

PURBANCHAL UNIVERSITY

Biratangar, Nepal

B.E. (Civil Engineering)

Syllabus (Poush, 2068)

Year: II

Semester: III

S. No.	Course Code	Course Description	Credits	Lecture	Tutorial	Laboratory	Total
1.	BE201SH	Mathematics - III	3	3	2	-	5
2.	BEG226EL	Electric Circuit & Machines	3	3	2	2/2	6
3.	BEG255CI	Engineering Geology	3	3	1	2/2	5
4.	BEG256CI	Strength of Materials	3	3	3	2/2	7
5.	BEG258CI	Survey - I	3	3	1	4	8
6.	BEG261CI	Fluid Mechanics	3	3	1	2/2	5
		Total	18	18	10	8	36

MATHEMATICS-II

BEG102SH

Year: II

Semester: III

Teaching Schedule Hours/week			Examination Scheme				Internal Assessments		Total Marks	Remarks
			Final				Theory Marks	Practical Marks		
			Theory		Practical					
L	T	P	Duration	Marks	Duration	Marks				
3	2	-	3	80	-	-	20	-	100	

Objectives: The purpose of this course is to round out the student's preparation more sophisticated applications with an introduction of linear algebra, a continuous of the study of ordinary differential equations and an introduction to vector algebra and Fourier series.

1.0 Matrices and Determinant. 14 Hrs

- 1.1 Matrix and Determinant
- 1.2 Vector Space introduction, Dependent and Independent vectors
- 1.3 Linear Transformation
- 1.4 System of Linear Equations, Gauss elimination method only
- 1.5 Inverse of Matrix (Gauss Jordan Method)
- 1.6 Rank of the Matrix
- 1.7 Eigen Values of Matrix, Eigen Vectors and its applications

2.0 Laplace Transformation 10Hrs

- 2.1 introduction
- 2.2 Laplace Transform of some Elementary Functions
- 2.3 Properties of Laplace Transform
- 2.4 Inverse Laplace Transforms
- 2.5 Application to differential equations

3.0 Line, Surface and Volume Integrals 9 Hrs

- 3.1 Definition of Line integral
- 3.2 Evaluation of line integral
- 3.3 Evaluation of Surface and Volume integrals
- 3.4 Diritchlet integrals

4. Integral Theorems 6 Hrs

- 4.1 Greens Theorem integral.
- 4.2 Stokes's Theorem (without proof)
- 4.3 Gauss Divergence Theorem (without proof)
- 4.4 Consequences and Applications of Integral Theorems

5.0 Fourier Series 6Hrs

- 5.1 Periodic Function
- 5.2 Trigonometric Series
- 5.3 Fourier Series
- 5.4 Determination of Fourier Coefficients: Euler Formulae $(-j, j)$
- 5.5 Fourier Series in the Intervals $(0, 2\pi)$ and $(-l, l)$
- 5.6 Even and Odd Functions and their Fourier Series: Fourier Cosine & Sine Series
- 5.7 Half Range Function
- 5.8 Parsevals Formula
- 5.9 Fourier Series in Complex Form (Introduction)

Reference Books:

1. E. Kreyszig, Advanced Engineering I mathematics - 5th Edition, wiley, New York,
2. A text book of Engineering Mathematics Vol. II - P.R. Pokhrel
3. A text book of Engineering Mathematics Vol. III - N.B. Khatakho & S.P. Pradhanang

Electric Circuit & Machines

BEG226EL

Year: II

Semester: III

Teaching Schedule Hours/week			Examination Scheme				Internal Assessments		Total Marks	Remarks
			Final				Internal Assessments			
			Theory		Practical		Theory Marks	Practical Marks		
L	T	P	Duration	Marks	Duration	Marks				
3	2	2/2	3	80	-	-	20	25	125	

Course Contents:

- 1.0 Introduction: 2hrs**
- 1.1 Energy sources and productions
 - 1.2 Generation, transmission and distribution of electrical power
- 2.0 Passive elements and laws in electrical engineering: 7hrs**
- 2.1 Electric current and emf
 - 2.2 Resistance, resistivity, temperature coefficient of resistance, variation of resistance with temperature
 - 2.3 Series and parallel combination of resistor
 - 2.4 Ohm's law and its application
 - 2.5 inductor, induction, inductance in series and parallel
 - 2.6 Faraday's laws of electromagnetic induction
 - 2.7 Capacitance, capacitor in series and parallel
 - 2.8 Kirchoff's Law and their application using mesh analysis and nodal analysis method
- 3.0 Network theorems: 7 hrs**
- 3.1 Star-delta transformation and Delta-star transformation
 - 3.2 Thevenin's Theorem
 - 3.3 Super position theorem
 - 3.4 Maximum power transmission theorem
- 4.0 AC Fundamentals 8hrs**
- 4.1 Generation of AC
 - 4.2 Waveform and terms used in AC
 - 4.3 Average and r.m.s. values of current and voltage
 - 4.4 Phasor representation- resistive, inductive, capacitive circuits, voltage and current waveforms
 - 4.5 Series RC, Series RL, Series and parallel RLC circuit and their phasor representation

4.6 Resonance in Series and parallel RLC circuit

4.7 Power factor

5.0 Lighting devices, wiring system and protective devices

5.1 Different type of lighting system

- Incandescent
- Tungstun-halogen
- Compact florescent lamp
- Tubular florescent

5.2 Types of wiring

- Open wiring
- Conceal wiring

5.3 Grounding/ Earthing

5.4 System grounding, Equipment Grounding

5.5 Types of grounding

5.6 Definitions of protection devices

- Fuse
- MCB
- Lighting arrestor

6.0 Transformer: 5hrs

6.1 Transformer-Construction, working principle

6.2 Emf equation of transformer

6.3 Voltage and current transformation ratio of transformer

6.4 Losses and efficiency of transformer

7.0 DC Machines: 7hrs

7.1 L.DC Generators: operating principle of dc generator, method of excitation. armature reaction

7.2 DC Motor: Operating principle of dc motor, back emf in dc motor, type of dc motor and their characteristics

8.0 AC Machines: 7hrs

8.1 Induction Motor: Introduction and construction of three phase induction motor, operating principle of three phase induction motor

8.2 "Synchronous Machine

8.2.1 Synchronous Generator: Construction of Synchronous generator advantages of rotating magnet system and stationary armature system parallel operation and synchronization

8.2.2 Synchronous Motors: Synchronous speed construction and operating principle of Synchronous motors

Practicals: Following six practical exercises will be performed in this course:

- a) Basic electrical measurement of voltage, current and resistance
- b) Verification of Ohm's law in series and parallel connections of resistance and cells circuit
- c) A.C. measurement of power and power factor
- d) Characteristics of D.C. machine
- e) Characteristics of A.C. machine
- f) Synchronous finexter chas

Reference Books:

1. "Basie Electrical Engineering", A. (Kasatkin & M, Perakalin, MIR Publisher" Mosco-w, 1970
2. "Electrical Engineering-An Introduction", Steven E. Sehwarz & William G. Oldhan" Holt. Rinehart& Winstom Publishers, New York" 1984
3. "A Text books, of 'Electrical Technology B. L. Theraja & A. K. Theraja, S. Chald &- Co. Ltd"

Engineering Geology

BEG255CI

Year: II

Semester: III

Teaching Schedule Hours/week			Examination Scheme					Total Marks	Remarks	
			Final		Internal Assessments					
			Theory		Practical		Theory Marks			Practical Marks
L	T	P	Duration	Marks	Duration	Marks				
3	1	2/2	3	80	-	-	20	25	125	

Course Contents:

- | | |
|--|----------------|
| <p>1.0 Introduction</p> <p>1.1 Scope of geology in civil engineering</p> <p>1.2 Basic review of earth sciences</p> <p>1.3 Various Landforms on the surface of the earth: Mountains, plateaus. shields</p> | 2Hrs |
| <p>2.0 The earth's interior and its effect</p> <p>2.1 The earth: Its internal structure and environment</p> <p>2.2 Plate tectonics</p> <p>2.3 Causes and effects of earthquakes</p> <p>2.4 Volcanism</p> | 5Hrs |
| <p>3.0 Geology in Civil Engineering</p> <p>3.1 Definition of engineering geology</p> <p>3.2 Scope and objective of engineering geology</p> <p>3.3 Importance of engineering geological studies in civil engineering</p> | 4 Hrs |
| <p>4.0 Petrology</p> <p>4.1 Definition</p> <p>4.2 Petro graphic classification: Igneous, Sedimentary and Metamorphic rocks</p> <p>4.3 Engineering significance of the three rock classes</p> | 4Hrs |
| <p>5.0 Structure Geology</p> <p>5.1 Rock deformation and reasons</p> <p>5.2 Study of folds, faults and joints cleavage</p> <p>5.3 Introduction to dip, strike and outcrop</p> <p>5.4 Unconformity</p> <p>5.5 Orientation of geological strata using geological maps , plans and Cross-sections</p> <p>5.6 Planes of discontinuities in rock masses</p> <p>5.7 Engineering classification of rock masses</p> | 5 Hrs |
| <p>6.0 Mass Movement and Rock Slope Engineering</p> <p>6.1 Types of landslides and factors affecting slope stability</p> | 6 Hours |

- 6.2 Preventive measure for landslides and corrective methods for maintaining stability
- 6.3 Rock fall, rock slide and mud flow

7.0 Hydrogeology **5 Hrs**

- 7.1 Morphology of river channel , transportation and disposition
- 7.2 Ground water movement and its origin
- 7.3 Permeability and porosity
- 7.4 Aquifer, aquiclude, water level and piezometric levels
- 7.5 Confined and unconfined aquifers
- 7.6 Springs and reservoirs

8.0 Site Investigation **7 Hrs**

- 8.1 Interpretation of Topographic Maps
- 8.2 Aerial photographs and geological maps
- 8.3 Geophysics and use of engineering geological map for terrain Evaluation
- 8.4 Site exploration: drilling test methods and borehole logs
- 8.5 Geological investigations for dams and reservoirs , roads and Pavements, foundations, bridge and tunnels

9.0 Engineering Geology of Nepal **6 Hrs**

- 9.1 Geological division of Nepal
- 9.2 Distribution of different rock /soil types
- 9.3 Geological structures and their engineering significance

Practicals:

Six practical exercises will be performed in this course, in addition to two site visits and one 3-day field trip. These are:

- (a) Identification of rocks and minerals.
- (b) Study of rock structures
- (c) Study of effects of weathering and outcrop.
- (d) Study of topographic maps, preparation on profiles, interpretation of geological cross-sections and stratum contours.
- (e) Preparation of interpretative engineering geological maps.
- (f) Study of fault and fold maps borehole and three point problems.
- (g) Brunton's compass
- (h) Schmidt's hammer

Reference Books:

1. "Principles of Physical Geology", Sanders. John wiles & Sons, New York
- 2" "Principles of Structural Geology", A. Holmes, ELBS English Language Society
- 3 " "Principles of Structural Geology", M. P. Billings, Prentice Hall of India, Delhi
4. "Geology of Nepal" Dr. C. K. Sharma, Educational Enterprises

Strength of Materials

BEG256CI

Year: II

Semester: III

Teaching Schedule Hours/week			Examination Scheme				Internal Assessments		Total Marks	Remarks		
			Final				Theory Marks				Practical Marks	
			Theory		Practical		Theory Marks	Practical Marks				
L	T	P	Duration	Marks	Duration	Marks						
3	3	2/2	3	80	-	-	20	25	125			

Course Contents:

1.0 Introduction

2 hrs

- 1.1 Types of loads - static, dynamic, dead, live, wind and seismic loads.
- 1.2 Type of supports
- 1.3 Statically determinate and indeterminate structures
- 1.4 Degree of static indeterminacy

2.0 Shear Forces and bending Moment

7 hrs

- 2.1 Revision of previous works
- 2.2 The concept of superposition of internal forces
- 2.3 Maximum bending moments and shearing forces and their positions for statically determinate beams and frames
- 2.4 Calculation of applied load from given bending moment and shear force diagram.

3.0 Moment of Inertia

4 hrs

- 3.1 Review of previous work
- 3.2 Moment of inertia of standard and built-up sections
- 3.3 Polar moment of inertia
- 3.4 Radius of gyration
- 3.5 Principal moment of inertia

4.0 Direct Stresses and Strains

7 Hrs

- 4.1 Stresses and strains - normal stress-strain, shear stress-strain, Hook's law, Poisson's ratio, modulus of elasticity, modulus of rigidity, bulk modulus and their relationship.
- 4.2 Stress-strain diagrams for steel, timber, masonry concrete and RCC
- 4.3 Ultimate stress, allowable stress, factor of safety and stress concentration
- 4.4 Elongation of bars: varying cross-sections, tapered section, principal of superposition
- 4.5 Compound bars subject to axial tension and compression
- 4.6 Thermal stresses: single bar. compound / composite bars

5.0	Principal Stresses	5hrs
	5.1 Introduction	
	5.2 Stresses on a inclined plane subjected to two mutually perpendicular normal stresses	
	5.3 Stresses on an inclined plane subjected two mutually perpendicular normal and stresses	
	5.4 Principal stresses and principal strains	
6.0	Theory of Flexure	7 hrs
	6. 1 Coplanar and pure bending, assumptions, derivation of bending equation.	
	6.2 Introduction to elastic and plastic bending	
	6.3 Radius of curvature, flexural stiffness	
	6.4 Analysis of beams of symmetric cross-section	
	6.5 Shear stress variation in rectangular and thin walled I beam	
	6.6 Analysis of composite beams	
	6.7 Concept of deflection in beams	
7.0	Torsion	3hrs
	7.1 Introduction	
	7.2 Assumptions and derivation of torsional equation	
	7.3 Calculation of torsional moments in series and parallel combination of shafts	
	7.4 Calculation of torsional stresses	
8.0	Thin-walled vessels	3hrs
	8.1 Definition and characteristics of thin-walled vessels	
	8.2 Types of stresses in thin-walled vessels	
	8.3 Calculation of stresses and strains in thin-walled vessels	
9.0	Compound Stresses Failure theories	4hrs
	9.1 Introduction	
	9.2 Load acting eccentrically to one and both axes	
	9.3 Condition for no tension in the section	
	9.4 Introduction to failure theories	
10.0	Introduction to Buckling	3hrs
	10.1 Definition of buckling	
	10.2 Buckling of columns	
	10.3 Effective length	

Practicals:

1. Tensile test of steel
2. Simple "bending test on steel or timber beam"
3. Torsion test on simple shaft
4. Test on column behavior and buckling

Reference Books:

- 1 S. P, Timoshenko & D. H. Young, Elements of Strength of Materials, 5th Edition, East-West Press Pvt. Ltd. 1987
2. G. H. Ryder, Strength of Materials, 3rd Edition, Macmillian, ELBS, 1985
3. E. P. Popov, Mechanics of Materials, 2nd Edition, Prentice Hall of India Pvt Ltd., New Delhi, 1989
4. R. K Bansal, A text book of strength of materials, Laxmi publication, New Delhi
5. S. S. Vavikatti, Strength of Materials, Vikas Publication, New Delhi
6. B.C. Punima Strength of Materials - Mechaniss of Structures, Standard Publication , ' Distributors, New Delhi
7. R.K.Rajput Strength of Material1s (Mechanics of So1ids), S.Chand, New Delhi

Survey-I

BEG258CI

Year: II

Semester: III

Teaching Schedule Hours/week			Examination Scheme				Internal Assessments		Total Marks	Remarks
			Final				Internal Assessments			
			Theory		Practical		Theory Marks	Practical Marks		
L	T	P	Duration	Marks	Duration	Marks				
3	1	4	3	80	-	25	20	25	150	

Course Description: *The course in land surveying will be taught in three consecutive semesters. Course BEG258CI deals with basic principles of land surveying. Conventional methods of surveying will be discussed in length.*

Course Objective: After the completion of this course, the students will be able to

- Understand the fundamental principle of land surveying
- Handle different types of surveying instruments.

Course Contents:

- | | | |
|-------------|--|--------------|
| 1.0. | Introduction | 3hrs |
| | <ul style="list-style-type: none"> 1.1 Introduction to surveying and its importance to civil engineering 1.2 History and the development of surveying 1.3 Classification of surveying 1.4 Principle of surveying 1.5 Plans and Maps 1.6 Introduction to scales used in surveying | |
| 2.0 | Distance measurements | 5 hrs |
| | <ul style="list-style-type: none"> 2.1 Types of measurements 2.2 Units of measurements, System of units, significance figures and rounding of numbers 2.3. Distance measurement technique and instruments used 2.4 Errors, types of errors and sources of errors in making measurements 2.6 Corrections for linear measurements | |
| 3.0 | Tape and offsets surveying | 5 hrs |
| | <ul style="list-style-type: none"> 3.1 Basic principles and geometry of area- measurement 3.2 Terms used in chain surveying 3.3 Field booking methods 3.4 Obstacles in chaining 3.5 Conventional symbols | |

4.0	Compass surveying	8 hrs
	4.1 Introduction to compass surveying	
	4.2 Meridians, Bearings and angles	
	4.3 Designation of bearings	
	4.4 Types of compass	
	4.5 Local attraction	
	4.6 Magnetic declination and its variations	
	4.7 Closing errors and adjustment	
	4.8 Traverse plotting: By parallel meridians and By included angles	
5.0	Leveling	10 hrs
	5.1 introduction	
	5.2 Basic principles and importance of leveling	
	5.3 Different methods of determining elevations	
	5.5 Two peg test	
	5.6 Temporary and permanent adjustment of level	
	5.7 Booking methods and their reductions, arithmetic checks	
	5.8 Curvature and refraction	
	5.9 Uses of leveling; profile leveling, cross-sectioning and fly leveling and contouring	
	5.10 Adjustment of level circuits and Sources of errors in leveling	
6.0	Plane Table surveying	2hrs
	6.1 Principle of plane table surveying	
	6.2 Methods of plane tabling	
	6.3 Advantages and disadvantages of plane tabling	
7.0	Introduction to Theodolite	5hrs
	7.1 introduction to Theodolite	
	7.2 Basic definitions	
	7.3 Temporary adjustment of Theodolite	
	7.4 Measurement of horizontal angles by direction and repetition methods	
	7.5 Measurement of vertical angles	
	7.6 Fundamental lines of Theodolite and its geometry	
	7.7 Sources of errors	
8.0	Computation of Area and Volume	5hrs
	8.1 Basic definition	
	8.2 Area by division into simple figures	
	8.3 Area by coordinates, area by double meridian distance method and trapezoidal and Simpson's 1/3 rule	
	8.4 Measurement of volume by trapezoidal, prismoidal method	
9.0	Field Astronomy GPS	2 hrs
	9.1 Introduction, definition of terms	
	9.2 Geographical coordinate system	
	9.3 Introduction and components of GPS	

Total number of Tutorials: Six (Chapters)

Practicals: Following six exercises will be performed in this course:

- A field survey using tape by direct and indirect methods
- Compass traversing and detailing
- A field survey using level to transfer RL (Fly leveling)
- Traversing and detailing by plane tabling
- Measurement of horizontal and vertical angles using Theodolite

Requirements: The number of students in each group should not be more than five (5 nos.). A facilitator should not supervise more than three groups

Reference Books:

- Banister A. & Raymond S., "Surveying", ELBS Publication
- Punima B. C., " Surveying", khanna Publishers
- Agor R., "A Text book of Surveying"

Fluid Mechanics

BEG261CI

Year: II

Semester: III

Teaching Schedule Hours/week			Examination Scheme				Internal Assessments		Total Marks	Remarks		
			Final				Theory Marks				Practical Marks	
			Theory		Practical		Theory Marks	Practical Marks				
L	T	P	Duration	Marks	Duration	Marks						
3	1	2/2	3	80	-	25	20	25	150			

Course Contents

1.0 introduction 2hrs

- 1.1 Matter as Solid, Liquid and Gas
- 1.2 Application of Fluid Mechanics in Civil Engineering
- 1.3 Concept of continuum and control volume

2.0 Physical Properties of Fluid 5 Hours

- 2.1 Density, Specific Weight, Specific Volume, Specific Gravity, Compressibility
Surface Tension, Capillarity, Vapor Pressure and Cavitations
- 2.2 Viscosity and Newton's Law of Viscosity
- 2.3 Classification of fluid

3.0 Fluid Statics

- 3.1 Intensity of Pressure and Pressure force
- 3.2 Pressure / Depth Relationship
- 3.3 Pascal's Law
- 3.4 Absolute, Gauge, Atmospheric and Vacuum Pressure
- 3.5 Measurement of Pressure: Barometer, Manometer and Bourdon Gauge
- 3.6 Pressure on Plane Submerged Surface, Pressure Diagram and Center of Pressure
- 3.7 Pressure on Curved Surface
- 3.8 Forces on Gates (Plane and Curve), Dams and Other Water Retaining Structures
- 3.9 Buoyancy and Floatation
- 3.10 Meta Center, Meta-Centric height and its determination
- 3.11 Condition of Equilibrium, Stability of submerged and floating bodies
- 3.12 Fluid within a Rigid Body Subjected to Motion (Acceleration and Rotation)

4.0 Kinematics of Flow 8hrs

- 4.1 Lagrangian and Eulerian Approaches of Describing Fluid Flow
- 4.2 Types of flow as Steady and Unsteady, Uniform and Non Uniform and Laminar and Turbulent
- 4.3 One, Two and Three dimensional Flow
- 4.4 Discharge and Mean Velocity of Flow \

- 4.5 Stream Lines, Streak Lines, Path Lines, Stream Tube
- 4.6 Principle of Conservation of Mass
- 4.7 Derivation of Equation of Continuity in Cartesian Co-ordinates and Cylindrical Polar Co-ordinates
- 4.8 Continuity equation for two-dimensional and one-dimensional flow
- 4.9 Velocity and acceleration of fluid Particle
- 4.10 Local and Convective acceleration

5.0 Dynamics of Flow 14 hrs

- 5.1 Various Forces Acting on Fluid
- 5.2 Euler's Equation of Motion and its Applicability
- 5.3 Integration of Euler's Equation of Motion in One Dimension to get Bernoulli's Equation
- 5.4 Energy of Steady Fluid Flow
- 5.5 Bernoulli's equation for real fluid
- 5.6 Application of Bernoulli's Equation to Orifice and Mouthpiece
- 5.7 Determination of hydraulic coefficients
- 5.8 Varying Head Flow: Emptying and Filling of Tanks
- 5.9 Venturimeter, Orifice-meter, Nozzlemeter and Pitot Tube
- 5.10 Derivation of Momentum Equation
- 5.11 Application of Momentum Equation to calculate Forces on Pipe Bends, Reducers
- 5.12 Force Exerted by Jets on Moving and Stationary Vanes of Different Shapes
- 5.13 Concept of Angular Momentum
- 5.14 Problems of Sprinklers

6.0 Boundary Layer Theory 3 Hrs

- 6.1 Concept of Boundary layer and its Application
- 6.2 Boundary Layer concept along a thin layer (Laminar Zone, Turbulent Zone, Transition Zone as well as Laminar Sub-layer.
- 6.3 Boundary Layer thickness, Momentum thickness and displacement thickness
- 6.4 Smooth and Rough Boundary examples

Practicals:

1. Newton's Law of Viscosity
2. Hydrostatic Forces on a Submerged Body.
3. Stability of a Floating Body.
4. Verification of Bernoulli's Theorem using venturimeter
5. Impact of Flow Jet
6. Flow Through Edged Orifice

References Books

1. J Lal, Fluid Mechanics and Hydraulics, Metropolitan Books Co. Pvt. Ltd. Delhi, 1987
2. P. N. Modi & S. M. Seth., "Fluid Mechanics and Hydraulics, Standard Book House, 2009
3. D. S. I Kumar, "Fluid Mechanics and Fluid Mechanics Engineering", S. K Kataria & Sons, Sixth Edition, 2005

4. D. P. Sangroula. "Fundamental of 'Fluid mechanics'". Nepal Printing Support, Anamnagar, Kathmandu, 2008
5. P.K Bansal "A Text Book of Fluid Mechanics" Laxmi Publishers" 2005