, Retaining wall. 5.5 Estimate of Septic tank and Soak pit.
• Be able to understand and make valuation of property. • Be able to write a report of valuation of property.	**Unit 5. Valuation(7 Hours)** 6.1 Introduction. 6.2 Purpose of valuation. 6.3 Terms used in valuation:Capitalised value, Depreciation, Rent, Mortgage, and Lease. 6.4Methods of determining value of property: Land and building. 6.5Report writing method of valuation.
• Be able to estimate building, road, irrigation, water supply and sanitary works. • Be able to estimate Retaining wall, Slab culvert, Aqueduct, Septic tank and Soak pit.	**Unit 6. Tutorial. (15 Hours)** 7.1 Estimate of a two room building. 7.2 Estimate of a double storied residential building. 7.3 Estimate of a portion of hill road. 7.4 Estimate of a Retaining wall. 7.5 Estimate of a RCC slab culvert. 7.6 Estimate of an aqueduct. 7.7 Estimate of septic tank and soak pit.

Prescribed Text:

1. Amarjit Aggarwal, "Civil Estimating Quantity Surveying and Valuation",Katson Publishing House, Ludhiana.

References:

1. M. Chakraborti,"Estimating, Costing, Specification and Valuation"
2. B. N. Dutta, "Estimating and Costingin Civil Engineering", UBS Publishers & Distributors P. Ltd.
3. G.S. Berdie, "Text book of Estimating and Costing"

Far Western University
Faculty of Engineering
Bachelor of Engineering (Civil)
Course of Study

Course Title: Seminar **Credit: 1**
Course Code: CE367 **Number of lecture/week:1**
Year/Semester: Third/Sixth **Total hours: 15**
Level: Bachelor of Engineering (Civil)

Course Introduction:

This course is aimed at teaching students about the preparation of seminar on the relevant topics of their interest in Civil Engineering.

Course Objectives:

At the end of this course the student should be able to:

- Conduct critical analysis on the relevant topics of their interest
- Develop presentation and communication skills in both oral and written form
- Enhance writing techniques and prepare report on the relevant topics of their interest.

Specific Objectives and Contents:

Specific Objectives	Contents
To highlight on significance of seminar, and different techniques used in conducting critical analysis and research activities and writing reports on the relevant topics of Students' interest in Civil Engineering	Introduction to Seminar; Significance of Research in Civil Engineering; Different Techniques and Skills of Presentation and Writing the Report on relevant topics **(3 hrs)**
To enhance writing and presentation skills of students, provide them appropriate feedbacks to improve their verbal skills, and make them able to face experts and large mass of audience.	Selection of relevant topics of student's interest; Preparation of reports; Presentation of relevant topics in front of subject experts and large mass of audiences; and Providing feedbacks to students about their presentation and report writing skills **(12 Hrs)**

Marks Distribution:

1) Student's attendance, class performance, participation in seminar discussion and learning attitudes=40%

2) Report Writing, Final Presentation, and Critical Analysis on the relevant topic of student's interest=60%

(Each student should present his/her research work/report verbally, and attend all the seminar presentation series by students)

Far Western University
Faculty of Engineering
Bachelor of Engineering (Civil)
Course of Study

Course Title: **Minor Project**	Credit: 2
Course Code.:CE 475	Number of lecture/week: 2
Nature of the Course: Consulted and supervise	Tutorial/week:
Year/Semester: Fourth/Seventh	Total hours: 30

Course Introduction:

The course is aimed to provide the basic knowledge of design, research or experiment in any civil engineering project. The project design and comprehensive knowledge is to provide a concept to choose a project title and area. It is a practical application of civil engineering discipline in real life. The whole project work process will be dependant on student or group of students choice, imagination and their own concept. But there is a close supervision and guidance of appropriate member / members of faculties to each student /group. The project gives an opportunity to the students to discuss and tack leany civil engineering problems. A project may be design type, dissertation type or lab experimental type. Finally a student requires to submit a project report and oral presentation of project.

Course Objectives:

At the end of this course the student should be able to understand the fundamentals of projects design: student should be

- Able to prepare a design for an extensive civil engineering project.
- Able to prepare dissertation type project , literature survey and review literature and correlation of existing knowledge
- Able to identify the problem, issues, questions and investigation through laboratory type experimental setup
- The minor project will be followed by major project in next VIII semester and students shall carry out following tasks in Minor Project

Specific Objectives and Contents:

Specific Objectives	Contents
• Understand the project and describe about the project • Knowledge of study area selection • Idea of literature survey and review • Idea of Formulatation of methodology of study • Know how the technique of data collection • Know how nd enhance the skill of report preparation , report writing and presentation of output • Undersatand Technique of Plotting / Drawing	**UNIT 1. Design type Project (30 Hours)** 1.1 Background of Project 1.2 Detail Explanation of Project 1.3 Project study area 1.4 Literature review/ Guidelines, norms, standards 1.5 Process and methodology 1.6 Data collection and processing 1.7 Map plotting / drawing 1.8 Report writing

Specific Objectives	Contents
• Understand the research and describe about the need of the research • Understand objective of study • Knowledge of study area selection • Idea of literature survey and review • Idea of Formulatation of methodology of study • Know how the technique of data collection • Undersatand Technique of data analysis / Plotting / Drawing • Know how nd enhance the skill of report preparation , report writing and presentation of output	**UNIT 2. Dissertation type Project (30 Hours)** 2.1 Background of Project 2.2 Detail Explanation of need of the research 2.3 Objectives of study 2.4 Literature survey and study 2.5 Scope of study work 2.6 Study area 2.7 Process and methodology 2.8 Data collection and processing 2.9 Map plotting / drawing 2.10 Report writing
Specific Objectives	**Contents**
• Understand the issue of experimental research and describe about the need of the experiment • Understand objective of study • Idea of literature survey and review • Idea of choosing study area • Idea of Formulatation of methodology of study • Know how the technique of data collection • Undersatand Technique of data analysis / Plotting / Drawing • Know how nd enhance the skill of report preparation , report writing and presentation of output •	**UNIT 3. Experimental Type Project(30 Hours)** 3.1 Background of Experiment 3.2 Detail Explanation of need of the investigation or test 3.3 Objectives of study 3.4 Literature survey and study 3.5 Scope of study work 3.6 Study area 3.7 Process and methodology 3.8 Experimental Setup 3.9 Data collection and analysis 3.10 Report writing/ manual

Notes: Project work will be initiated by supervisor/faculty with numerous lectures at beginning. Students are encouraged for discussion and they are free to peruse according to their own effort. Student should consult with supervisor adequately. Before submission the final report the student must submit a draft report and seek necessary feedback from supervisor. Finally the report is examined by external expert in presence of supervisor.

Far Western University

Faculty of Engineering

Bachelor of Engineering (Civil)

Course of Study

Course Title: Design of RCC Structure **Credit: 3**

Course Code: CE471 **Number of lecture/week: 3 Year/Semester: Fourth / Seventh** **Tutorial/week: 1**

Level: BCE (Bachelor of Civil Engineering) **Lab/week: 2/2**

Total Lectures: 45 hrs

Course Introduction

The main aim of this course is to provide theoretical as well as practical knowledge for design of reinforced concrete elements of a building. This course introduces working stress method of design as well as Limit State Method of design but focuses on Limit State Methods of Design. The students will learn to use output of Structural Analysis to design different elements of a building according to the National and International standards and detailing of the reinforcement. The course also includes key features of Seismic Building Code and provisions of ductile detailing in reinforced concrete structures.

Course Objectives

At the end of the course the students should be able to

- Design methods of Reinforced Concrete Structures
- Characteristic strength and characteristic load
- Working Stress Method of Design
- Limit State Method of Design
- Design of Singly Reinforced Beam, Doubly Reinforced Beam and Flanged Beam
- Design for Shear and Torsion
- Design for control of deflection and crack
- Design of Slab, Column, Foundation and Staircase
- Earthquake Resistant Design

Course Outline

Specific Objectives	Contents	Duration
• Design Methods	**1. Concrete Structures and Design Methods** 11.4. Introduction to Reinforced Concrete Structures 11.5. Design methods of Reinforced Concrete Structures 11.6. Characteristic strengths and loads 1.4 Design process and basis for design	2 hrs
• Working Stress Design Method	**12. Working Stress Method of Design** 12.1. Basic assumption in working stress design 12.2. Working load and permissible stresses in concrete and steel 12.3. Behavior of beam under loading 12.4. Types of reinforced concrete beam and different	3 hrs

	RC sections 12.5. Design of singly reinforced rectangular beam	
• Limit State Design Method	**13. Limit State Method of Design** 13.1. Safety and serviceability requirements and different limit states of structure 13.2. Design strength of materials and design loads 13.3. Idealized stress-strain diagram of concrete and steel 13.4. Limit state of serviceability in deflection and in cracking	2 hrs
• Design of Beams	**14. Design of Beams for Flexure** 14.1. Limit state of collapse in flexure and flexural behavior of reinforced concrete beam 14.2. Design of Rectangular Beams (Singly, Doubly Reinforced Sections) 14.3. Design of Flanged Beam Sections	4 hrs
• Design for shear and torsion	**15. Design for Shear and Torsion** 15.1. Limit state of collapse in shear and torsion 15.2. Stress in beam due to shear and torsion 15.3. Behavior of concrete under shear and torsion 15.4. Design of section for shear and torsion	3 hrs
• Development length	**16. Concrete Bond Strength and Development length** 16.1. Concrete Bond Strength 16.2. Development length 16.3. Anchorage bond	2 hrs
• Reinforce detailing	**17. Reinforcement detailing : Codal Provisions** 17.1. Requirements for good detailing 17.2. Nominal cover 17.3. Curtailment of Flexural Reinforcement 17.4. Shear reinforcement 17.5. Splicing of reinforcement 17.6. Anchorage 17.7. Bar bending schedule	4 hrs
• Control of Deflection and Cracks	**18. Limit State of Serviceability: Deflection and Cracking** 18.1. Elastic theory: Cracked, uncracked and partially cracked sections 18.2. Short-term and long-term deflections 18.3. Control of deflection in design 18.4. Control of cracking in design	4 hrs
• Design of slab and staircase	**19. Design of slab and staircase** 19.1. Design and detailing of one-way and two-way slabs 19.2. Design and detailing of longitudinally loaded stairs	4 hrs
• Design of Columns	**20. Design of compression members: Columns** 20.1. Limit state of collapse in compression 20.2. Effective length of columns	5 hrs

	20.3. Design of short columns 20.4. Design of long columns 20.5. Reinforcement detailing	
• Design of Footings	**21. Design of Footing** 21.1. Design of spread footing 21.2. Design of isolated footings 21.3. Design of combined footings 21.4. Design of mat foundation	6 hrs
• Earthquake Resistant Design and Detailing	**22. Introduction to Earthquake Resistant Design and Provisions for Ductile Detailing** 22.1. Damage to RCC structures in earthquake 22.2. Philosophy of design of structures in earthquake prone region 22.3. Design for strength and ductility 22.4. Provision of ductility in building codes **22.5.** Ductility requirement for beam, column and joints	6 hrs

Note: Tutorial Classes may be added as per requirements.

Project work

Individual project to analyze and design elements of a low rise building

Practical:

7. Test a beam in pure bending failure
8. Test a beam in pure shear failure
9. Test a beam in combined bending shear failure
10. Practical work on making skeleton of beam-column connection
11. Practical work on making skeleton of beam-slab

References:

1. Jain, A.K. 2002. Reinforced Concrete Limit State Design, Nem Chand and Bros, Roorkee, India (Reprint 2009)
2. Pillai, S.U., Menon, D. 2011. Reinforced Concrete Design, Tata McGraw Hill Education Private Limited, New Delhi
3. Kong, F.K., Evans, R.H. 1987. Reinforced and Pre-stressed Concrete, ELBS, London
4. Agrawal, P., Shrikhande, M. 2006. Earthquake Resistant Design of Structures, PHI Learning Private Limited, New Delhi (Reprint 2008)
5. Dayaratnam, P. Design of Reinforced Concrete Structures, Oxford and IBH Publishing Company

Evaluation scheme

The questions will cover all the chapters in the syllabus.

Far Western University
Faculty of Engineering
Bachelor of Engineering (Civil)
Course of Study

Course Title: **Safety Engineering**	Credit: 3
Course Code: CE 474	Number of lecture/week: 3
Nature of the Course: Theory	Tutorial/week: 1
Year/Semester: Fourth/ Seventh	Total hours: 60

1. Course Introduction:

The course is aimed to provide the basic knowledge of safety concept in construction project.
Understand accidents and safety, different aspects of safety engineering

2. Course Objectives:

At the end of this course the student should be able:

- To understand the fundamentals of safety concept in engineeringconstruction project works.
- To understand accidents and safety, different aspects of Safety, be able to manage Site Safety.Understand Safety Rules in detail, To understand Psychological and Ergonomics of Safety
- To understand human factors in construction safety, To understand human factors in construction safety
- To understand aspects of personal protection equipment, be able to implement Safety Legislation, understand aspects of personal protection equipment's

3. Specific Objectives and Contents:

Specific Objectives	Contents
• To Understand about Accidents and safety	**UNIT 1. Introduction [3hours]** Accidents • Nature and Causes of Accidents • Impact of Accidents • Evolution of Safety Concepts
• To understand different aspects of Safety.	**UNIT 2. An Overview of Construction Safety [4 hours]** Construction Safety • Current Situation • Organizational Aspect • Behavioral Aspect
• To understand Safety Rules in detail.	**UNIT 3. Important Safety Rules [4 hours]** Accident Reporting • Storage of Materials • Atmosphere in Confined Place • Prevention from Drowning • Fire Prevention and Protection • First Aid and Medical Care

Specific Objectives	Contents
	• Personal Protective Equipments
• To be able to manage Site Safety	**UNIT 4. Site Safety Management [4 hours]** • Workplace and Equipment • Structures and Equipments • Working Platforms • Safety Organizations
• To understand and be able to manage Safety in construction Operation.	**UNIT 5. Safety in Construction Operations [6 hours]** • Planning For Safety • Excavation • Blasting • Tunneling • Building Works • Scaffolding • Lifting • Use of Electricity
• To understand and be able to manage Safety in use of construction equipments	**UNIT 6. Safety in the Use of Construction Equipments[4 hours]** • Psychology of Construction Workers • Rights and Obligation of Parties • Health of Equipment Operators • Vehicles • Cranes • Lifting Gears • Temporary Power Supply
• To understand Safety Economics	**UNIT 7. Safety and Economy [3 hours]** • Direct Costs of Accidents • Indirect Costs of Accidents • Cost of Safety Programs • Safety Cost Optimization.
• To understand Psychological and Ergonomics of Safety	**UNIT 8. Psychological Aspects and Ergonomics[3 hours]** • Carelessness • Related Physical Factors • Other Factors • The Shop Environment and Safe Behavior • Job Stress and its Effect • Human Factors, Biomechanics and Ergonomics

Specific Objectives	Contents
• To understand human factors in construction safety	**UNIT 9. Human Factors in Construction Safety [2 hours]** • Employee Selection • Placement • Motivation: Awareness and Training
• To understand aspects of personal protection equipments	**UNIT 10. Personal Protection Equipments[4 hours]** • Eye Protection • Finger, Arm and Hand Protection • Foot and Leg Protection • Noise Safeguard • Head Protection • Safety Belt
• To understand and be able to implements Safety Legislation	**UNIT 11. Safety Legislation in Construction Industry[4 hours]** • Safety Codes Applicable to Construction Industry • ILO Standards • OSHA regulations • Health and Safety Provision in Nepal • Contract Conditions on Safety in Civil Works Projects
• To understand and roles of various parties in Safety Management	**UNIT 12. Safety Management: Roles of Various Parties[4 hours]** • Employers • Designers • Supervisors • Manufacturers / Dealers • Workers / Employees • Motivation Management • Contractual provisions

Prescribed Text:

Tutorials:

1. Safety rules implementation

2. Accident Analysis

3. Safety cost Analysis and Optimization

Field Visit: Minimum of one day Field Visit of Construction Projects to observe site safety practices is required

References:

1.GrimaldiJohn. V. and Simonds R.H., "Safety Management" 1991, All India Traveller Book Seller, Fifth Edition.

2. Vaid, K.N. "Construction Safety Management", NICMAR Publication,1988.

Far Western University
Faculty of Engineering
Bachelor of Engineering (Civil)
Course of Study

Course Title: **Foundation Engineering**	Credit: 3
Course Code.:CE 473	Number of lecture/week: 3
Nature of the Course: Theory	Tutorial/week: 1
Year/Semester: Fourth/Seventh	Total hours: 60

Course Introduction:

The course is aimed to provide the basic knowledge of Foundation Engineering of civil engineering works. Foundation Engineering is very fundamental subject consisting of selection of proper type of foundation as per sub-soil profile and type of structure. Any civil engineering structure needs strong and stable foundation which depends on proper understanding of soil behaviour, determination and interpretation of soil parameters, determination of stresses in soil. The design of any foundation system is based on understanding of soil parameters and its implication based on through interaction with type of structure. The course on Foundation Engineering provides the students basic knowledge on
foundation selection, foundation forces, foundation design and its stability under seismic forces. Various types of foundation and their analytical solution helps the student to design suitable foundation with respect to soil and site condition.

Course Objectives:

At the end of this course the student should be able:

1. Students will learn how to design shallow and deep foundations, retaining walls, and slopes.
2. Students will learn how to utilize their knowledge in soil mechanics to perform various types of engineering calculations. This includes consolidation analysis for foundations, and stability analysis of slopes and retaining walls.

Learning Outcomes:

1. To learn about types and purposes of different foundation systems and structures.
2. To provide students with exposure to the systematic methods for designing foundations.
3. To discuss and evaluate the feasibility of foundation solutions to different types of soil conditions considering the time effect on soil behavior.
4. To build the necessary theoretical background for design and construction of foundation systems.

Specific Objectives and Contents:

Specific Objectives	Contents

• Understand the nature of the the deposits of soil. • Able to know the depth and thickness of the various soil strata and their extent in the horizontal direction. • Having the knowledge to obtain soil and rock samples from the various strata. • To know the in-situ properties by performing field tests.	**Unit 1. Soil Exploration and Geophysical Investigation (6 Hours)** 1.1 Introduction 1.2 Planning for subsurface exploration 1.3 Methods of exploration 1.4 Geophysical exploration 1.5 Soil sampling and samplers 1.6 In-situ tests 1.7 Common soil tests 1.8 Soil investigation report
• To know the definition of lateral earth pressure and common structures that it applies to. • To know to calculate lateral earth pressure coefficients using the Rankine and Coulomb theories. • To know to calculate of additional forces acting on a wall, including surcharge earthquake and water pressure.	**Unit 2. Theory of Lateral Earth Pressure (6 Hours)** 2.1 Introduction 2.2 Types of earth pressures 2.3 Different theories of earth pressures 2.4 Displacement-related earth pressure 2.5 Rankine and Coulomb theory 2.6 Terzaghi's analysis 2.7 Development of bearing capacity theory 2.8 Development of uplift capacity theory
• Able to know the different types of analysis method used. • Familiar with the limit and fininite element method of foundation design. • Able to calculate shear modulus using in-situ measurement, theoretical relationships, and experimental laboratory data.	**Unit 3. Methods of Analyses (6 Hours)** 3.1 Introduction 3.2 Different methods of analysis 3.3 Limit equilibrium 3.4 Limit analysis 3.5 Method of characteristics 3.6 Finite element method
• Able to understand different types of foundation and its properties. • Able to calculate settlement of foundation. • To become the familiar with codal provision used in shallow foundation design.	**Unit 4. Design of Shallow Foundations (10 Hours)** 4.1 Introduction 4.2 Different types of foundations 4.3 Calculation of bearing capacity 4.4 Stresses in soil 4.5 Concept of contact pressure 4.6 Calculation of settlements 4.7 Codal provision
• Able to evaluate and satisfy sampling requirements to support design requirements. • Able to design the different type of deep foundation. • Able to select the proper foundation	**Unit 5. Design of Deep Foundations (12 Hours)** 5.1 Introduction 5.2 Different types of foundations 5.3 Analysis of Mat foundation 5.4 Design methodology for piles 5.5 Calculation of pile capacity

type for appropriate site. • Able to design well foundation, piers etc.	5.6 Stresses in pile 5.7 Analysis of pile group 5.8 Settlement of pile group 5.9 Concept of negative skin friction 5.10 Piles subjected to lateral loads 5.11 Pile load test 5.12 Design and construction of well foundation, piers etc.
• Familiar with the different type of retaining structure on the basis of stability analysis. • Able to design the retaining structures. • Able to know the bracing system for underground structures.	**Unit 6. Design of Retaining Structures (8 Hours)** 6.1 Introduction 6.2 Different types of retaining structures 6.3 Stability analysis of rigid walls 6.4 Design of cantilever sheet piles 6.5 Design of anchored sheet piles 6.6 Bracing system for underground construction 6.7 Failure analysis for bracing system 6.8 Dewatering
• Able to improvement of different type of soils appropriately. • Able to use of soil reinforcement for ground improvement.	**Unit 7. Ground Improvement for Foundations (6 Hours)** 7.1 Introduction 7.2 Significant characteristics of expansive soil 7.3 Techniques of ground improvement 7.4 Foundations in swelling soil 7.5 Use of soil reinforcement
• Able to know characteristics of load on machine foundation. • Able to know different types of dynamic properties of soils. • Able to design the machine foundation.	**Unit 8. Design of Machine Foundations (6 Hours)** 8.1 Introduction 8.2 Free and forced vibration 8.3 Dynamically loaded foundations 8.4 Dynamic soil properties 8.5 Mass-spring-dashpot model 8.6 Elastic half space theory

Prescribed Text:

2. Joseph E. Bowels, "Foundation Analysis and Design" McGraw-Hill International Editions.

References:

4. Dr. R.K. poudel and R. Neupane, A Text Book of Foundation Engineering " Heritage Publisher
5. V. N. S. Murthy; Soil Mechanics & Foundation Engineering; Sai Kripa Technical Consultants, Banglore
6. Gopal Ranjan, Rao A.S.R.; Basic and applied soil mechanics; New age int. (p) ltd.
7. Arora K.R.; Soil Mechanics & Foundation Engineering; Standard Pub., Delhi
8. Das Braja M; Principles of Geotechnical Engineering; Thomson" Asia Pvt. Ltd.
9. B.C. Punamia; Soil Mechanics & Foundation Engineering; Laxmi Pub. Pvt. Ltd.,Delhi.

10. Bowles, J. E. 1988. Foundation Analysis and Design. McGraw-Hill.

Practical:

1. Unconfined compression test
2. Triaxial test
3. Standard penetration tes
4. Dynamic cone penetration test

One observation tour of a site investigation projects and each each student should prepare the individual report on the basis of prescribed format.

Far Western University
Foundation Engineering
Bachelor of Engineering (Civil)
Course of Study

Course Title : **Hydropower Engineering** Credit : 3
Course No :CE 472 Number of Hours per week : (3+1)
Nature of the Course : Theory + Tutorial Total Hours : 60
Practical : 1.5 / 2 Hour each week Level : Bachelor of Engineering (Civil)
Year : Forth Semester : Seventh

Course Introduction:

This course is advance course for Bachelor students. Before teaching this course, students should know the basic knowledge in fluid mechanics, hydraulics engineering and Hydrology. This course aimed to deliver the knowledge to the Civil Engineering Student of Forth Year First Part at Bachelor Level about the application of fluid mechanics, hydraulics engineering and hydrology inducing its own fundamental understanding. This course aims to deliver the knowledge to the students for demand analysis, planning, design, operation and maintenance of Hydropower Plants and its system components.

Course Objectives:

At the end of this course the students should be able -

- To understand the fundamental terms used in Hydropower Engineering.
- To know the behavior of Hydropower Engineering and its components.
- To know the problems arise in Hydropower Engineering.
- To know the Overall design of components used in HydropowerProjects.
- To carry out the basic survey for Hydropower Projects

Specific Objectives and Contents:

Specific Objectives	Contents
➢ To know the concepts of Hydropowerengineering ➢ To know thenational scenario of hydropower of Nepal ➢ To know the relevant latest hydropower policy of Nepal	**Unit 1. Introduction (3 Hour)** 1.20 Energy Sources and Global Overview of Power 1.21 History of Hydropower Engineering 1.22 Scope and advantages and disadvantages of Hydropower 1.23 Power Potential of World and Nepal (Gross, Technical and Economic Consideration) 1.24 Latest Water Resource Act and Hydropower Development Policy of Nepal
➢ T know the different types of Hydropower ➢ To know the planning steps and layout of Hydropowerprojects ➢ To know the use of Hydrological data for hydropower development ➢ To know terms used in Power and energy sectors ➢ To know the current energy scenario in market and compare with hydropower potential	**Unit 2 .Planning of Hydropower Projects and Energy Studies(10 Hours)** 2.22 Objectives of planning 2.23 Types of Hydropower Projects (Based on Head, Storage Capacity and Layout) 2.24 Investigations and Studies of Hydropower Development (Reconnaissance, Pre-feasibility, Feasibility and Detail Engineering Design) 2.25 Layout of different types of Hydropower Plants and their basic differences 2.26 Processing of Hydrological Data 2.27 PMP and PMF and their uses 2.28 Flow duration curve, Power Duration curve, Load duration curve and their uses 2.29 Load factor, Power factor, Capacity factor, Utilization factor, Diversity factor 2.30 Storage and pondage, Elevation- Area- Volume curves 2.31 Load prediction and Market survey of Power Requirement

	2.32 Installed capacity of a Power plant, Estimation of Power Potential, Economic value of Hydropower 2.33 Estimation of Energy (Primary, Secondary, Spill and Total)
➢ To know the structures used in Hydropower projects ➢ To know the function and design of different headworks for hydropower ➢ To know the analysis and stability of Hydropower Dams ➢ To know the sediment handling process for hydropower projects ➢ To know the function of spillways and energy dissipation methods ➢ To know the use of gate in hydropower structures ➢ To know the basic knowledge in sediment handling in reservoir	**Unit 3 .Head works for Hydropower Plants(20 Hours)** 3.24 General arrangements of headwork components for Storage, RoR and PRoR plants and their main differences 3.25 Spillways, Under sluices and Intake (Descriptions and main differences for RoR and Storage plants) 3.26 General requirement of a functional RoR and Storage Head works 3.27 Dam Engineering i. Functions of a Dam ii. Classification (Based on Material, function and Head) iii. Selection of Dam site and choice of dams iv. Main differences between concrete and embankment dams) v. Failure modes of Concrete and embankment Dams vi. Stability Analysis of Gravity dams vii. Elementary profile of a gravity dams viii. Analysis of Embankment Dams (Phreatic line and seepage calculation), Seepage control and foundation treatment (grouting, drainage) 3.28 Intake of Storage and RoR plants (general arrangements, location, hydraulic analysis), Control bed load and floating debris in RoR intakes 3.29 Spillway (purpose, general arrangement, types, hydraulic size), Cavitation in spillway and preventive measures) 3.30 Energy dissipation below spillway (stilling basin, ski-jump, flipbucket etc.), Hydraulics of stilling basin 3.31 Gate in RoR and Storage plants (Types, their choices, and location) 3.32 Sediment Handling Measures in RoR plants (Estimation of Suspended Sediment Load, Bed load, Design of settling basin, estimation of sediment volume in settling basin, flushing of deposited sediment and estimation of flushing frequency 3.33 Sediment Handling Measures in Storage Plants (sediment bypass, check dams, estimation of reservoir dead storage volume, capacity inflow ration, estimation of reservoir life)
➢ To know Tunnels and Canal structures and their uses in hydropower plants ➢ To know use of surge tanks and forebay structures ➢ To know the use and basic design concepts of penstocks and its accessories	**Unit 4 .Water Conveyance Structures in Hydropower plants (5 Hours)** 4.25 Types of conveyance system (Tunnel and Canal), and their selection 4.26 Hydraulic Tunnels (Geometric shapes, hydraulic design, tunneling method, supports in tunnels, lining of tunnels) 4.27 Hydraulic Canals (Geometric shapes, hydraulic design, lining of canals) 4.28 Forebay and Surge Tanks (General arrangement,

	importance and hydraulic design) 4.29 Penstock and Accessories (Classification, design criteria, economic diameter, and steel thickness), Anchor blocks, water hammer and its estimation
➢ To know the difference between Hydro-Mechanical and Electro-Mechanical equipments ➢ To know the concepts of different types of turbines and their section criteria ➢ To know the selection of generators and their ratings ➢ To know the use of pumps in hydropower plants	**Unit 5 .Hydro-Mechanical and Electro-Mechanical Machines (5 Hours)** 5.23 Differences between Hydro-Mechanical and Electro-Mechanical equipments 5.24 Hydro-Mechanical Equipment (purpose of installation, types of turbines [Pelton, Francis, Kaplan, Bulb] and their performance characteristics, Specific speed and turbine selection, Setting of turbine, preliminary design of francis and pelton turbines, scroll case and draft tube, their importance and basic design 5.25 Electro-Mechanical Equipment (purpose of installation, Generators and their types, rating of generators, Transformers and their types, Governors and its working principle) 5.26 Pumps used in hydropower plants (General introduction to centrifugal and reciprocating pumps, their performance characteristics)
➢ To understand the powerhouses and its components	**Unit 6 .Powerhouse(2Hours)** 6.21 Types of Powerhouses (Underground, Semi-underground and Surface), General arrangement of power houses components and dimension of powerhouse, Advantages and limitations of underground powerhouses

Practical / Tutorials :

The following Laboratory works or Tutorials will be performed during the course. The practical work should be carried out in fully equipped laboratory. Concepts should be given through suitable tutorial works.

12 Performance Characteristics of a Francis Turbine
13 Performance Characteristics of a Pelton Turbine
14 Performance Characteristics of a Centrifugal Pump
15 Performance Characteristics of a Reciprocating Pump

Field Visit :

Two day field visit should be carried out to the students in suitable power plants.
After the field visit, students should submit the field visit report which reflects the detail description of Power plants they visited.

Evaluation System

External Evaluation	Marks	Internal Evaluation	Weightage	Marks	Practical	Marks
End Semester Examination (Details are given at the end)	60	Assignments	50%	10	Lab Reports	15
		Quizzes				
		Presentation				
		Group work				
		Mid-term Exam	50%	10	Field Reports	5
Total External	60	Total Internal		20	Total	20

External Evaluation

End Semester Examination

It is a written examination at the end of the semester. The questions will be asked covering all the units as per their allocated lecture duration. Following table shows the question model with full marks.

Full Marks: 100, Pass Marks: 45, Time: 3 hours

Nature of Questions	Total Questions to be asked	Total Questions to be Answered	Total Marks	Weightage	External Exam Marks
Numerical and theory mixed type Questions	10	10	100	100%	60

Note: Each student must secure at least 45% marks in internal evaluation in order to appear in the end semester examination.
The students unable to secure 45% marks in internal examination, will not be eligible to appear in the End Semester Examination

Internal Evaluation

Assignments

Each Student must submit the assignments individually within specified time.

Quizzes

Pre-informed and surprises quizzes / tests will be taken by the respective subject teachers at least two times within each semester. The students will be evaluated accordingly.

Presentation and Group work

Depending upon the topics taught in the class, respective subject teacher may form the group and ask for group presentation. In this presentation, student performance will be marked accordingly.

Mid-Term Exam / Minor Tests

The midterm written examination will cover all the topics that already taught at the time of examination date. It will be evaluated individually.

Practical / Tutorial Work and Field Visit

All prescribed practical/ Tutorial works should be done as per class routine. Each Student must submit the Lab / Tutorial report within prescribed time frame. And Lab/ Tutorial report will be evaluated individually for marking. At the end of field visit, students should carry out the field report in specified format and it will be evaluated as necessary.

Instruction Techniques

- Lecture and discussions
- Group work and Individual assignments
- Class tutorial
- Assignments at home
- Term paper writing
- Presentation by students
- Case study
- Quizzes
- Guest Lecture

Note: Students are advised not to leave any classes at optimum. If a student does not attend the class/s, it is his/her sole responsibility to carryout self study the topics that taught at his/her absence.

References:

27. Dandekar, M. M. and Sharma, K. N., "Water Power Engineering", Vikas Publishing House, New Delhi, 2013.
28. Garg, S. K., "Irrigation Engineering and Hydraulic Structures", Khanna Publishers New Delhi, 2009.
29. Hind, Justin and Creager, "Engineering for Dams", Wiley Eastern, New Delhi, 1968.
30. NTNU, "Hydropower Development Series (17 Volumes)", Norwegian University of Science and Technology, Norway.
31. Mosoni, E., "Water Power Development: Low Head Power Plants, Vol-I", AkademiaiKiado, Budapest, 1987
32. Mosoni, E., "Water Power Development: High Head Power Plants, Vol-II", AkademiaiKiado, Budapest, 1991

33. Novak, P., Moffat, A.I.B, Nalluri, C., and Narayan, R. , “Hydraulic Structures”, Taylor and Francis, 2014.
34. Sharma, R.K. and Sharma, T. K., “A test book of Water Power Engineering”, S. Chand and Company, New Delhi, 2003.
35. Punmia, B. C. and Lal, P. B.B., Jain, A.K. and jain A.K. “Irrigation and Water Power Engineering”, Laxmi Publications, Delh , 2009.
36. Warnick, C. C., “Hydropower Engineering”, Prentice Hall, Inc, Englewood Cliffs, NJ, 1984.

Far Western University
Faculty of Engineering
Bachelor of Engineering (Civil)
Course of Study

Course Title: **Project Engineering and Construction Management**	Credit: 3
Course Code.:CE482	Number of lecture/week: 3
Nature of the Course: Theory	Tutorial/week: 1
Year/Semester: Fourth/Eighth	Total hours: 60

Course Introduction:

The course is aimed to provide the basic knowledge of Project Engineering and Construction Management of civil engineering works.

Course Objectives:

At the end of this course the student should be able:

- To provide basic knowledge on project and project environment.
- To understand and prepare feasibility study report and project proposal.
- To understand the fundamental techniques of project management of construction works (project planning, implementation, and controlling).
- To make the plan and schedule of required resources to complete the construction works.
- To provide knowledge of contract/procurement management.

Specific Objectives and Contents:

Specific Objectives	Contents
• Understand the project objective and its life cycle phases. • Be able to prepare project proposals and understand the project appraisal.	**Unit 1. Introduction** (6 Hours) 1.1 Definition and Characteristics of Project. 1.2 Project Objective and Goal. 1.3 Project Life Cycle Phases. 1.4 Project Proposals (Technical and Financial). 1.5 Project Appraisal.
• Understand the Importance of Project Planning. • Understand the Work Break Down Structure. • Be able to Prepare Scheduling with Bar Chart, CPM and PERT.	**Unit 2. Project Planning andScheduling** (12 Hours) 2.1 Steps of Planning. 2.2 Importance of Project Planning. 2.3 Work Break Down Structure (WBS). 2.4 Project Scheduling with Bar Chart. 2.5 Critical Path Method (CPM). 2.6 Introduction to Program Evaluation and Review Technique (PERT).
• Understand the project risks and its type and sources. • Be able to manage project risks.	**Unit 3. Risk Analysis and Management** (5 Hours) 3.1 Introduction to Project Risk. 3.2 Types of Project Risk. 3.3 Sources Project Risk. 3.4 Management of Project Risk.
• Be able to manage Construction Site.	**Unit 4. Construction Site Management** (8 Hours) 4.1 Construction Site Planning.

• Understand to maintain the Measurement Book. • Be able to keep Record and make Progress Report. • Understand Running Bill and Final Bill.	4.2 Relation between Owner, Consultant and Contractor. 4.3 Responsibility of Site Engineer. 4.4 Supervising Work of Contractor. 4.5 Record Keeping. 4.6 Progress Report. 4.7 Measurement Book. 4.8 Running Bill and Final Bill.
• Understand Contract and its Types. • Understand the Essential Elements of a Valid Contract. • Understand the terms Bid Bond, Performance Bond, Pre and Post-qualification, Tender Notice. • Be able to make Bid Evaluation, Selection and Award	**Unit 5. Contract Management** (8 Hours) 5.1 Definition of Contract and Essential Elements of Valid Contract. 5.2 Types of Contract. 5.3 Conditions of Contract. 5.4 Tender Document and its Preparation. 5.5 Bid Bond and Performance Bond. 5.6 Pre-qualification and Post-qualification. 5.7 Tender Notice. 5.8 Bid Evaluation, Selection and Award
• Understand the objectives of Monitoring and Quality Control. • UnderstandTime Cost Tradeoff • Be able tounderstand the Earned Value Analysis.	**Unit 6. Monitoring and Quality Control** (6 Hours) 6.1 Introduction to Monitoring. 6.2 Objectives of Monitoring. 6.3 Introduction to Quality Control. 6.4 Objectives of Quality Control. 6.5 Project Control Cycles. 6.6 Time Cost Tradeoff. 6.7 Earned Value Analysis.

References:

Project Engineering

1 Ishwar Adhikari and Santosh Kr. Shrestha, "A text book of Project Engineering" 2011, Chandeshwori Publication, First Edition.

2 K. Nagarajan, "Project Management", ISBN: 81-224-1340-4, New Age International (P) Limited, New Delhi, India, 2001.

3 Dr. Govinda Ram Agrawal, "Project Management in Nepal" Edition: 2006, M.K. Publishers and Distributors, Kathmandu, Nepal.

Construction Management

1. Chitkara, K.K, "Construction Project Management": McGraw Hill
2. B.L. Gupta, Amit Gupta, "Construction Management and Machinery"
3. Adhikari, R. P, "Construction Project Management"

Far Western University
Faculty of Engineering
Bachelor of Engineering (Civil)
Course of Study

Course Title: Engineering Professional Practices and society **Credit: 3**
Course Code: CE 483 **Number of lecture/week: 3**
Year/Semester: Fourth/Eight **Tutorial/week: 1**
Level: Bachelor of Engineering (Civil) **Total hours: 45**

Course Introduction:

This course provides the basic knowledge of social, ethical, professional and legal environment encountered in engineering practice.

Course Objectives:

After successful completion this course, students are expected to be able to:

a) Analyze the role of engineers in a society,
b) Analyze ethical and unethical behaviors in professional practice,
c) Make professional decisions by following existing regulatory and professional frameworks,
d) Select appropriate dispute and conflict resolution methods, and
e) Analyze professional engineering issues related to ethics, code of conduct, conflict of interest, norms and standards and to render decisions on appropriateness of steps taken and assign degree of responsibility in specific cases.

Specific Objectives and Contents:

Specific Objectives	Contents
Understand the origin of society; Role of technology in social change; Role of engineer in society	**UNIT 1. Society, Technology and Engineers** 1.1 Definition of society and community. 1.2 Origin, evolution and types of societies 1.3 Factors affecting social change. 1.4 Technology and society 1.5 Technology and environment 1.6 Computer and society 1.7 Impact of Technology on social change. 1.8 Effects of major technological developments on practice of engineering profession 1.9 Civilization, cultures, values and norms 1.10 Role of engineers in society 1.11 Historical development of Engineering Practice in Nepal
To understand the importance of ethics , values in professional practice	**UNIT 2. Ethics and Professionalism** 2.1 Moral, ethics and professionalism 2.2 Characteristics of ethical decision making 2.3 Liability of engineers in design, construction and implementation of projects 2.4 Loss of professionalism 2.5 Responsibilities and rights 2.6 Individual freedom versus societal responsibility 2.7 Public versus private

Specific Objectives	Contents
	2.8 Conflict of interest 2.9 Relation of engineers with client, contractor and fellow engineers.
Understand professional organisation and their role in professional activities	**UNIT 3. Roles of Professional Organizationsin regulation and professiona development** 3.1 Regulation of the practice of engineering profession 3.2 Objectives of Nepal Engineering Council and its licensing provision 3.3 Codes of ethics and guidelines for professional engineering practice – the NEC code of conduct 3.4 Professional organizations like NEA and their objectives. 3.5 Roles of professional organizations in induction of new entrants into the profession 3.6 Role of professional societies in upgrading and maintaining the professional and technical competence of members of professional associations 3.7 Role of professional societies in providing technical expertise to public authorities in developing policies, acts, standards, project implementation procedures and international agreements and negotiations 3.8 Ensuring occupational health, safety and general welfare of the public 3.9 Role of professional societies in environmental protection 3.10 Role of professional and professional societies during disaster
Understand legal system to be encountered in professional activities	**UNIT 4. Legal Aspects of Professional Engineering in Nepal** 4.1 Introduction to Nepalese legal system 4.2 Contract and its types. Significance of contract. 4.3 Contract document and its importance 4.4 Liability under contract, criminal law and tort 4.5 Duties and Liabilities of designers and professionals 4.6 Conditions for establishment of professional negligence (duty, breach, proximity cause and damage) and professional liability insurance. 4.7 Types of business enterprises: sole proprietorship, partnership, and limited company 4.8 Intellectual property right (Copy right, patent, design, trademark etc)
Understand conflicts, sources of conflicts and disputes management	**UNIT 5. Conflict and Dispute Management** 5.1 Definition, sources and level of conflict 5.2 Conflict resolution methods: avoidance, diffusion, containment, confrontation, conciliation, mediation, arbitration and litigation 5.3 Dispute resolution methods: adjudication and arbitration 5.4 Nepalese practice in dispute management in contract.
To be able the analyzevarious issues	**UNIT 6. Case Studies Related to Practice of Engineering Profession**

Specific Objectives	Contents
related in engineering profession and able to give appropriate solution.	6.1 Cases involving public safety, industrialization and protection of environment 6.2 Cases involving conflict of interest, personal integrity, and personal privacy 6.3 Cases involving professional negligence (duty, breach, proximate cause and damage) 6.4 Cases involving breach of duty, criminal law, and tort 6.5 Cases involving breach of NEC's code of conduct 6.6 Cases involving breach of Public Procurement Act and Public Procurement Regulation 6.7 Cases involving breach of intellectual property rights and copyrights 6.8 Cases involving abuse of position and authority 6.9 Globalization and cross cutting issues

Textbooks:

1. Whitbeck, C., 2012, Ethics in Engineering Practice and Research, Cambridge University Press

References:

1. Shrestha, S. K. and Shrestha, R. K., 2013, Engineering Professional Practice, Heritage Publishers and Distributers Pvt. Ltd.,
2. Adhikari, R. P.,2010, Engineering Professional Practice, Pashupati Publishing House, ISBN: 978-9937-8249-03
3. Galami, T. B., 2008, Engineering Professional Practice, AkshalokPrakashan, ISBN: 978-99946-779-1-7
4. Morrison, Carson and Hughes, Philip, 1982. Professional Engineering Practice - Ethical Aspects. Toronto: McGraw-Hill Ryerson Ltd.

Far Western University
Faculty of Engineering
Bachelor of Engineering (Civil)
Course of Study

Course Title: RS and GIS Application to Civil Engineering	**Credit: 3**
Course Code.:GE 481	**Number of lecture/week: 3-1-1.5**
Nature of the Course: Theory and Practical	**Tutorial/week: 1**
Year/Semester: Fourth/Eighth	**Total hours: 45+36**

Course Introduction:

The course is aimed to provide the knowledge of Geographic Information System, Remote Sensing and Globla Navigation Satellite System

Course Objectives:

This course introduces principles, concepts and applications of Geographic Information Systems (GIS): a decision support tool for planners and managers of spatial information. Database development, manipulation and spatial analysis techniques for information generation, basic knowledge of remote sensing and global navigation satellite sysem. Students will have the scope of using GIS for applications in their related fields such as natural resource management, environment, civil engineering, agriculture, information system, etc will be discussed through miniproject and laboratory exercises.

Specific Objectives and Contents:

Specific Objectives	Contents
Understanding of GIS and software Application of GIS	**1. Introduction and Overivew of GIS(3 Hours)** Definition of a GIS features and functions 1.6Why GIS is important and how GIS is applied 1.7historical development of GIS 1.8GIS as an Information System 1.9GIS and cartography 1.10 contributing and allied disciplines 1.11 GIS data feeds 1.12 Application of GIS
Projection and coordinate system used GIS Projection system used in Nepal	2. **GIS and Maps, Map Projections and Coordinate Systems(3 Hours)** **2.1** Maps and their characteristics (selection, abstraction, scale, etc.); **2.2** automated cartography versus GIS; **2.3** map projections; coordinate systems **2.4** precision and error

Data model of Vector and Raster GIS	3. **Spatial Data Models** **(3 Hours)** 3.1 Concept of data model; 3.2 raster data model; compression, 3.3 indexing and hierarchical data structures; 3.4 vector data model; 3.5 topology; 3.6 TIN data model.
Different types of data inputs and data quality	4. **Data Sources, Data Input and Data Quality** **(3 Hours)** 4.1 Major data feeds to GIS and their characteristics: 4.2 maps, GPS, images, databases, 4.3 commercial data; locating and evaluating data; 4.4 data formats; 4.5 data quality; 4.6 metadata.
Gedatabase concept and different types of Databse management system	**5. Database Concepts** **(3 Hours)** 5.1 Database concepts and components 5.2 relational database systems; 5.3 data modeling; 5.4 views of the database; normalization; 5.5 databases and GIS.
Vector Geodatabase Management and Analysis tools	**6. Vector Geo Processing** **(6 Hours)** **6.1** Clip **6.2** Merge **6.3** Dissolve **6.4** Union **6.5** Intersection **6.6** Buffer
Raster Geodatabase and Management tools	8 **Raster Geo Processing** **(6 Hours)** 8.1 Clipping, merging, appending, raster cataloge 8.2 raster analysis; 8.3 statistics; 8.4 Integrated spatial analysis. 8.5 Map Algebra 8.6 Interpolation functions
Different sources of Digital Terain Model/Digital Elevation Model, processing related to DEM	9 **Raster Surface** **(3 Hours)** 9.1 DEM (different source of DEM, creating DEM) 9.2 slope, 9.3 aspect and **9.4** other raster functions using DEM
Explains about Global Navigation Satellite System works	**10 GNSS (Global Navigation Satellite System)** **(4 Hours)** 10.1 Basic concept of **GNSS** 10.2 How **GNSS** works 10.3 D**GNSS** 10.4 Errors in **GNSS** 10.5 Application of GNSS
Explains about RS (Remote	**11 Introduction to Remote Sensing** **(4 Hours)**

Sensing)	11.1 Concept of Remote Sensing 11.2 Electro Magnetic Spectrum and windows 11.3 Spectral signature of different landuses 11.4 Introduction to different satellites 11.5 Resolutions in RS **11.6** Application of Remote Sensing
River basing Analysis using DEM and Raster GIS	**12 Hydrologyical Analysis(4 Hours)** 12.1 Flow direction, 12.2 flow accumulation, 12.3 River network Generation 12.4 Catchment boundary 12.5 Subcatchment boundary 12.6 Elevation band in catchment
Producing final layout of Maps for Printing and Exporting	13 **Making Maps** **(3 Hours)** 13.1 map functions in GIS; 13.2 map design and 13.3 map elements; 13.4 choosing a map type; 13.5 Exporting map in different format 13.6 Printing a map

Laboratory Sessions:

1. Spatial database development (Georeferencing, digitizing point/line/polygon) 6h
2. Projection 3h
3. Database editing and updating 6h
4. GNSS and Google Map data integration in GIS, 2h
5. Geo processing 3h
6. Spatial analysis 4h
7. River Analysis 2h
8. Map Layout 2h
9. Mini-project for GIS application. 8h

Prescribed Text:

1 *Raghunath Jha (2002):* Course Manual for GIS, IOE, Water Resources Engineering.

2 *P.A. Burrough and R. A. McDonnell (1998):* Principles of Geographical Information Systems, Oxford University Press.

3 *J. Star and J. Estes (1990):* Geographic Information Systems: An Introduction: Prentice Hall, Englewood Cliffs, N.J.

4 *J. Lee, D.W.S. Wong (2002):* Statistical Analysis with Arc View GIS: John Wiley and Sons, Inc., New York.

References:

11. Davide J Maguire, Michael Goodchild and David W RHIND, 1999, *Geographical Information Systems Vol 1: Principles*, Longman Scientific Technical.

12. Laura Lang, 2000, *Managing Natural Resources with GIS*, ESRI, Redlands, CA.

Far Western University
Faculty of Engineering
Bachelor of Engineering (Civil)
Course of Study

Course Title: **Major Project**	Credit: 4
Course Code.:CE 484	Number of lecture/week:4
Nature of the Course: Consulting and supervise	Tutorial/week:
Year/Semester: Fourth/Eighth	Total hours: 30

Course Introduction:

The major project is continuation of minor project. In Major project students are required to complete the whole concept of project. The following tasks are required to complete as a carryover of minor project under different types of project works

Course Objectives:

At the end of this course the students should be able to understandthe fundamentals of project design: student should be

- Able to prepare a design for an extensive civil engineering project.
- Able to prepare dissertation type project , literature survey and review literature and correlation of existing knowledge
- Able to identify the problem and investigation through laboratory type experimental setup

The major project is continuation of minor project already complete inprevious t VII semester and students shall carried out following task in Major Project

Specific Objectives and Contents:

Specific Objectives	Contents
• Understand the project and describe about the project • Knowledge of study area selection • Idea of literature survey and review • Idea of formulation of methodology of study • Know how the technique of data collection • Understand data analysis / Technique of Plotting / Drawing • Knowhowand enhance the skill of report preparation , report writing and presentation of output	**UNIT 4. Design type Project (30 Hours)** 4.1 Background of Project 4.2 Detail Explanation of Project 4.3 Project study area 4.4 Literature review/ Guidelines, norms, standards 4.5 Process and methodology 4.6 Data collection and processing 4.7 Map plotting / drawing 4.8 Report writing

Specific Objectives	Contents
• Understand the research and describe about the need of the research • Understand objective of study • Knowledge of study area selection • Idea of literature survey and review • Idea of formulation of methodology of study • Know how the technique of data collection • Understand Technique of data analysis / Plotting / Drawing • Know howand enhance the skill of report preparation , report writing and presentation of output	**UNIT 5. Dissertation type Project (30 Hours)** 5.1 Background of Project 5.2 Detail Explanation of need of the research 5.3 Objectives of study 5.4 Literature survey and study 5.5 Scope of study work 5.6 Study area 5.7 Process and methodology 5.8 Data collection and processing 5.9 Map plotting / drawing 5.10 Report writing
Specific Objectives	**Contents**
• Understand the issue of experimental research and describe about the need of the experiment • Understand objective of study • Idea of literature survey and review • Idea of choosing study area • Idea of Formulatation of methodology of experiment • Know how the technique of data collection • Undersatand Technique of data analysis / Plotting / Drawing • Know how nd enhance the skill of report preparation , report writing and presentation of output	**UNIT 6. Experimental Type Project(30 Hours)** 6.1 Background of Experiment 6.2 Detail Explanation of need of the investigation or test 6.3 Objectives of study 6.4 Literature survey and study 6.5 Scope of study work 6.6 Study area 6.7 Process and methodology 6.8 Experimental Setup 6.9 Data collection and analysis 6.10 Report writing/ manual

Notes: Project work was initiated by supervisor faculty with numerous lectures at beginning. Students are encouraged for discussion and they are free to peruse according to their own effort. Students should consult with supervisor adequately. Before submission of the final report, the student must submit a draft report and seek necessary feedback from supervisor. Finally the report is examined by external expert in presence of supervisor.