

PURBANCHAL UNIVERSITY

Biratangar, Nepal

B.E. (Civil Engineering)

Syllabus (Jestha, 2069)

Year: II

Semester: IV

| S. No. | Course Code | Course Description | Credits | Lecture | Tutorial | Laboratory | Total |
|--------|-------------|------------------------------|-----------|-----------|-----------|------------|-----------|
| 1. | BEG203SH | Probability & Statistics | 3 | 3 | 2 | - | 5 |
| 2. | BEG210AR | Fundamentals of Architecture | 3 | 2 | - | 2 | 4 |
| 3. | BEG259CI | Survey - II | 3 | 3 | 1 | 4 | 8 |
| 4. | BEG262CI | Hydraulics | 3 | 3 | 2 | 2/2 | 6 |
| 5. | BEG263CI | Engineering Hydrology | 3 | 3 | 2 | 2/2 | 6 |
| 6. | BEG265CI | Theory of Structure - I | 3 | 3 | 3 | 2/2 | 7 |
| 7. | BEG296MS | Research Methodology | 2 | 2 | 1 | - | 3 |
| | | Total | 19 | 19 | 11 | 9 | 39 |

Probability and Statistics
BEG203SH

Year: II

Semester: IV

| Teaching Schedule Hours/week | | | Examination Scheme | | | | Internal Assessments | | Total Marks | Remarks |
|------------------------------|---|---|--------------------|-------|-----------|-------|----------------------|-----------------|-------------|---------|
| | | | Final | | | | | | | |
| | | | Theory | | Practical | | Theory Marks | Practical Marks | | |
| L | T | P | Duration | Marks | Duration | Marks | | | | |
| 3 | 1 | - | 3 | 80 | - | - | 20 | - | 100 | |

Course Contents:

1. **Introduction and Descriptive Statistics** **5 hrs**
 - 1.1 An overview of Statistics: Application of Statistics in Engineering
 - 1.2 Pictorial Representation of Data (Pie-Chart, Histogram and Ogive Curves)
 - 1.3 Measures of location: Mean, Median, Mode and Partition Values
 - 1.4 Measures of variability (standard deviation, CV and their application)

2. **Correlation and Regression** **4 hrs**
 - 2.1 Correlation
 - 2.2 Coefficient of Correlation (Karl Pearson's and Spearman's), the coefficient of determination, properties and interpretation
 - 2.3 Regression, Simple lines of regression
 - 2.4 Properties of regression coefficient

3. **Probability** **4 hrs**
 - 3.1 Sample spaces and events
 - 3.2 Axioms, interpretations and properties of probability
 - 3.3 Counting techniques
 - 3.4 Conditional probability
 - 3.5 Theorems on probability (Addition, Multiplication and Bayes and their applications)

4. **Random Variables and Mathematical Expectation** **3 hrs**
 - 4.1 Introduction, types of random variable, Probability mass function and probability density function, cumulative distribution function
 - 4.2 Mathematical Expectation and its physical meaning
 - 4.3 Probability distribution and its types

5. **Discrete Probability Distributions** **6 hrs**
 - 5.1 The Binomial and Poisson probability distribution, introduction, characteristics, mean and variance and its application
 - 5.2 Fitting of Binomial and Poisson distribution
 - 5.3 The hyper-geometric and negative binomial distributions (introduction and properties only)

6. **Continuous Probability Distribution** **4 hrs**
 - 6.1 The Normal, Standard Normal, The Gamma, Chi-squ are and t-distribution (introduction, characteristics end its applications)

7. **Estimation** **5 hrs**
 - 7.1 Parameters and Statistics
 - 7.2 Standard error and sampling distribution

7.3 Point estimation

7.4 Interval Estimation (single of proportion & mean, difference of proportion & mean)

7.5 Properties of good estimator

8. Statistical Inference

9 hrs

8.1 Hypothesis, types of hypothesis, Error in testing of hypothesis, level of significance, degree of freedom, one tailed and two tailed, some comments on selecting a test procedure

8.2 Large-sample tests (z-test), Test for population mean, population proportion, different between two population means and proportions

8.3 Small sampling distribution (t-test): t-test for single mean, difference of two means, and paired t-test

9. The Analysis of categorical data

5 hrs

9.1 Chi-square test

9.2 Test procedures for a population variance

9.3 Test for goodness of fit

9.4 Two way contingency table and test of independence of attributes

Reference Books:

1. Jay L. Devore, "Probability & Statistics for Engineering & the Sciences", Brooks/Cole Publishing Company, Monterey, California, 1982
2. S. C.Gupra: "Fundamental of Statistics, Sultan Chand Publication
3. Arjun K. Gaire, "Probability & Statistics for Engineering", Kathmandu

**Fundamental of Architecture
BEG210AR**

Year: II

Semester: IV

| Teaching Schedule Hours/week | | | Examination Scheme | | | | Internal Assessments | | Total Marks | Remarks |
|------------------------------|---|---|--------------------|-------|-----------|-------|----------------------|-----------------|-------------|---------|
| | | | Final | | | | | | | |
| | | | Theory | | Practical | | Theory Marks | Practical Marks | | |
| L | T | P | Duration | Marks | Duration | Marks | | | | |
| 2 | - | 2 | 1.5 | 40 | - | - | 10 | 50 | 100 | |

Course Objective: To provide the students with the basic knowledge in architectural planning and design of different private and public buildings.

Course Contents:

1. **Introduction** **2 hrs**
 - 1.1 A brief introduction of Architecture
 - 1.2 Basic Techniques of Architectural development

2. **Building and their types** **4 hrs**
 - 2.1 Functional Classification of the buildings
 - 2.2 Construction System of the Building

3. **Basic Principles of Architectural Design** **4 hrs**
 - 3.1 Design Process
 - 3.2 Modern Technologies of designing

4. **Basic Principles of Urban Planning** **4 hrs**
 - 4.1 Principles of Urban Planning and its impact in environment
 - 4.2 Restoration and Reconstruction of Architectural objects

5. **Architectural Composition** **4 hrs**
 - 5.1. Form and function, volumetric and spatial composition of building
 - 5.2 .General introduction of proportion, rhythm, harmony and space

6. **Basic Building Science** **4 hrs**
 - 6.1 Thermal insulation and its importance
 - 6.2 Acoustics
 - 6.3 Light

7. **Residential Building and their types** **2 hrs**
8. **Public Building and their type** **2 hrs**
9. **Building for community purpose** **2hrs**
 - 9.1 Kinder gardens
 9. 2 Public centers
 - 9.3 Schools
 - 9.4 Bazaars/Supermarkets

- | | |
|---|--------------|
| 10. Airport and Railways stations | 1 hrs |
| 11. Auditorium, Theaters and Sport complexes | 1 hrs |

Course Project:

Each student will prepare architectural design of building and prepare plan, elevation, section, site plan and perspective of the building and submit to the teacher at the end of the semester as a course project.

Reference Books:

1. Ching, Francis D., A Visual Dictionary of Architecture, VNR Publications, New York
2. Fletcher, Banister, A History of Architecture 19th Edition
3. Hiraskar G. K., The Great Ages of World Architecture, Dhanp Rai & Sons, Delhi, 1996
4. The Architects, E. D. Kostof, Spiro, Oxford University Press, New York, 1997
5. Nuttgens, Patrick., the Story of Architecture, 2nd Edition. Phaidon Press Ltd., London

Survey - II BEG259CI

Year: II

Semester: IV

| 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 | 4 | 3 | 80 | - | - | 20 | 25 | 125 | |

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

- Apply the basic principle of surveying for land characterization,
- Gain general and theoretical knowledge on plane and topographical surveying of small area,
- Carry out mapping works by both digital and graphical means.

Course Contents:

- | | |
|--|--------------|
| <p>1.0 Traversing</p> <p>1.1 Principles and importance of traversing, types of traverse</p> <p>1.2 Field works for traversing and booking of field notes</p> <p>1.3 Reduction of reading to angle and bearing</p> <p>1.4 Angular misclosure and Closing Error</p> <p>1.5 Traverse adjustment and computation for closed and link traverse – Gale's Table</p> <p>1.6 Plotting of traverse survey</p> <p>1.7 Omitted measurements in traversing</p> <p>1.8 Instructions to field applications</p> | 6hrs |
| <p>2. Tachometry</p> <p>2.1 Definitions</p> <p>2.2 Principle of optical distance measurements</p> <p>2.3 Systems of tacheometric measurements- Stadia method and tangential method using vertical staff</p> <p>2.4 Subtense bar</p> <p>2.5 Booking and plotting of details</p> <p>2.6 Sources of errors and precision of tacheometric survey</p> <p>2.7 Instruction on field work</p> | 5 Hrs |
| <p>3. Trigonometric Leveling</p> <p>3.1 Problems of heights and distances</p> <p>3.2 Plane and geodetic trigonometric leveling</p> <p>3.3 Significance and error ratio</p> <p>3.4 Instruction on field applications</p> | 4 Hrs |
| <p>4. Contouring</p> <p>4.1 Introduction</p> <p>4.2 Contour interval and characteristics of contours</p> <p>4.3 Method of contouring (direct and indirect)</p> <p>4.4 Interpolation of contours</p> <p>4.5 Use of contour map</p> | 4 Hrs |

| | | |
|------------|--|---------------|
| | 4.6 Instruction on field works | |
| 5. | Orientation | 3 hrs |
| | 5.1 Introduction | |
| | 5.2 Analytical intersection and resection | |
| | 5.3 Two point and three point problems and their significance | |
| | 5.4 Use of geodetic control points | |
| | 5.5 Instruction on field applications | |
| 6. | Curves | 10 hrs |
| | 6.1 Classification of curves and their common uses | |
| | 6.2 Elements of simple circular curves | |
| | 6.3 Setting out of simple circular curves by ordinate from long chord, by offset from tangents and by deflection angle methods | |
| | 6.4 Geometry of transition curves and their elements | |
| | 6.5 Elements of vertical curves and computation of reduced levels of points on curve | |
| | 6.6 Instruction on field applications | |
| 7. | Triangulation and Trilateration | 4hrs |
| | 7.1 Introduction | |
| | 7.2 Principal of triangulation | |
| | 7.3 Purpose of triangulation | |
| | 7.4 Classification of triangulation | |
| | 7.5 Layout of triangulation | |
| | 7.6 Fieldwork of triangulation | |
| 8. | Photogrammetry and Remote Sensing | 3 hrs |
| | 8.1 Introduction to photogrammetry as a branch of surveying | |
| | 8.2 Types of aerial photographs | |
| | 8.3 Scale of vertical photograph | |
| | 8.4 Relief displacement | |
| | 8.5 Merits and limitations of photogrammetry | |
| | 8.6 Introduction to remote sensing | |
| 9. | Field Astronomy and GPS System | 2 Hrs |
| | 9.1 Celestial sphere and spherical triangle | |
| | 9.2 Characters of spherical triangles | |
| | 9.3 Merits of field astronomy and GPS system for horizontal control in civil engineering problems | |
| 10. | EDM | 2 Hrs |
| | 10.1 Basic definition | |
| | 10.2 Classification of EDM instruments | |
| | 10.3 Principle of Electronic Distance Measurement | |
| 11. | Total Station | 2 Hrs |
| | 11.1 Introduction | |
| | 11.2 Features of total station | |
| | 11.3 Electronic data recording | |
| | 11.4 Summary of total station characteristics | |
| | 11.5 field procedures for total station in topographical surveying | |

Laboratory: There shall be eight laboratory exercises this course. These are:

1. Traverse survey, computation and plotting
2. Application of tachometry to measure distance and elevation by the stadia system including detailing, computation, plotting and contouring
3. Intersection and resection using theodolite.
4. Establishing of control points by triangulation and trilateration.
5. Trigonometric leveling.
6. Setting out of simple circular curve, transition curve.
7. Demonstration and application of total station.
8. Demonstration and application of GPS.

Requirements: The number of students in each group should not be more than five. A facilitator should not response more than three groups.

Reference Books:

1. Banister, A. & Raymond, S., "Surveying", ELBS Publication
2. Punima, B. C., "Surveying", Khanna Publishers
3. Agor, R., "A Text Book of Surveying and Leveling", Khanna Publishers
4. Dr.Arrora K. R. , "Surveying", Standard Book House, Delhi

Hydraulics BEG262CI

Year: II

Semester: IV

| 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 | 2 | 2/2 | 3 | 80 | - | - | 20 | 25 | 125 | |

Course Contents:

1. Pipe Flow

6 Hrs

- 1.1 Introduction
- 1.2 Continuity and Bernoulli's Equations
- 1.3 Laminar and Turbulent Flow, Reynolds Equations
- 1.4 Head loss, Hazen Poisseuille Equation
- 1.5 Hydraulic and Energy Grade line
- 1.6 Darcy-Weisbach's formula, Colebrooke white's Equations and its Development. Use of Moody's Chart
- 1.7 Types of Pipe flow problems and their solutions.

2. Pipe Networking

5 Hrs

- 2.1 Short and Long Pipes with constant diameters
- 2.2 Pipes in Series and parallel
- 2.3 Equivalent Pipe
- 2.4 Pipe network by Hardy-Cross method
- 2.5 Three Reservoir Problem and its solution

3. Syphon

2 Hrs

- 3.1 Definition and condition of application
- 3.2 Conditions for continuous supply
- 3.3 Syphon Problem and its Solution

4. Unsteady Flow in Pipes

4 Hrs

- 4.1 Water Hammer and its effects in pipes and Penstock
- 4.2 Water Hammer due to gradual closure of valve
- 4.3 Variation of pressure due to sudden closure of valve for the cases of rigid and elastic pipes
- 4.4 Relief Devices against action of water hammer

5. Open Channel Flow

3 Hrs

- 5.1 Open Channel as mode of water Transportation
- 5.2 Differences between pipe flow and open channel flow
- 5.3 Classifications and shapes of open channel
- 5.4 Geometric properties of channel: Area of flow, Vetted perimeter and Hydraulic radius
- 5.5 Classification of open channel by time, space and hydraulic regime

6. Uniform flow

6 Hrs

- 6.1 Condition of uniform flow in prismatic channel
- 6.2 Shear stress and velocity Distribution
- 6.3 Chezy's and Manning's equation
- 6.4 Relationship between Chezy's, Manning and Darcy's coefficient

- 6.5 Most economic rectangular, triangular, trapezoidal and circular section
- 6.6 Types of uniform flow problems and solutions
- 7. Flow Over Notches and Weirs 4 Hrs**
- 7.1 Types of Broad and Sharp crested weirs and different shapes
- 7.2 Discharge equation for Rectangular, Triangular and Trapezoidal weirs – Francis formula
- 7.3 Consideration of Approach velocity and notch ventilation
- 7.4 Advantage of Notches
- 8. Non-Uniform Flow in Open Channel 4 Hrs**
- 8.1 Energy and Momentum Principle for open channel flow
- 8.2 Specific energy, critical depth, Alternate depths of flow and depth-discharge relationship
- 8.3 Use of specific energy concept in analyzing flow over broad crested weirs, flumes and Venturi flumes
- 8.4 Concept of specific forces
- 9. Gradually Varied Flows 4 Hrs**
- 9.1 Description of water surface profile behind Dams and other Water retaining Structure
- 9.2 Governing equation of Gradually varied flow and assumptions in their derivations
- 9.3 Classification of slopes
- 9.4 Solution of Gradually varied flow Equations by Graphical and Numerical methods
- 10. Hydraulic Jump and its Analysis 3 Hrs**
- 10.1 Flow conditions and applications
- 10.2 Hydraulic Jump equation
- 10.3 Energy Loss in Hydraulic Jump
- 10.4 Practical Examples of Jump
- 11. Flow in Non-rigid Boundary Channel 2Hrs**
- 11.1 Non-rigid Boundary channel – Difference from Rigid Boundary Alluvial Channel
- 11.2 Effects of shear stress and incipient motion, Critical tractive stresses
- 11.3 Shield's approach of predicting critical tractive stress
- 11.4 Various types of Bed forms
- 12. Similitude and Physical Modeling 2Hrs**
- 12.1 Definition and Types of Similarities
- 12.2 Definition and Types of Models, Necessity of model Studies
- 12.3 Modeling Criteria
- 12.4 Introduction to Distorted and Undistorted Models
- 12.5 Introduction to Scale effects in Model Studies

Laboratories

1. Reynolds's Experiment
2. Head Loss in a pipe line
3. Flow through open sluice gate
4. Hydraulic Jump in open channel
5. Flow over Broad-crested weir) Triangular Notch and Rectangular Notch

Reference Books:

1. J Lal Fluid Mechanics & Hydraulics, Metropolitan Books Co. Ltd., New Delhi, India
2. K. G. Ranga Raju, Flow through Open Channel, Tata McGraw Hill Publishing Co. Ltd., New Delhi, India
3. VenTe Chow, Open Channel Hydraulics, McGraw Hill Book Co. Ltd., 1973
4. P. N. Modi & S.M. Seth, Fluid Mecha11ics & Hydraulics, standard Book House, 2009
5. K. Subramanya, Flow in Open Channels, Tara McGraw Hill Publishing Co. Ltd., 2000

Engineering Hydrology

BEG263CI

Year: II

Semester: IV

| 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 | 2 | 2/2 | 3 | 80 | - | - | 20 | 25 | 125 | |

Course Contents:

1. Introduction

4

Hrs

- 1.1 Hydrology as a Science of Water
- 1.2 Scope and Application of Hydrology in Civil Engineering
- 1.3 Hydrological Cycle and Water Balance Equation
- 1.4 Development of hydro meteorological study in Nepal

2. Hydrological Processes

12 Hrs

- 2.1 Precipitation, its Causes, Classification and Measurement by Rain gauges
- 2.2 Types of Rain gauges, Locations, Site Selection, Errors in Measurement
- 2.3 Double Mass Curve Method of Adjustment and hyetograph
- 2.4 Analysis of Point Rainfall by various Methods
- 2.5 Intensity Duration Curve, Depth -Area-Duration Curve
- 2.6 Snow fall and Introduction to Snow-fall Measurement
- 2.7 Evaporation, types of Evaporimeter, Evapotranspiration and factors affecting Evapotranspiration
- 2.8 Penman's Equation and its uses
- 2.9 Infiltration, factors affecting infiltration, Horton's Equation, Infiltration Indices (ϕ and W) and Infiltrimeters

3. Surface Runoff

8 Hrs

- 3.1 Stream Gauging, Selection of Site, Types of Gauges and their Selection
- 3.2 Measurement of Velocity by Current Meter, by floats, by surface and sub surface velocity Rods
- 3.3 Flow Measurement in River Cross-Section by velocity area method and slope area method
- 3.4 Rainfall Runoff Correction and Rating Curves
- 3.5 Factors Affecting Runoff from a Catchment

4. Hydrographs

7Hrs

- 4.1 Hydrographs and their Analysis
- 4.2 Unit Hydrograph and its Limitation
- 4.3 Derivation of Unit Hydrographs from different Storms
- 4.4 Peak Flow Estimation using Empirical Methods
- 4.5 The Rational Method and its Limitation

- 5. Hydrology of Floods** **3 Hrs**
- 5.1 Definition. Causes and Effects of Floods
 - 5.2 Hydro Geomorphologic Characteristics of Rivers
 - 5.3 Flood Prediction and Design Flood
 - 5.4 Methods of Mitigating Floods
- 6. Statistical Hydrology** **6Hrs**
- 6.1 Introduction to Frequency and Probability Concept
 - 6.2 Frequency Analysis and Recurrence Interval
 - 6.3 Gamma and Student's Distribution and their application in Hydrology
 - 6.4 Gumbel's Method in Hydrology
- 7. Ground Water** **5 Hrs**
- 7.1 Occurrences and Distribution of Ground water Aquifers, Aquicludes and Artesian Wells
 - 7.2 Water Wells and Their Types
 - 7.3 Wells and Their Classifications
 - 7.4 Devices for Testing of Wells
 - 7.5 Role of Ground Water for Irrigation Development
 - 7.6 Well Hydraulics
 - 7.7 Recharge of Ground Water
 - 7.8 Introduction to the Pumps for the Water Well

Laboratories:

1. Use of Current meter in determining flow velocity in the field.
2. Discharge measurement in the field by float method.
3. Discharge measurement by slope area and velocity area method in the field.

Reference Books:

1. K. Subramanya , Engineering Hydrology, Tata McGraw Hill Publication
2. Venn Te Chow, Applied Hydrology
3. FAO Irrigation & Drainage Engineering, Paper-24, (1972)
4. R. S. Varshney, Engineering Hydrology, Nem Chand & Bros., Roorkee
5. Linsley Kobler & Paulhus, Hydrology for Engineers, McGraw Hill Publishing Company

Theory of Structure - I

BEG265CI

Year: II

Semester: IV

| 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 | 3 | 2/2 | 3 | 80 | - | - | 20 | 25 | 125 | |

Course Objective: To familiarize the terminology and concept about the type of determinate structures and provide the understanding of useful analysis methods under different loading conditions.

Course Contents:

- 1. Introduction 2hrs**
 - 1.1 Types of structures
 - 1.2 Linearly elastic structures
 - 1.3 Non-linearity in structural behavior
 - 1.4 Methods of analysis

- 2. Strain Energy Method 4hrs**
 - 2.1 Strain energy and complementary strain
 - 2.2 Strain energy due to gradually applied, suddenly applied and impact loads
 - 2.3 Strain energy due to bending, shear and torsion
 - 2.4 Displacement by method of Real work / strain energy
 - 2.5 Real work from bending
 - 2.6 Limitation of the method of real work

- 3. Virtual Work Method 5 Hrs**
 - 3.1 Work and complementary work
 - 3.2 Direct and bending effects
 - 3.3 Deflection by unit load virtual work methods
 - 3.4 Temperature effects, length adjustments and misfits
 - 3.5 Combination of different effects in statically determinate beams, frames and trusses

- 4. Deformation of Statically Determinate Beams, Frames and Trusses 10 Hrs**
 - 4.1 Curvature, slope and deflection
 - 4.2 Differential equation of the deflection curve.
 - 4.3 Deflection by method of integration
 - 4.4 Deflection by moment area method

- 5. Influence Lines for Simple Structures 12 Hrs**
 - 5.1 Concept of influence lines

- 5.2 Influence Line diagrams for reactions, bending Moments and shear forces in beams
- 5.3 Influence Line Diagrams for the case of indirect load application (Panel loadings)
- 5.4 Calculation of reactions, bending moments and shear forces from the influence line
- 5.5 Criterion for maximum reaction, shear force, bending moment in simple beams
- 5.6 Inflection diagram using train of loads
- 5.7 Influence line diagrams for forces in members of plane trusses
- 5.8 Criterion for maximum axial force in a member of a plane truss

6. **Statically Determinate Arches**

6 Hrs

- 6.1 Various types of arches
- 6.2 Various types of three hinged structures - symmetrical and unsymmetrical, supports at different levels, arches parabolic and circular
- 6.3 Support reactions, bending moments, normal and radial shear forces in circular and parabolic three hinged arches
- 6.4 Introduction to influence line diagram for support reactions, shear forces, bending moments and radial shear in three hinged arches

7. **Cable Structure**

6Hrs

- 7.1 Cable and cables bridges
- 7.2 General cable theorem
- 7.3 Cables under uniformly distributed load
- 7.4 Elements of simple suspension bridge
- 7.5 Suspension bridge with three-hinged stiffening girder

Laboratories:

1. Influence lines for beams.
2. Analysis of plane frames.
3. Influence line for horizontal thrust in a three-hinged arch
4. Reaction on three-hinged arch under given system of loading.
5. Deflection of beam subjected to point load and Uniformly distributed load.
6. Experimental analysis of suspension bridge.

Reference Book:

1. C. H. Norris, J. B. Wilbur & S. Utku, Elementary Structural Analysis, 3rd Edition, McGraw Hill Company Limited, New York, 1977
2. C. K. Wang, Intermediate Structural Analysis, International Student Edition, McGraw Hill Company Limited, 1989
3. A. Darken, Kuznets, Structural Mechanics, Mir Publishers, Moscow
4. C. B. Korea, V. V. Satyr, Experimental Methods in Structural Mechanics, Standard Publishers Distributors, Delhi, 1991

Research Methodology BEG296MS

Year: II

Semester: IV

| Teaching Schedule Hours/week | | | Examination Scheme | | | | Internal Assessments | | Total Marks | Remarks |
|------------------------------|---|---|--------------------|-------|-----------|-------|----------------------|-----------------|-------------|---------|
| | | | Final | | | | | | | |
| | | | Theory | | Practical | | Theory Marks | Practical Marks | | |
| L | T | P | Duration | Marks | Duration | Marks | | | | |
| 2 | 1 | - | 1.5 | 40 | - | - | 10 | - | 50 | |

Course Objective: To explain the concept of research method and their applications which can be applied to any research studies.

Course Contents:

1. **Social Research** **3hrs**
 - 1.1 Definition
 - 1.2 Objectives
 - 1.3 Phases on Social Research
 - 1.4 Types of Social Research: Basic & Applied Research

2. **Fundamental Concept on Research** **5hrs**
 - 2.1 Hypothesis
 - 2.2 Sampling, its characteristics, types, benefits and problems
 - 2.3 Field work
 - 2.4 Validity
 - 2.5 Reliability

3. **Research Design** **5 hrs**
 - 3.1 Definition of Research Design
 - 3.2 Types of research Design
 - 3.3 Research Proposal
 - 3.4 Selection of topics of Research

4. **Data Collection** **4 hrs**
 - 4.1 Meaning of Data Collection
 - 4.2 Importance of Data collection
 - 4.3 Types of Data
 - 4.4 Source of Data Collection

5. **Data Collection Techniques and Classification** **5 hrs**
 - 5.1 Survey
 - 5.2 Interview
 - 5.3 Questionnaire
 - 5.4 Case Study
 - 5.5 Observation
 - 5.6 Analysis and presentation of data

6. **Median and Standard Deviation** **5hrs**
 - 6.1 Definition
 - 6.2 Different methods of calculation of mean median and standard Deviation

7. Report Writing

3 hrs

- 7.1 Definition
- 7.2 Organization Report
- 7.3 Presentation of Diagram
- 7.4 Construction of tables
- 7.5 Bibliography

Reference Books:

1. Perm R. Patna, "Social Science Research & Thesis Writing", Buddha Publisher
2. Best, John W., "Research Education", Prentice Hall of India, New Delhi
3. Goode William J. & Paul. Hat, "Methods in Social Research". McGraw Hill, Kogakt1sha Ltd., 1952
4. Tika Bhattarai, "Research Methodology"