Purbanchal University

Faculty of Engineering, Biratnagar, NEPAL

Eighth Semester's Course Structure

Program: Bachelor in Civil Engineering

Effective from 2021 (2078) Batch

Year-IV **Semester-VIII**

S.N.	Course code	Subject	Credit Hours	L	T	P	Total	Internal		Final		Total
								Th.	P	Th.	P	
1	BCI8035	Civil Engineering Project II	3	1	-	3	4	-	100	-	50	150
2	BEG8009	Engineering Professional Practice	2	2	1	-	3	20	-	30	-	50
3	BCI88--	Elective-II	3	3	2	-	5	40	-	60	-	100
4	BCI8036	Internship	3	-	-	#	-	-	100	-	-	100
		Total	**11**	**6**	**4**	**4**	**12**					**400**

30 working days

Note- **L:** Lecture **T:** Tutorial **P:** Practical **Th. :** Theory

CIVIL ENGINEERING PROJECT-II
BCI8035

Year: IV **Semester: VIII**

Teaching Hours/week				Examination Scheme						Total Marks
				Internal		Final				
				Theory	Practical	Theory		Practical		
Credit Hours	L	T	P			Duration	Marks	Duration	Marks	
3	1	-	3	-	100	-	-	-	50	150

Course Objective:
This course is designed to apply the acquired knowledge in the real engineering fields and to enhance the students' confidence to work as professional**.**

Course Details:

Under the supervision and guidance of member/members of faculty each student is required to carry out an individual or group project which provides opportunities for tackling problem to Civil Engineering and is required to submit a project report.

A project may involve:
a) An experimental investigation,
b) Preparation of Dissertation involving a literature survey and a correlation of existing knowledge,
c) Preparation of a design for an extensive Civil Engineering project

The project will be conducted under the guidance of the member/members of faculty as they fit beneficial to the students. In the initial phase the faculty may conduct a number of lectures and discussions as to the approach of the project. In the later phase the student will be left on his own to pursue his work and to consult the faculty whenever any problem crops up. He/she should submit a draft report prior to the final report so the guide can correct gross mistake. The final report should be submitted to the department Head in duplicate. The final report should be defended with presentation by the students.

Evaluation Scheme:

The work of the students will be evaluated on the basis of their performance in the project work during the semester, their presentation/communication skill and viva voce during the defense of their project progress/status. The department and the supervisor will be responsible for the 50% evaluation of the total internal marks.

ENGINEERING PROFESSIONAL PRACTICE
BEG 8009

Year: IV **Semester: VIII**

Teaching Hours/week				Examination Scheme						Total Marks
				Internal		Final				
				Theory	Practical	Theory		Practical		
Credit Hours	L	T	P			Duration	Marks	Duration	Marks	50
2	2	1	-	20	-	1.5 Hours	30	-	-	

Course Objectives:
To introduce ethical and legal environment in which engineering is practiced.

Course Content:

1.0 Engineering Professionalism: **[6 hrs]**

- **1.1** Profession/Professional and Professionalism.
- **1.2** Moral and ethics in engineering profession.
- **1.3** Codes of ethics and guidelines for engineering Profession.
- **1.4** Relationship of the engineering Profession to basic science and technology; Relationship to other Profession
- **1.5** Key roles of engineers in development activities.
- **1.6** Law of ethics in engineering practices.
- **1.7** Fundamental canons for professional engineers.
- **1.8** Individual freedoms and society goals

2.0 History of Engineering Practices:- **[4 hrs]**

- **2.1** Concept about society, elements of society and types of society.
- **2.2** History of engineering practice in eastern and western society.

3.0 Engineering Professional Practice in Nepal: **[10 hrs]**

- **3.1** Nepal Engineering Council and Nepal Engineering Association.
- **3.2** Engineering Council Act
- **3.3** Contract Law, Elements and types of Contract Law.
- **3.4** Globalization and cross cultural issues
- **3.5** Company Registration

3.6 FIDIC
3.7 Public Private Partnership (PPP)
3.8 Tort liability, Elements of Tort liability and Types of Tort liability.
3.9 Business and labor laws.
3.10 Relationship to foreign firms working in Nepal.
3.11 Trade Union Act

4.0 Professional Practice Sectors in Nepal: **[4 hrs]**
4.1 Job description of engineers working in public sectors
4.2 Job description of engineers working in private sectors

5.0 Issues on Engineering Professional Ethics: **[6 hrs]**
5.1 Intellectual property rights: copy rights, Trademark and Patent protection.
5.2 Engineers in international development.
5.3 Conflict and Dispute management
5.4 Corporate social responsibilities

References:

1. Carson Morrison and Philip Hughes, "Professional Engineering Practice- Ethical Aspects", McGraw- Hill Ryerson Ltd., Toronto 1982
2. Dr. RajendraAdhikari, "Engineering Professional Practice- Nepalese and International Perspectives"PashupatiPublicing House, Kathmandu Nepal 2010
3. M. Govindarajan; S Natrajan and Senthikumar. "Engineering Ethics"- PHI- Learning Pvt. Ltd.New Delhi 2009

Final Examination Scheme:		
Chapters	Marks	Remarks
1	6	
2	4	
3	10	
4	4	
5	6	
Total	30	
Note: There might be deviation in mark distribution. *Mandatory: Evaluation should be based on solving approach and steps.*		

PURBANCHAL UNIVERSITY

FIRST SEMESTER FINAL EXAM-2025

(MODEL QUESTION)

LEVEL : B. E. Civil/Computer/Bio-Medical/Elex. Comm & Automation
SUBJECT: Engineering Professional Practice
FULL MARKS : 30 PASS MARKS: 12 TIME : 1.5 hours

Answer All Questions:

Group A: **[2×2=4]**

1. Define Patent, Copyright and Trademark.
2. Mention few examples of Corporate Social Responsibilities.

Group B: **[4×4=16]**

3. Explain Moral and ethics and describe Law of ethics in detail.
4. Discuss Key roles of Engineers in development activities with suitable examples.
5. Describe Fundamental canons for Professional Engineers.
6. Discuss Profession, Professionalism and features of Professionals.
7. Discuss Engineering Registration process by Nepal Engineering Council and explain Code of ethics for Engineers developed by NEC.

Group C: **[2×5=10]**

8. Discuss Tender and Tender Process in detail. Explain Prequalification and Post qualification.

   OR

   Discuss Tort liability, elements of tort, types of negligence and types of liability with suitable examples.
9. A RCC bridge was designed by the designer on behalf of consultant. This was constructed by the reputed "A" class contractor. After the completion of the Construction, traffic was allowed on the bridge. After six months of operation there were crack in the bridge. A Probe Team was established by Road department. The design procedure was okay, but it was found that the quality of steel metal used was not duly tested. The contractor argued that the procedure of construction was in accordance with the instruction of Engineer and specification. There was also lack of proper supervision by the consultant. The design load for the bridge was 20 Tons. It was also reported that there happen to pass more than 20 Tons vehicles also. The consultant was good friend of contractor. Being a member of Probe Team, what is your judgment on the failure of this bridge?

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INTERNSHIP
BCI8036

Year: IV **Semester: VIII**

Teaching Hours/week				Examination Scheme						Total Marks
				Internal		Final				
				Theory	Practical	Theory		Practical		
Credit Hours	L	T	P			Duration	Marks	Duration	Marks	
3	-	-	#	-	100			-	-	100

Internship Duration will be 30 working days.

Course Objective:

The internship course is a practical experience gaining course. The objective of the course is to provide exposure for final year students into market and to provide opportunity for career exploration. The course is expected to make students more pragmatic and professional. It includes applying theoretical and practical knowledge for solving real world problems while working in civil engineering project and understanding of engineering ethics.

Course Details:

The students should basically acquire knowledge on following topics:

1. General concept of civil engineering firm's working method.
2. Client dealings, discussion, conversation etc. as related with acquiring of jobs, concept development, project execution and supervision.
3. The students are supposed to work on various types of civil engineering projects that may be related with construction, design and research works.
4. Producing of drawings, working drawings and detailing, correction and changes etc.
5. Documentation and report preparation.
6. Study of drawings of previous projects (already executed)
7. Site visits and supervision so as to learn how to do changes in drawing as per site condition and requirements, quality control in construction etc.

Nature of Internship

The internship is an individual activity. The students should work on various types of civil engineering projects that may be related with construction, design and research works. The internship can be practiced at civil engineering consultants, construction company,

valuator's firm, engineering department of municipalities, government and non-government organizations and other relevant institutions. The student should be responsible for the timely completion of all the activities and projects assigned maintaining professional quality.

Students should maintain daily records and should inform or communicate frequently with the supervisor assigned by the department on the progress and status of intern activities. Each student must prepare and submit individual internship report on the basis of his/her work done during the internship period.

Evaluation Criteria

SN	Description	Marks
1	College Supervisor	30
2	Report/Viva/Presentation	40
3	Office Supervisor	30
Total		**100**

The evaluation and marking will be carried out on the basis of the observation/examination by college supervisor and submitted report/viva/presentation and on the basis of continual observation and examination by office supervisor.

ADVANCED HYDROLOGY (ELECTIVE II)
BCI 8816

Year: IV **Semester: VIII**

Teaching Hours/week				Examination Scheme						Total Marks
				Internal		Final				
				Theory	Practical	Theory		Practical		
Credit Hours	L	T	P			Duration	Marks	Duration	Marks	
3	3	2	-	40	-	3 hrs	60	-	-	100

Course objective

The objective of this course is to gain the knowledge of atmospheric hydrology, hydrologic process, surface run-off, sub-surface flow and unit hydrograph. It gives the knowledge of run-off characteristics of watershed and it's an analysis

Unit 1: Introduction **3hrs**

1.1 Hydrologic cycle ware budget equation, world water quantities, residence time, system concepts, transfer function operators, hydrologic model classification

Unit 2: Hydrologic Process **3hrs**

2.1 Reynolds transport theorem, continuity equation, momentum equation, energy equation, discrete time continuity

Unit 3: Atmospheric hydrology **8hrs**

3.1 Atmospheric circulation, Water vapor, formation of rainfall, types and forms of precipitation,

Monsoon characteristics in Nepal, rainfall measurement, density and adequacy of rain gauges, moving measurement of discharge

3.2 Thunderstorm, cell model, IDF Relationships, spatial averaging methods of rainfall,

moving average method

3.3 Factors affecting evaporation, estimation and measurement of evaporation, energy balance

method, Penman method, Blaney –cridle method, Thronthwait method, Radiation method

Unit 4: Sub-surface water **7hrs**

4.1 Spoil moisture, porosity, saturated and unsaturated flow, Richarrd`s equation, infiltration, Horton`s Philips and green Ampt methods, Ponding time concept

Unit 5: Surface water **7hrs**

5.1 Catchment storage concept, Hortonian and saturation overland flow, stream flow hydrographs, base-flow separation.

5.2 Phi-index, ERH & DRH, algorithm for abstraction using Green-Ampt equation, SCS method, overland and channel flow modeling, time area concepts, and stream networks

Unit 6: Hydrograph: **9hrs**

6.1 General hydrologic system model, response functions of a linear hydrologic systems and their inter-relationships, convolution equation; definition and limitations of a UH;

6.2 UH derivation from single and complex storms: UH optimization using regression. Matrix, and LP methods;

6.3 Synthetic unit hydrograph, S-Curve, IUH, Clerk model

Unit 7: Hydrologic Statistics: **8hrs**

7.1 Probability concepts, random variables, laws of probability, PDFs & CDFs;

7.2 Normal and Binomial distributions; Statistical parameters: expected value, variance, skewness, and peakedness;

7.3 Fitting of a probability distribution, methods of moments and maximum likelihood: Testing the goodness of fit, Chi-square test;

7.4 Frequency analysis: return period, probability plotting, extreme value distributions, Frequency, factors, Log-Pearson distribution, confidence limits

Reference Books:

1. Applied Hydrology by Ven T. Chow, David R. Maidment, and Larry W. Mays,McGraw Hill International Editions.
2. Engineering Hydrology by K. Subramanya, Tata McGraw Hill Publishing Company, New Delhi.

Final Examination Question Format:

In accordance with the unit-wise weightage based on lecture hours, the final examination will be structured as follows. Candidates are required to answer all questions.

Group A: Very Short Answer Questions ***(4 × 2 = 8 marks)***

- This section will consist of four questions, each carrying 2 marks.

Group B: Short Answer Questions ***(7 × 4 = 28 marks)***

- This section will consist of seven questions, each carrying 4 marks.
- *Note:* Two additional questions will be provided as OR options in this section.

Group C: Long Answer Questions ***(3 × 8 = 24 marks)***

- This section will consist of three questions, each carrying 8 marks.
- *Note:* One additional question will be provided as an OR option in this section.

ADVANCED RCC DESIGN (ELECTIVE II)
BCI 8818

Year: IV **Semester: VIII**

Teaching Hours/week				Examination Scheme						Total Marks
				Internal		Final				
				Theory	Practical	Theory		Practical		
Credit Hours	L	T	P			Duration	Marks	Duration	Marks	
3	3	2	-	40	-	3 hrs	60	-	-	100

General objectives:

To make the students familiar with Advance Design Concept of RCC Structure.

Specific objectives:

On the successful completion of the course, students are expected to:

- Apply the theory and design of various problems involving design of RCC structure.
- Understand the long-term deflection and cracking of RCC structure.
- Learn the design of slab, wall and folded plate.
- Understand the design concept of performance-based design.

Course content:

1. Introduction **(5 hrs)**

1.1. Design Philosophies.
1.2. Review on Collapse and Serviceability Limit State
1.3. Modern Seismic Control Devices.
1.4. Evolution of Materials in Structural Design.

2. Deflection, Cracking and Moment Redistribution **(5 hrs)**

2.1. Long Term Deflection of Concrete Beam and Slab
2.2. Crack-width Estimation in RCC Element
2.3. Concept of Moment Redistribution

3. Design of Slab **(8 hrs)**

3.1. Different Approach in Analysis and Design of Slab
3.2. Introduction to Yield Line Analysis of Slab

3.3. Design of Ribbed Slab
3.4. Design of Composite Deck Slab
3.5. Introduction to Precast Hollow Concrete Slab.
3.6. Introduction to Flat Slab

4. Design of Beam **(7 hrs)**

4.1 Review on Design of Simple Beam.
4.2 Introduction to Strut-and-Tie Method (STM) for Beam Analysis
4.3 Design of Deep Beam
4.4 Introduction to Design and Detailing of Spandrel Beam
4.5 Design of Corbel
4.6 Introduction to Design and Detailing of Hunched Beam

5. Design of Footing **(8 hrs)**

5.1 Review on Foundation Settlement and Bearing Capacity
5.2 Review on design of Isolated / Strap and combined Footings
5.3 Design of Raft Footing
5.4 Design of Piled Footing
5.5 Introduction to Design of Piled Raft Footing

6. Design of Retaining Wall, Shear Wall, Water Tank and Chimney **(7 hrs)**

6.1 Design of RCC Retaining Wall
6.2 Design of Shear Wall
6.3 Introduction to Design of Water Tank
6.4 Introduction to Analysis and Design of Chimney

7. Introduction to Performance Based Seismic Design **(5 hrs)**

7.1. Seismic Response Control Concepts
7.2. Seismic Demand and Seismic Capacity
7.3. Overview of Linear and Nonlinear Procedures of Seismic Analysis
7.4. Capacity Based Design
7.5. Performance Based Seismic Design

Final Examination Scheme

Chapters	Marks	Remarks
1 / 2	**2+4+8**	**Th + Nu**
3	**2+2+8**	**Th / Nu**
4	**2+8**	**Th / Nu**
5	**4+8**	**Th / Nu**
6	**2+2+4**	**Th / Nu**
7	**4**	**Th**
Total	**60**	
Note: There might be minor deviation in mark distribution. ***Mandatory: Marks should be evaluated based on solving steps.***		

References

1. Raju, N.K., 2005. *Advanced reinforced concrete design*. CBS Publishers & Distributors Pvt Limited.
2. Varghese, P.C., 2009. *Advanced reinforced concrete design*. PHI Learning Pvt. Ltd.
3. Aoyama, H., 2001. *Design of modern highrise reinforced concrete structures* (Vol. 3). World Scientific.
4. Fragiadakis, M. and Papadrakakis, M., 2008. Performance-based optimum seismic design of reinforced concrete structures. *Earthquake Engineering & Structural Dynamics*, *37*(6), pp.825-844.
5. Gambhir, M.L., 2008. *Design of reinforced concrete structures*. PHI Learning Pvt. Ltd..

PURBANCHAL UNIVERSITY

FIRST SEMESTER FINAL EXAM-2025

(MODEL QUESTION)

LEVEL : B. E. Civil

SUBJECT: Advanced RCC Design (Elective II)

FULL MARKS : 60

TIME : 3 hours PASS MARKS: 24

Candidates are required to give their answers in their own words as far as practicable.
Figure in the margin indicates full marks.

Attempt All Questions.

IS456:2000 / SP16 / NBC105:2020 are allowed.

Q.1. Define Moment redistribution. A cantilever beam of span 2.5 m has a cross section of 250 mm x 450 mm. It is reinforced with 4 bars of 20 mm diameter on tension side and 2 bars of 20 mm on compression side, with effective cover of 50 mm on both sides. Determine the deflection at free end, if it is subjected to a total service load (including self weight) of 30 kN/m. Use M 25 and Fe 500. Take Ultimate shrinkage strain = 0.0003, Creep coefficient = 1.6. [2+8]

Q.2. Define flat slab. Design a RCC grid Floor to cover effective floor area 15m x 15m. Live load on Floor is 4kN/m2. Adopt material as M25/Fe500. Assume slab as simply supported from all 4 sides. Assume suitable grid spacing. Show rebar detailing also. [2+8+4]

Q.3. List types of Raft Footing. Design a pile footing group if total axial load from column is 10,000kN. Take M20 and FE500 as material. Take soil as consolidated clay with unconfined compressive strength as 50kN/m^2. [2+8]

Q.4. Differentiate shear wall and retaining wall. Design a shear wall of length 3m and unsupported height 4m if total axial load on wall is 1000kN, moment about major axis is 800kN-m and moment about minor axis is 50kN-m [2+8]

OR

Explain in short about strut and tie method. Design a RCC Deep Beam simply supported over span of 4m with width of 350mm and depth of 2.5m with udl 50kN/m. [2+8]

Q.5. Write Short Notes on (Any Four) [4x4 = 16]

a) Performance based Design

b) Yield Line Analysis

c) Design Philosophies

d) Corbel Design

e) Analysis of Overhead Water Tank.

End

BIO-ENGINEERING (ELECTIVE II)
BCI 8818

Year: IV **Semester: VIII**

Teaching Hours/week				Examination Scheme						Total Marks
				Internal		Final				
				Theory	Practical	Theory		Practical		
Credit Hours	L	T	P			Duration	Marks	Duration	Marks	
3	3	2	-	40	-	3 hrs	60	-	-	100

Course Objective:
The objective of this course is to provide students with fundamental and applied knowledge of slope stabilization and erosion control using vegetation and bio-engineering techniques. Students will be able to analyze slope stability problems, select appropriate bio-engineering solutions, and understand the role of appropriate and sustainable technology in the development of rural and mountainous infrastructure, particularly in landslide-prone regions.

Course Content:

1.0 Introduction **(2 hrs)**
- 1.1 Definition and concept of bio-engineering
- 1.2 Justification and need of bio-engineering
- 1.3 Fields of applications and scope
- 1.4 Advantages and limitations of bio-engineering techniques

2.0 Site Investigation **(8 hrs)**
- 2.1 Geological study
- 2.2 Geomorphologic study of slopes
- 2.3 Rainfall and its related hazards
- 2.4 Landslides
- 2.5 Triggering agents and mechanisms
- 2.6 Landslide mapping techniques
- 2.7 Assessment of severity and risk
- 2.8 Repair priorities and intervention planning

3.0 Basic Aspects of Vegetation **(5 hrs)**
- 3.1 Plant types, forms and structures

3.2 Vegetation and plant communities
3.3 Basic requirement of plants
3.4 Plants and soil interaction
3.5 Plants and climate interaction
3.6 Plant propagation methods

4.0 Role of Vegetation in slope stability (4 hrs)
4.1 Hydrological effects
4.2 Hydraulic effects
4.3 Mechanical and root reinforcement effects
4.4 Influence of vegetation on Soil strength and stability

5.0 Vegetative Stabilization Techniques (5 hrs)
5.1 Plant engineering concepts
5.2 Vegetative engineering systems
5.3 Design of vegetative systems
5.4 Maintenance and performance monitoring

6.0 Small Scale Civil Engineering Systems (6 hrs)
6.1 Small-scale Civil engineering measures
6.2 Design of civil engineering systems
6.3 Interaction between civil and vegetative systems

7.0 Selection of Plant Species (6 hrs)
7.1 Distribution of plants in Nepal
7.2 Criteria for plant species selection
7.3 Selection based on soil type and slope condition
7.4 Selection based on moisture availability and drought resistance

8.0 Optimal Bio-engineering Techniques (3 hrs)
8.1 Site categorization for bio-engineering
8.1 Selection of optimal technique based on site condition

9.0 Nursery and Plant Production (3 hrs)
9.1 Nursery establishment
9.2 Souring of plants materials
9.3 Nursery techniques
9.4 Nursery management and quality control

10.0 Management and Implementation (3 hrs)

10.1 Programming and implementation planning
10.2 Quality assurance and quality control
10.3 Estimating and costing

References:

• Gray, D.H. & Sotir, R.B. (1996). **Biotechnical and Soil Bioengineering Slope Stabilization**. John Wiley & Sons, New York.

• Coppin, N.J. & Richards, I.G. (1990). **Use of Vegetation in Civil Engineering**. CIRIA, London.

• Morgan, R.P.C. (2005). **Soil Erosion and Conservation** (3rd ed.). Blackwell Publishing.

• Department of Roads (DoR), Nepal. **Roadside Bio-engineering: Site Handbook**.

• Department of Roads (DoR), Nepal. **Roadside Bio-engineering: Reference Manual**.

• Howell, J. (1999). **Roadside Bio-engineering**. Transport Research Laboratory (TRL), UK.

• Stokes, A. et al. (2014). **Eco- and Ground Bio-engineering: The Use of Vegetation to Improve Slope Stability**. Springer.

• Norris, J.E., Stokes, A., Mickovski, S.B. et al. (2008). **Slope Stability and Erosion Control: Ecotechnological Solutions**. Springer.

• Rickson, R.J. (2014). **Sustainable Erosion Control Practices**. Routledge.

• FAO (2011). **Guidelines for Watershed Management and Soil Bio-engineering**. Food and Agriculture Organization, Rome.

• Greenwood, J.R., Norris, J.E. & Wint, J. (2019). **Assessing the Contribution of Vegetation to Slope Stability**. ICE Publishing.

Evaluation Scheme: Marks Division

Question Type	No. of Questions	Marks	Total Marks
Short	4	2	8
Medium	7	4	28
Long	3	8	24
Total			60

Final Examination Scheme:		
Chapters	Marks	Remarks
1	2	Th
2	12	Th
3	6	Th
4	4	Th
5	6	Th
6	10	Th
7	10	Th
8	4	Th
9	4	Th
10	2	Th
Total	60	Th: Theory/N: Numerical
Note: There might be minor deviation in mark distribution. *Mandatory: Evaluation should be based on solving approach and steps.*		

PURBANCHAL UNIVERSITY
SEMESTER FINAL EXAMINATION – 2025 (MODEL QUESTION)

LEVEL: B. E. (Civil)
SUBJECT: Bio-engineering (Elective II) FULL MARKS: 60
TIME: 03:00 hrs PASS MARKS: 24

Attempt all questions.

Group A (2*4=8)

1. Define bio-engineering and explain its significance in slope stabilization.
2. List different plant propagation methods commonly used in bio-engineering.
3. Enumerate vegetative stabilization techniques suitable for shallow landslides.
4. List out key quality control measures to ensure successful bio-engineering slope stabilization.

Group B (4*7=28)

5. A slope is 30° with loose soil and heavy rainfall. Identify suitable site investigation parameters you would study and explain why.

   OR

   A 20 m high slope has a history of shallow landslides. Suggest a site investigation plan including geological, geomorphological, and hydrological studies.
6. Explain the relationship between plants and soil in slope stabilization.

   OR

   Compare and contrast plant community and individual plant characteristics in the context of slope stabilization.
7. Explain the difference between plant engineering and vegetative engineering systems with examples.

   OR

   Explain the concept of palisades and outline the steps involved in their construction.
8. Describe two small-scale civil engineering measures that can complement vegetation on slopes.

   OR

   List two advantages of combining civil and vegetative systems over using only one method.

9. For a hillside in Nepal with dry soil and moderate slope, select suitable plant species for stabilization. Justify your selection based on drought factor, root type, and soil binding ability.

OR

Explain why local plant species are often preferred over exotic species in bio-engineering projects.

10. Explain how site categorization helps in selecting the optimal bio-engineering technique for erosion control.
11. Describe the steps to establish a nursery for slope stabilization plants and outline key management practices.

Group C (8*3=24)

12. A 6-meter high roadside slope in a region with moderate seasonal rainfall has experienced significant surface erosion and minor shallow slips after a recent monsoon. The soil is primarily a silty-clay. As a site engineer, you are required to design a cost-effective and sustainable stabilization solution.

    a) Analyze the site conditions and list the primary engineering challenges for this slope.

    b) Propose a detailed hybrid stabilization design combining one primary civil engineering structure and appropriate vegetative techniques. Provide a step-by-step explanation of the construction sequence and include a neat, labelled cross-sectional diagram of your design.

    c) Briefly state one key long-term ecological advantage of your hybrid design over a purely structural solution.

13. Discuss brush layering as a soil bioengineering technique. Explain its construction procedure, functional mechanism, and suitability for shallow landslides, highlighting key design considerations.

OR

Explain the concept of live check dams in bioengineering works. Describe their design philosophy, construction sequence, and role in controlling gully erosion and debris flow.

14. Compare pure bioengineering techniques with combined civil–bioengineering systems. Explain why hybrid systems are often preferred in road slopes and riverbanks, with reference to slope stability and durability.

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Note: *Number of alternative questions may be different from those in the above model question.*

COMPUTATIONAL TECHNIQUE IN CIVIL ENGINEERING (ELECTIVE II)
BCI 8819

Year: IV **Semester: VIII**

Teaching Hours/week				Examination Scheme						Total Marks
				Internal		Final				
				Theory	Practical	Theory		Practical		
Credit Hours	L	T	P			Duration	Marks	Duration	Marks	
3	3	2	-	40	-	3 hrs	60	-	-	100

Course Objective:

The object of this course is to equip students with knowledge of numerical solutions of various civil engineering problems and design of structures

Course Contents

Unit 1: Introduction **4 hrs**

1.1 History of numerical computations of civil engineering problems
1.2 Brief description of solution techniques
- 1.2.1 Finite Element Method
- 1.2.2 Finite Difference Method
- 1.2.3 Boundary Conditions
- 1.2.4 Discretization
- 1.2.5 Smoothed particle hydrodynamics

Unit 2: Solutions for Linear Equations **6 hrs**

2.1 System of linear equations.
2.2 Gaussian Elimination
2.3 Data storage and memory optimization
2.4 Conjugate gradient method
2.5 Fourier Integral
- 2.5.1 Discrete Fourier Transform
- 2.5.2 Fast Fourier Transform

2.6 Principal of Minimum Potential Energy (Rayleigh – Ritz Method)

Unit 3: Elasticity in solids **5 hrs**

3.1 Stress Displacement relationship
3.2 Stress- strain relationship (constitutive) relations
- 3.2.1 3D state of solid, lame constants
- 3.2.2 Plane stress and plane strain condition

3.2.3 Axisymmetric stresses
3.3 Equilibrium equations

Unit 4: One Dimensional Finite Element Formulation **12 hrs**

4.1 Linear Bar Element
4.2 Coordinates and Shape Functions
4.3 Generation of Stiffness Equation
4.4 Quadratic Bar Element and Shape Functions
4.5 Generation of Stiffness Equation
4.6 Beam Element and shape functions
4.7 Generation of Stiffness Equation
4.8 Truss Elements and shape functions
4.9 Generation of Stiffness Equation
4.10 Frame Elements and shape functions
4.11 Application by Potential Energy Approach: Discretization of problem domain, Element Stiffness Matrix, Stress calculations, Temperature effects

Unit 5: Two Dimensional Finite Element Formulation **7hrs**

5.1 Triangular Elements
5.2 Generation of Shape Functions; Constant Strain Triangle
5.3 Four- Noded Quadrilateral Elements
5.4 Plane Stress Problems
5.5 Plane Strain Problems
5.6 Axisymmetric Problems
5.7 Application by Potential Energy Approach; Discretization, Element Stiffness Matrix, Stress Calculation

Unit 6: Finite difference method **5 hrs**

6.1 Finite difference
6.2 Explicit scheme and implicit scheme
6.3 Governing equations of movement of fluid (Momentum and continuity equations)
6.4 Discretization of kinematic wave motion (linear and non linear)
6.5 Order of accuracy of the scheme and its applications
6.6 Numerical diffusion, dispersion and stability of scheme
6.7 Applications of the schemes in hydraulic channel routing
6.8 Implicit dynamic wave model
6.9 finite difference schemes for Saint – Venant equations

Unit 7: Solving Problems through Computer Applications **6 hrs**

7.1 Solution Techniques
7.2 Computer Solution of One- Dimensional Problems
7.3 Computer Solution of Two- Dimensional Problems
7.4 Mesh Generation Techniques for Simple One- and Two - Dimensional Problems
7.5 Computer Codes for Simple One- and Two - Dimensional Problems
7.6 Presentation of Results

References:

1. Robert D. Cook, David S. Malkus, Michael E. Plesha; Concepts and Applications of Finite Element Analysis; John Wiley & Sons.
2. T. R. Chandrupatla and A.D. Belegundu; Introduction to Finite Elements in Engineering; Pearson Education Asia.
3. J.N. Reddy: An Introduction to Finite Element Method.
4. P. Seshu; Text book of Finite Element Analysis
5. J.F. Abel and C.S. Desai; Introduction to the Finite Element Methods, CBS Publications
6. O.C. Zeinkiewicz, The Finite Element Method.

Final Examination Question Format:

In accordance with the unit-wise weightage based on lecture hours, the final examination will be structured as follows. Candidates are required to answer all questions.

Group A: Very Short Answer Questions ***(4 × 2 = 8 marks)***

- This section will consist of four questions, each carrying 2 marks.

Group B: Short Answer Questions ***(7 × 4 = 28 marks)***

- This section will consist of seven questions, each carrying 4 marks.
- *Note:* Two additional questions will be provided as OR options in this section.

Group C: Long Answer Questions ***(3 × 8 = 24 marks)***

- This section will consist of three questions, each carrying 8 marks.
- *Note:* One additional question will be provided as an OR option in this section.

DISASTER MANAGEMENT (ELECTIVE II)
BCI 8820

Year: IV **Semester: VIII**

Teaching Hours/week				Examination Scheme						Total Marks
				Internal		Final				
				Theory	Practical	Theory		Practical		
Credit Hours	L	T	P			Duration	Marks	Duration	Marks	
3	3	2	-	40	-	3 hrs	60	-	-	100

Course Objectives

- To understand different types of disasters and their impacts
- To study disaster risk reduction, preparedness, and mitigation strategies
- To apply disaster management principles in civil engineering planning and design
- To understand institutional, legal, and technological frameworks for disaster management

Unit 1: Introduction to Disaster Management (7 Hours)

- Definition of disaster, hazard, vulnerability, risk, and capacity
- Classification of disasters: natural and man-made
- Disaster management cycle: prevention, mitigation, preparedness, response, recovery
- Impact of disasters on infrastructure, economy, society, and environment
- Role of civil engineers in disaster management

Unit 2: Natural Disasters and Their Management (10 Hours)

- Earthquakes: causes, effects, seismic zones of India/Nepal
- Floods: causes, flood forecasting, flood control measures
- Cyclones, droughts, landslides, avalanches
- Volcanic eruptions, tsunamis
- Climate change and extreme events

Unit 3: Man-Made Disasters and Industrial Safety (8 Hours)

- Industrial disasters: chemical, nuclear, and biological hazards
- Fire hazards and explosions
- Transportation disasters (road, rail, air, water)
- Urban disasters and infrastructure failure
- Safety audits and risk assessment

Unit 4: Disaster Mitigation, Preparedness, and Response (10 Hours)

- Structural and non-structural mitigation measures
- Disaster-resistant construction techniques
- Building codes and standards (IS codes, NBC)
- Preparedness planning and early warning systems
- Emergency response, search and rescue operations

Unit 5: Disaster Management Framework and Case Studies (10 Hours)

- Institutional framework for disaster management (NDMA, SDMA, DDMA)
- Disaster management policies and legislation
- Role of NGOs, community participation, and media
- Use of GIS, Remote Sensing, and AI in disaster management
- Case studies: Nepal earthquake, Bhuj earthquake, Kedarnath floods.

References

1. Disaster Management by *R. Subramanian* (Vikas Publishing / S. Chand)
2. Disaster Management by *Mrinalini Pandey*
3. Disaster Management and Preparedness by *Taimpo* (CRC Publications
4. Disaster Science and Management by *T. Bhattacharya* (McGraw Hill India)

PURBANCHAL UNIVERSITY

FINAL EXAM-2025

(MODEL QUESTION)

LEVEL : B. E. Civil
SUBJECT: Disaster Management (Elective II)
FULL MARKS : 60 PASS MARKS: 24 TIME : 3 hours

Candidates are required to give their answers in their own words as far as practicable.
Figure in the margin indicates full marks.

Attempt All Questions.

Group-A: Very Short Questions [4*2=8]

1. Define disaster and hazard.
2. What is meant by structural mitigation?
3. What is the role of NDMA / SDMA in disaster management?
4. What is an industrial disaster?

Group-A: Very Short Questions [7*4=28]

5. Explain the disaster management cycle with a neat diagram.
6. Discuss the causes and effects of earthquakes.
7. Explain the concept of disaster risk reduction (DRR) and its significance in sustainable development.
8. Describe fire hazards in industrial areas.
9. Explain man made disasters with examples.
10. Discuss structural mitigation measures for disaster management. *(Unit IV)*

OR

Explain the role of early warning systems in disaster preparedness.

11. Explain the role of NGOs and community participation in disaster management.

OR

Explain the impact of disasters on society, economy, and infrastructure, with special reference to civil engineering works.

Group-C: Long Questions [3*8=24]

12. Explain different types of natural disasters and their management strategies.
13. Explain the use of modern technologies in disaster management with suitable examples.
14. Explain disaster-resistant construction techniques and relevant building codes.

OR

Describe the phases of disaster response and recovery, highlighting their objectives.

End

DRONE DATA PROCESSING AND GIS (ELECTIVE-II)
BCI 8821

Year: IV **Semester: VIII**

Teaching Hours/week				Examination Scheme						Total Marks
				Internal		Final				
				Theory	Practical	Theory		Practical		
Credit Hours	L	T	P			Duration	Marks	Duration	Marks	
3	3	2	-	40	-	3 hrs	60	-	-	100

Course Objectives:

To equip students with the skills to acquire, process, analyze, and integrate drone-based spatial data into GIS for environmental monitoring, mapping, infrastructure, agriculture, and other geospatial applications.

Course Content:

1. Introduction to Drones **(2 hrs)**

Introduction and history of Drones, Purpose of drone survey, Different components of Drones, Basic Hardware and Software requirements for Drone Survey.

2. Introduction to GIS **(2 hrs)**

GIS definition, Purpose of GIS, Different components of GIS, Hardware and Software requirements of GIS

3. Coordinate Systems **(2 hrs)**

Concepts of thematic layers, topology, Co-ordinate systems for drone data processing.

4. Cartography **(3 hrs)**

Mapping Concepts, Map Elements and typography, color, text, Map scales and representations, Map Projection, Mapping concepts or techniques

5. Drone Data **(2 hrs)**

Models, Drone based Digital Elevation Model (DEM), Different derivatives of DEM and their applications, Triangulated Irregular Network (TIN)

6. GIS Model **(2 hrs)**

Raster and vector data models, their associated advantages and disadvantages, Raster data compression techniques, Different vector data

7. Drone and GIS Integration **(3 hrs)**

Importing Drone Products, Georeferencing and verifying spatial accuracy, Terrain Analysis, Generating slope, aspect, and hill shade from drone-derived DEMs, and Cover Classification from Orthomosaic, Performing supervised classification, Geometric rectification, Digitization, error identification.

8. GIS Database Design **(3 hrs)**

Database design: editing and topology creation in GIS, Linkage between spatial and non-spatial data, GIS customization concepts, and approaches of multi-criteria decision making, concepts and applications of Geostatistics.

9. Drone and GIS Formats **(2 hrs)**

Representation of geographic features in vector, raster data models, GIS database: Concept of arc, node, vertices and topology

10. GIS Based Storing Spatial Data **(2 hrs)**

Computer representation for storing spatial data: Block code, Run-length encoding, Chain coding, Quadtree. Issues governing choice of models

11. Drone Data Processing and Applications **(10 hrs)**

Application of Geo-spatial technology in Civil Engineering, assessment of cyclones, rainfall, Land use, inventory and monitoring, urban planning, snow and glaciers, coastal zone management, air and water pollution

12. Drone and GIS Operations **(10 hrs)**

Drone data and GIS analysis, Errors in Drone Survey and GIS and their rectification, limitations of GIS and drone survey

13. Drone Operation Regulations **(2 hrs)**

Drone Regulations, Registration and Permit, Restricted zones, UASR of CAAN

Practical Works:	
Week	Contents
1	Identification of Drone Components, Hands-on identification of frame, motors, propellers, sensors, flight controller
2	GPS module, battery, and gimbal, Pre-Flight Safety & Legal Compliance Drill
3	checking airspace restrictions (requirements as per CAAN), Reviewing checklists and safety protocols, Flight Mission Planning Using Software
4	creating a survey grid in software, setting parameters: altitude, overlap, speed, camera angle, Ground Control Points (GCP) Planning
5	Selecting GCP locations in the field and logging their coordinates with GNSS/RTK.
6	Executing a Drone Survey, Flying the planned mission, capturing imagery for a test area
7	Recording environmental conditions & metadata, Calibrating RGB and multispectral sensors using calibration targets.
8	Transferring & Organizing Drone Imagery, File structuring, naming conventions, metadata verification
9	Image Quality Assessment, removing blurred or improperly exposed images; checking geotags
10	Processing RGB Drone Images, aligning photos, generating sparse & dense point clouds
11	Generating Orthomosaic, DSM, and DTM, exporting outputs in Geo TIFF format for GIS use, Creating a 3D Textured Model, Visualizing 3D models for infrastructure or heritage mapping
12	Importing Drone Products, Georeferencing and verifying spatial accuracy, Terrain Analysis, Generating slope, aspect, and hill shade from drone-derived DEMs
13	Land Cover Classification from Orthomosaic, Performing supervised classification in GIS software
14	Accuracy Assessment Using GCPs, Calculating RMSE and comparing with mission specifications, Map Layout & Report Preparation, Designing a cartographic-quality map with legend, scale, and metadata

References:

S. No.	Name of Books/ Authors/ Publishers	Year of Publication/ reprint
1	De Marchi, M., Diantini, A., & Pappalardo, S. E. (2023). Drones and Geographical Information Technologies in Agroecology and Organic Farming: Contributions to Technological Sovereignty (p. 308). Taylor & Francis.	2023
2	Kennedy, M., "Introducing Geographic Information Systems with ArcGIS", John Wiley & Sons	2006
3	Heywood, I., Cornelius S. and Carver S., "An Introduction to Geographical Information Systems" (4th Edition), Pearson Prentice Hall.	2012
4	Chang K., "Introduction to Geographic Information Systems", McGraw-Hill Education	2006
5	Bernhardsen, T., "Geographic Information Systems: An Introduction", John Wiley & Sons	2005
6	Aronoff, S., "Geographic Information Systems: A Management Perspective" WDL Publications	1991

Detailed Course Content:

DETAILED TOPICS- LECTURES	
S. No.	Contents
1.	Drone and GIS basics
Introduction and history of Drones [**1hr**], Purpose of drone survey and GIS [**1hr**], Different components of Drones and GIS [**1hr**], Hardware and Software requirements of GIS [**1hr**].	
2.	Coordinate Systems
Concepts of thematic layers, topology, Co-ordinate systems for drone data processing [**2hr**], Mapping Concepts, Map Elements and typography, color, text [**1hr**], Map scales and representations, Map Projection, Geometric rectification, Digitization, error identification [**2hr**].	
3.	Drone data and GIS model
Raster and vector data models, their associated advantages and disadvantages, Raster data compression techniques, Different vector data Models [**2hr**], Drone based Digital Elevation Model (DEM), Different derivatives of DEM and their applications, Triangulated Irregular Network (TIN) [**2hr**].	
4.	Drone data processing and applications
Application of Geo-spatial technology in Civil Engineering [**3hr**], assessment of cyclones, rainfall, Land use [**2hr**], inventory and monitoring, urban planning [**2hr**], snow and glaciers, coastal zone management, air and water pollution [**3hr**].	

5.	Drone and GIS operations
Drone data and GIS analysis [**3hr**], Errors in Drone Survey and GIS and their rectification [**5hr**], limitations of GIS and drone survey [**2hr**]	
6.	Drone Operation Regulations
Drone Regulations, Registration and Permit [**1hr**], Restricted zones, UASR of CAAN [**1hr**].	

DETAILED TOPICS- LAB	
S.No.	Contents
1.	UAV Familiarization & Safety
Identification of UAV Components, Hands-on identification of frame, motors, propellers, sensors, flight controller, GPS module, battery, and gimbal, Pre-Flight Safety & Legal Compliance Drill, checking airspace restrictions (DGCA Digital Sky or equivalent), Reviewing checklists and safety protocols.	
2.	Mission Planning
Flight Mission Planning Using Software, creating a survey grid in software, setting parameters: altitude, overlap, speed, camera angle, Ground Control Points (GCP) Planning, Selecting GCP locations in the field and logging their coordinates with GNSS/RTK.	
3.	Field Data Acquisition
Executing a Drone Survey, Flying the planned mission, capturing imagery for a test area, Recording environmental conditions & metadata, Calibrating RGB and multispectral sensors using calibration targets.	
4.	Data Management & Pre-processing

Transferring & Organizing Drone Imagery, File structuring, naming conventions, metadata verification, Image Quality Assessment, Removing blurred or improperly exposed images; checking geotags.	
5.	Photogrammetry & 3D Reconstruction
Processing RGB Drone Images, Aligning photos, generating sparse & dense point clouds, Generating Orthomosaics, DSM, and DTM, Exporting outputs in GeoTIFF format for GIS use, Creating a 3D Textured Model, Visualizing 3D models for infrastructure or heritage mapping.	

6.	GIS Integration
Importing Drone Products, Georeferencing and verifying spatial accuracy, Terrain Analysis, Generating slope, aspect, and hillshade from drone-derived DEMs, Land Cover Classification from Orthomosaic, Performing supervised classification in GIS software.	
7.	Accuracy & Reporting
Accuracy Assessment Using GCPs, Calculating RMSE and comparing with mission specifications, Map Layout & Report Preparation, Designing a cartographic-quality map with legend, scale, and metadata.	

PURBANCHAL UNIVERSITY

FIRST SEMESTER FINAL EXAM-2025

(MODEL QUESTION)

LEVEL : B. E. Civil
SUBJECT: Drone Data Processing & GIS (Elective II)

FULL MARKS : 60
TIME : 3 hours PASS MARKS: 24

Group A – Short Questions *(4 × 2 marks)*

1. Define Orthomosaic and state two advantages of using orthomosaics in GIS analysis.
2. What is a Ground Control Point (GCP)? Why is it important in drone data processing?
3. Differentiate between Digital Surface Model (DSM) and Digital Terrain Model (DTM).
4. List any four sources of error in drone-based GIS surveys.

Group B – Medium Questions *(7 × 4 marks)*

5. A drone survey uses 5 GCPs. The RMSE values in X and Y directions are 0.12 m and 0.16 m respectively.
   Calculate the planimetric RMSE.
6. Explain raster and vector data models with their advantages and disadvantages.
7. Describe the steps involved in supervised land cover classification using drone imagery.
8. A municipality wants to assess urban expansion over 5 years using drone data.
   Explain a suitable GIS workflow for this task.
9. Explain map projection and state why it is important in drone–GIS integration.
10. A raster DEM has a spatial resolution of 0.5 m × 0.5 m.
    How many raster cells are required to cover an area of 1 hectare?

OR

A drone-derived orthomosaic has a spatial resolution of 10 cm**.**
Calculate the number of pixels required to represent an area of 2 hectares**.**

11. Describe GIS database design and explain the concept of topology.

OR

Explain the linkage between spatial and non-spatial (attribute) data in a GIS environment. How does this linkage support querying and decision-making in drone-based applications?

Group C – Long Questions *(3 × 8 marks)*

12. Explain the complete drone data processing workflow, starting from flight planning to GIS analysis.

OR

Describe the procedure for integrating drone-generated orthomosaic and DEM into a GIS platform**,** including georeferencing, accuracy verification, and terrain analysis**.**

13. Explain the method of slope generation from a drone-based DEM and discuss two engineering applications of slope maps.

OR

Discuss the role of drone-derived Digital Elevation Models (DEM) in civil engineering applications**.** Explain their use in any three engineering analyses such as road alignment, drainage planning, or landslide assessment.

14. A civil engineering project requires flood risk mapping using drone and GIS technologies. Describe the methodology, data requirements, and limitations of this approach.

EARTHQUAKE ENGINEERING (ELECTIVE II)
BCI 8822

Year: IV **Semester: VIII**

Teaching Hours/week				Examination Scheme						Total Marks
				Internal		Final				
				Theory	Practical	Theory		Practical		
Credit Hours	L	T	P			Duration	Marks	Duration	Marks	
3	3	2	-	40	-	3 hrs	60	-	-	100

Course Objectives:
The student will learn the basic understanding and nature of the earthquakes, analysis of structures subjected to earthquakes and design of structures to resist strong ground motions. The student will also learn the practical approach including use of prevalent codes in analysis and design of structures for earthquake loads.

Course Contents

1.0 Introduction **2 hrs.**

1.1 Effects of earthquakes
1.2 Theories and criteria of earthquake design
1.3 Basic requirements for earthquake resistant structures

2.0 Fundamental of earthquake engineering 6hrs

2.1 Earthquake and Seismicity
2.2 Causes of earthquakes
2.3 Mechanism of earthquakes
2.4 Measure of earthquakes
2.5 Attenuation laws
2.6 Local soil conditions
2.7 Response spectra of earthquakes
2.8 Seismic risk and seismic zoning

3.0 Basics structural dynamics **6 hrs.**

3.1 Introduction
3.1.1 Dynamic problems
3.1.2 Response of structures of vibration

3.2 Introduction to Single degree of freedom (SDOF) system
3.2.1 Simple harmonic motion
3.2.2 Equation of motion and natural frequency
3.2.3 Free vibration response (damped and undamped) of SDOF system

3.3 Multi degree of freedom (MDOF) System

3.3.1 Modeling of MDOF system structures

3.3.2 Equation of motion in matrix form

4.0 Lateral load resisting systems for buildings **8hrs**

4.1 Different structural systems for lateral loads

4.2 Floor diaphragms

4.3 Lateral load distribution with rigid floor diaphragms

4.4 Centre of mass and centre of rigidity

4.5 Torsionally coupled and uncoupled system

4.6 Moment resisting frames

4.7 Shear walls

5.0 Earthquake design buildings **8 hrs.**

5.1 Strength, stiffness and stability requirements

5.2 Ductility of the system and members

5.3 Seismic coefficient method and code provisions

5.4 Response spectrum method and the code provision

5.5 Introduction to modal analysis

5.6 Code provision on ductility factors, drift limit

5.7 Detailing of reinforced concrete moment resisting frames for earthquakes

References:

1. V.K. Manicka Selvam, Elementary Structural Dyanamics, Dhanpat Rai Publication Clough
2. 2. R.W., Penzien J., Dynamics of Structures, McGraw-hill Inc.
3. Chopra Anil, Dynamics of Structures, Prentice-Hall
4. P. Agrawal & M. Shrikhande, Earthquake Resistance Design of Structures. Printice Hall of India, New Delhi, 2006.
5. V.K. Manicka Selvam, An Introduction to Earthquake Analysis of Structures, Dhanpat Rai Publications
6. I.S. 1893.2002 (Part I) Indian Standard Criteria for Earhtquake Resistant Design of Structures, Bureau of Indian Standards
6. I.S. 13920:1993 – Indian Standard Ductile Detailing of Reinforcement Concrete Structures, Bureau of Indian Standards

Final Examination Question Format:

In accordance with the unit-wise weightage based on lecture hours, the final examination will be structured as follows. Candidates are required to answer all questions.

Group A: Very Short Answer Questions ***(4 × 2 = 8 marks)***

- This section will consist of four questions, each carrying 2 marks.

Group B: Short Answer Questions ***(7 × 4 = 28 marks)***

- This section will consist of seven questions, each carrying 4 marks.
- *Note:* Two additional questions will be provided as OR options in this section.

Group C: Long Answer Questions ***(3 × 8 = 24 marks)***

- This section will consist of three questions, each carrying 8 marks.
- *Note:* One additional question will be provided as an OR option in this section.

ENVIRONMENTAL IMPACT ASSESSMENT (ELECTIVE II)
BCI 8823

Year : IV **Semester : VIII**

Teaching Hours/week				Examination Scheme						Total Marks
				Internal		Final				
				Theory	Practical	Theory		Practical		
Credit Hours	L	T	P			Duration	Marks	Duration	Marks	
3	3	2	-	40	-	3 hrs	60	-	-	100

Course Objectives:

This subject deals with different environmental assessments prevalent in the country and focus on EIA steps and processes for various development projects with regulatory framework as per EPA and EPR. By the end of this course, students will be able to understand BES, IEE and EIA steps and processes for development projects and will be able to understand different impact identification, prediction and evaluation and mitigation measures. Finally, the students will be able to conduct and prepare EMP in a team.

Course Content:

1. Introduction **(4 hrs)**

1.1. Introduction to Environmental Assessment
1.2. Environmental Impact Statement (EIS)
1.3. Emergence of EIA
1.4. History of EIA in Nepal
1.5. Definition, Objectives, Principles, Benefits and Issues in EIA
1.6. Project Types, EIA process and Project Cycle
1.7. Legal provisions and Sectorial guidelines on EIA in Nepal

2. Project Screening, Brief Environmental Study and Initial Environmental Examination (4 hrs)

2.1. Objectives of Screening
2.2. Screening Criteria and Procedure
2.3. Brief Environmental Study (BES)
2.4. Initial Environmental Examination (IEE)
2.5. Procedure for IEE

3. Scoping and Preparation of Terms of Reference (ToR) (4 hrs)

3.1. Objectives of scoping
3.2. Importance and Methods of Scoping
3.3. Terms of Reference and its Main Components
3.4. TOR approval process

4. Establishing the Environmental Baseline and Impact Identification (5 hrs)

4.1. The Environmental Setting
4.2. Purpose of Baseline Data
4.3. Method of Data Collection
4.4. Importance of Baseline Data
4.5. Methods of Impact Identification

5. Impact Prediction, Evaluation and Mitigation Measures (10 hrs)

5.1. Methods of Impact Prediction
5.2. Impact Evaluation Techniques
5.3. Numerical on Impact Prediction and Evaluation: Air Pollution, Water Pollution and Noise Pollution
5.4. Types of Mitigation Measures

6. Management of EIA Processes

(8 hrs)

6.1. Environmental Management Plan

6.2. Environmental Monitoring
6.3. Environmental Auditing
6.4. EIA Report Review and Decision Making
6.5. Stakeholder Consultation and Public Participation

7. Case Study of EIA on Development Projects: (10 hrs)

7.1. Preparation of environmental management plan
7.2. Preparation of environmental monitoring plan
7.3. Preparation of environmental auditing plan
7.4. Review of IEE/ EIA report

References:

- B.K. Upreti, "Environmental Impact Assessment: Process and Practice", Published by Uttara Uprety, Koteshwor, Kathmandu.
- J. Glasson, R. Therivel, and A. Chadwick, "Introduction to Environmental Impact Assessment", UCL Press Ltd., London.
- L. W. Canter, "Environmental Impact Assessment", McGraw Hill, New York.
- IUCN/ Nepal, "EIA: Training Manual for Professional and Managers", Published by IUCN/ Nepal.

Final Examination Question Format:

In accordance with the unit-wise weightage based on lecture hours, the final examination will be structured as follows. Candidates are required to answer all questions.

Group A: Very Short Answer Questions ***(4 × 2 = 8 marks)***
- This section will consist of four questions, each carrying 2 marks.

Group B: Short Answer Questions ***(7 × 4 = 28 marks)***
- This section will consist of seven questions, each carrying 4 marks.
- *Note:* Two additional questions will be provided as OR options in this section.

Group C: Long Answer Questions ***(3 × 8 = 24 marks)***
- This section will consist of three questions, each carrying 8 marks.
- *Note:* One additional question will be provided as an OR option in this section.

Micro Hydropower (Elective II)
BCI 8824

Year: IV **Semester: VIII**

Teaching Hours/week				Examination Scheme						Total Marks
				Internal		Final				
				Theory	Practical	Theory		Practical		
Credit Hours	L	T	P			Duration	Marks	Duration	Marks	
3	3	2	-	40	-	3 hrs	60	-	-	100

Course Objectives:
After successful completion of this course students will be able to describe/design main features and processes involved in micro hydropower.

Course Contents

Unit 1: Introduction **2hrs**

1.1 History of MHP in Nepal
1.2 Multipurpose use of MHP
1.3 Site selection for MHP

Unit 2: Hydrology **6hrs**

2.1 Introduction and Definitions
2.2 Guidelines and Standards
2.3 Discharge Measurement
2.4 Hydrology and Nepali MHP
2.5 Hydrological Data
2.6 Medium Irrigation Project (MIP) Method
2.7 WECS/DHM (HYDEST) Method
2.8 Flood Flows

Unit 3: Headworks **4hrs**

3.1 Introduction and Definitions
3.2 Guidelines and Standards
3.3 Weir design
3.4 Intake design
3.5 Intake Trash rack design

3.7 Detail drawing of head works
3.7 Spillway

Unit 4: Headrace/Tailrace **4hrs**.

4.1 Introduction and Definitions
4.2 Guidelines and Standards
4.3 Canal design
4.4 Pipe design
4.5 Detail drawings of headrace/tailrace

Unit 5: Settling Basins **7hrs**

5.1 Introduction and Definitions
5.2 Guidelines and Standards
5.3 Sediment Settling Basins
5.4 Settling Basin Theory
5.5 Gravel Trap design
5.6 Settling Basin design
5.7 Forebay design
5.8 Vertical flushing pipe
5.9 Gate design
5.10 Detail drawings of settling basin

Unit 6: Support System **5hrs**

6.1 Anchor block design
6.2 Support pier design s.
6.3 Foundation design for turbine, generator, etc.

Unit 7: Penstock and Power Calculations **4hrs**

7.1 Introduction and Definitions
7.2 Guidelines and Standards
7.3 Detail drawings of penstock pipe and alignment

Unit 8: Turbine Selections **4hrs**.

8.1 Introduction and Definitions
8.2 Guidelines and Standards
8.3 Detail drawing of turbine

Unit 9: Electrical Equipment Selections **4hrs**

9.1 Introduction and Definitions
9.2 Guidelines and Standards
9.3 Selection of generator size and type
9.4 Sizing and RPM of Synchronous Generator
9.5 Sizing and RPM of Induction Generator

9.6 Detail drawings of electrical component (line diagram)

Unit 10: Transmission and Distribution **3hrs**

10.1 Introduction and Definitions
10.2 Guidelines and Standards
10.3 Design and Calculation of transmission and distribution
10.4 Detail drawings of transmission and distribution

Unit 11: Loads and Benefits **2hrs**

11.1 Introduction and Definitions
11.2 Guidelines and Standards
11.3 Calculation of load and benefits

References

1. Allen R. Inversin (1986), Micro-Hydropower Sourcebook, A Practical Guide to Design and
2. Implementation in Developing Countries, NRECA International Foundation, 1800 MassachusettsAvenue N. W., Washington, DC 20036.
3. Adam Harvey (1993), Micro-Hydro Design Manual, A guide to small-scale water powerschemes, Intermediate Technology Publications, ISBN 1 85339 103 4.
4. BPC Hydro consult, Intermediate Technology Development Group (ITDG), Kathmandu, Nepal
(2002), Civil Works Guidelines for Micro-Hydropower in Nepal.
5. GTZ/Department of Energy Development, Energy Division, Papua New Guinea, Micro HydropowerTraining Modules (1994), Modules 1-7, 10, 13, 14 & 18B.
6. European Small Hydropower Association (1998), Layman's Guidebook on How to Develop a Small Hydro Site

Final Examination Question Format:

In accordance with the unit-wise weightage based on lecture hours, the final examination will be structured as follows. Candidates are required to answer all questions.

Group A: Very Short Answer Questions *(4 × 2 = 8 marks)*

- This section will consist of four questions, each carrying 2 marks.

Group B: Short Answer Questions *(7 × 4 = 28 marks)*

- This section will consist of seven questions, each carrying 4 marks.
- *Note:* Two additional questions will be provided as OR options in this section.

Group C: Long Answer Questions *(3 × 8 = 24 marks)*

- This section will consist of three questions, each carrying 8 marks.
- *Note:* One additional question will be provided as an OR option in this section.

RAILWAY ENGINEERING (ELECTIVE II)
BCI 8825

Year: IV **Semester: VIII**

Teaching Hours/week				Examination Scheme						Total Marks
				Internal		Final				
				Theory	Practical	Theory		Practical		
Credit Hours	L	T	P			Duration	Marks	Duration	Marks	
3	3	2	-	40	-	3 hrs	60	-	-	100

Course Objectives

- To understand components and functioning of railway systems
- To study railway alignment, permanent way, and track components
- To learn design and maintenance of railway tracks
- To understand points & crossings, stations, and signaling basics

UNIT I: Introduction and Railway Alignment (7 Hours)

- Importance and advantages of railways
- Classification of railway lines
- Gauge: types and selection of gauge
- Railway alignment: factors affecting alignment
- Surveys for railway alignment

UNIT II: Permanent Way and Track Components (10 Hours)

- Permanent way: definition and functions
- Rails: types, rail sections, requirements of ideal rail
- Sleepers: types, functions, comparison
- Ballast: functions, materials, size, and depth
- Rail fastenings

UNIT III: Geometric Design and Track Construction (10 Hours)

- Coning of wheels and tilting of rails
- Creep of rails: causes, effects, and prevention
- Gradients: types and necessity
- Curves in railway track: simple, transition curves
- Super-elevation and cant deficiency

UNIT IV: Points, Crossings, and Stations (9 Hours)

- Points and crossings: necessity and types
- Components of turnout
- Design considerations of crossings
- Railway stations: classification and functions
- Yard layouts

UNIT V: Track Maintenance and Signaling (9 Hours)

- Track stresses and wear of rails
- Track maintenance methods
- Track defects and their remedies
- Introduction to railway signaling
- Interlocking and safety devices

Textbooks:

1. *Railway Engineering — Satish Chandra & M. M. Agarwal* (Oxford University Press / University Press)
2. *A Textbook of Railway Engineering — S. C. Saxena & S. P. Arora* (Dhanpat Rai & Sons)
3. *Railway Track Engineering — J. S. Mundrey* (Tata McGraw Hill)

PURBANCHAL UNIVERSITY

FINAL EXAM-2025

(MODEL QUESTION)

LEVEL : B. E. Civil
SUBJECT: Railway Engineering (Elective II)
FULL MARKS : 60 PASS MARKS: 24 TIME : 3 hours

Candidates are required to give their answers in their own words as far as practicable.
Figure in the margin indicates full marks.

Attempt All Questions.

Group-A: Very Short Questions [4*2=8]

1. Define gauge of a railway track.
2. What is meant by permanent way?
3. Define creep of rails.
4. What is a railway turnout?

Group-A: Very Short Questions [7*4=28]

5. Explain the factors affecting railway alignment.

6. Classify railway gauges and state their advantages.

7. Describe track maintenance methods used in railways.

8. Explain different types of sleepers with their merits.

9. Explain the functions of ballast and materials used.

10. Explain creep of rails, its causes, and prevention.

OR

Describe the necessity of super-elevation on railway curves. *(Un*

11. Explain different types of points and crossings.

Group-C: Long Questions [3*8=24]

12. Explain the construction and working of points and crossings with neat diagrams.

OR

Discuss the failure of rails and defects in rails, and methods adopted to prevent rail failures.

13. Describe railway track defects, their causes, and suitable maintenance measures.

14. Discuss geometric design of railway curves, including super-elevation and cant deficiency.

End

ROCK SLOPE ENGINEERING (ELECTIVE II)
BCI 8826

Year: IV **Semester: VIII**

Teaching Hours/week				Examination Scheme						Total Marks
				Internal		Final				
				Theory	Practical	Theory		Practical		
Credit Hours	L	T	P			Duration	Marks	Duration	Marks	
3	3	2	-	40	-	3 hrs	60	-	-	100

\Course Objective:

The general objective of this elective course is to prepare students with knowledge, skill and tools required for analysis, design and stabilization of excavation and embankments in rock slope.

Course Content:

1. Fundamentals of Rock Slope Engineering (2 hrs)

1.1. Introduction to rock slope engineering
1.2. Objectives of slope stability analysis

2. Mechanisms and Modes of Rock Slope Failure (6 hrs)

2.1. Geometry of slopes
2.2. Factors affecting the slope stability
2.3. Failure mechanisms of rock slopes

3. Geological Data Interpretation and Visualization (4 hrs)

3.1. Definitions of geological and geometrical terms
3.2. Stereographic projection
3.3. Graphical techniques for data problems
3.4. Kinematic Analysis: Identification of slope instability
  3.4.1. Plane Failure
  3.4.2. Wedge Failure
  3.4.3. Toppling Failure

4. Site Investigation and Geological Data Collection **(5 hrs)**

4.1. Planning geological investigation
4.2. Site reconnaissance
4.3. Spacing, persistence and roughness measurement
4.4. Drill coring and core logging
4.5. Engineering geological mapping

5. Quantification of Groundwater Pressure **(2 hrs)**

5.1. Occurrence and characteristics of groundwater
5.2. Effects of groundwater on slope stability
5.3. Groundwater pressure models
5.4. Measurement of water pressure

6. Methods for rock slope stability analysis **(4 hrs)**

6.1. Empirical methods
6.2. Kinematic analysis
6.3. Deterministic method
6.4. Probabilistic method
6.5. Numerical modelling

7. Plane Failure **(6 hrs)**

7.1. General conditions of plane failure
7.2. Factors influencing plane failure
7.3. Analysis of plane failure

8. Wedge Failure **(6 hrs)**

8.1. Definition of wedge geometry
8.2. General conditions of wedge failure
8.3. Analysis of wedge failure

9. Circular Failure **(4 hrs)**

9.1. Condition of circular failure
9.2. Derivation of circular failure charts
9.3. Groundwater flow assumptions
9.4. Analysis of slope by using circular failure charts

10. Toppling Failure **(4 hrs)**

10.1. General conditions of toppling failure

10.2. Types of toppling Failure
10.3. Analysis of toppling failure

11. Stabilization of Rock Slopes **(4 hrs)**

11.1. Stabilization by rock reinforcement
11.2. Stabilization by rock removal
11.3. Protection measures against rock falls
11.4. Emerging technologies in slope stabilization

Project Work:

Design and stability assessment of a rock slope in a real-world setting (e.g., road, dam, tunnel portal).

Tutorial:

(i) Graphical presentation of geological data
(ii) Plane failure
(iii) Wedge failure
(iv) Circular failure
(v) Toppling failure

References:

- Hoek, E. and Bray, J. W. 1981. Rock Slope Engineering.
- Wyllie, D. C. and Mah, C. W.2005. Rock Slope Engineering.

Evaluation Scheme: Marks Division

Question Type	No. of Questions	Marks	Total Marks
Short	4	2	8
Medium	7	4	28
Long	3	8	24
Total			60

Final Examination Scheme:		
Chapters	Marks	Remarks
1	2	Th
2	6	Th
3	4	Th
4	6	Th
5	2	Th+N
6	4	Th+N
7	10	Th+N
8	10	Th+N
9	4	Th+N
10	6	Th+N
11	6	Th
Total	60	Th: Theory/N: Numerical
Note: There might be minor deviation in mark distribution. *Mandatory: Evaluation should be based on solving approach and steps.*		

PURBANCHAL UNIVERSITY
SEMESTER FINAL EXAMINATION – 2025 (MODEL QUESTION)

LEVEL: B. E. (Civil)
SUBJECT: Rock Slope Engineering (Elective II) FULL MARKS: 60
TIME: 03:00 hrs PASS MARKS: 24

Attempt all questions.

Group A (2*4=8)

1. Enumerate the aims of rock slope stability analysis.
2. List out the advantages and disadvantages of equal area net with respect to equal angle net.
3. Illustrate different ground water pressure models with suitable diagrams.
4. Define flexural and block toppling.

Group B (4*7=28)

5. Explain the factors affecting rock slope stability.
6. Explain planning of geologic geological data collection for slope stability analysis.

   OR

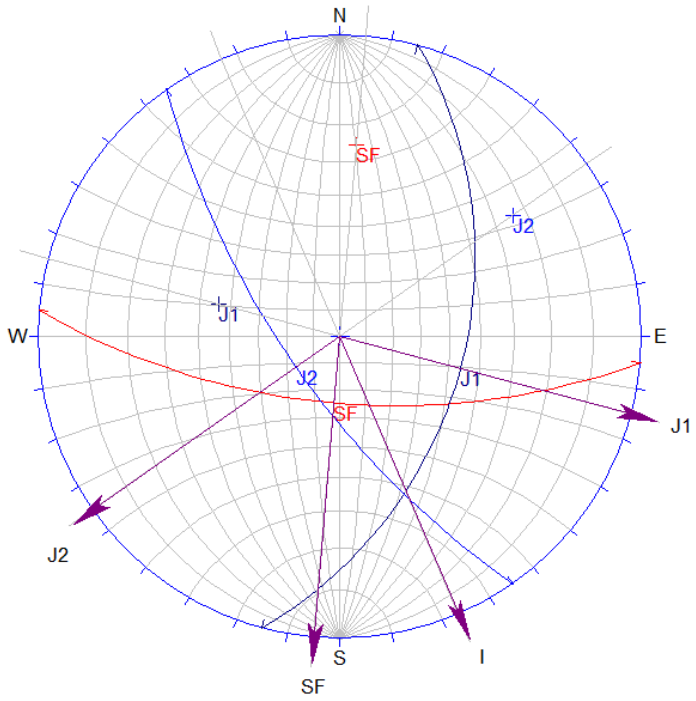
   Explain line and window mapping and stereogrammetric mapping of discontinuities.
7. Explain numerical modelling for rock slope stability analysis.

   OR

   Explain Probabilistic method for rock slope stability analysis.
8. Explain general conditions of plane failure with suitable diagrams.

   OR

   Interpret the following stereo net plot in light of wedge failure.



9. Explain the procedure to use circular failure charts with neat sketches.
10. Explain block shape tests on kinematics of block toppling failure.
11. Explain protection measures against rock falls.

Group C (8*3=24)

12. A 15 m high rock slope has been excavated at a face angle of 62˚. The rock in which this cut has been made contains persistent bedding planes that dip at an angle of 35˚ into the excavation. The 4.5 m deep tension is filled with water to a height of 3 m above the sliding surface. The strength parameters of the sliding surface are as follows:

Cohesion, c = 15 kPa, Friction angle, φ = 30˚, seismic coefficient, αh = 0.15.

The unit weight of the rock is 26.5 kN/m^3, and the unit weight of water is 9.81 kN/m^3.

Assuming that the plane slope failure is the most likely type of instability, analyze the following stability conditions.

a. Calculate the factor of safety of the slope for the conditions given
b. Design the rock bolt to obtain the factor of safety of 1.3

13. Determine the possible mode of failure (kinematically). Compute for FoS, and direction of failure of following example. If Any.

Description	Dip Amount (in degrees)	Dip Direction (in degrees)	Friction Angle ϕ	Cohesion c, kN/m^2
Slope Face	62	186		
Upper Slope	12	190		
Joint, J1	44	108	35	8
Joint, J2	68	232	30	12

Height of Slope, H = 22 m
Unit weight of rock, γ_r = 26.5 kN/m^3
Unit weight of water, γ_w = 9.81 kN/m^4

14. Explain the stabilization and protection measures commonly used for rock slopes with suitable diagrams.

----------XXX----------

Note: *Number of alternative questions may be different from those in the above model question.*

RURAL ROAD ENGINEERING (ELECTIVE II)
BCI 8827

Year: IV **Semester: VIII**

Teaching Hours/week				Examination Scheme						Total Marks
				Internal		Final				
				Theory	Practical	Theory		Practical		
Credit Hours	L	T	P			Duration	Marks	Duration	Marks	
3	3	2	-	40	-	3 hrs	60	-	-	100

Course Objectives:

Rural roads are the fundamentals for the socioeconomic development providing access and economic opportunities. The main objective of the course "Rural Road" is to impart knowledge about design and construction of rural road systematically and scientifically with the use of concept of value engineering, connectivity and. Key topics of the course attempt to impart knowledge in the following contemporary concepts:

Course Content:

1.0 Introduction **(4 hrs)**

1.1 Concept of Rural Road
1.2 Importance and Necessity of Rural roads
1.3 History of rural road development
1.4 Characteristics of Rural Road
1.5 Issues and Challenges of Rural Road Development
1.6 National policy and plan about rural road

2.0 Planning of Rural Road **(6 hrs)**

2.1 Concept of rural road network planning
2.2 Social and economic value of rural road
2.3 Planning process of rural road
2.4 Methodology of preparation of PTMP and MTMP
2.5 Coding criteria of Rural Road (Provincial and rural Municipal roads0

2.6 Prioritization of rural roads

3.0 Rural road design approaches **(5 hrs)**

3.1 Classification of Municipality /Rural Municipality Roads
3.2 General consideration in alignment selection
3.3 Concept of Rural connectivity
3.4 Special consideration in hills (compound and reverse curve, hairpin bend)
3.5 Design standards for rural road components
3.6 Road safety considerations in rural road
3.7 Concept of Road Safety Inspection for rural road

4.0 Construction and Specifications: **(5 hrs)**

4.1 Design criteria and standard of low volume road
4.2 Labor based technology in rural road development
4.3 Selection of materials and Methodology
4.4 Construction of Embankment and subgrade, sub-base, base course
4.5 Spoil in hill road – cause, problems and precautions
4.6 Construction of surface works including block pavement

5.0 Road Slope Protection **(4 hrs)**

5.1 Classification of slope failures
5.2 Slope failure mechanism
5.3 Road slope inspection
5.4 Risk assessment of slope
5.5 Counter measure for slope protection

6.0 Green Road **(6 hrs)**

6.1 Concept of green road
6.2 Suitability of green road
6.3 Components of green road
6.4 Principles of green road construction
6.5 Emerging trend in green technology
6.6 Design standards
6.7 Green road construction and maintenance steps
6.8 Construction technology and equipment used in green road

6.9 Estimation of Economic benefits of green road constructions

7.0 Concept of Nature based solutions (5 hrs)

7.1 Vegetation in Engineering, and road side vegetation
7.2 Types of Bio-engineering, advantages and limitations
7.3 Vegetative techniques and applications
7.4 Standard specifications for bioengineering
7.5 Vegetation used for road side bioengineering in Nepal

8.0 Maintenance of Rural Road (2 hrs)

8.1 Type of Maintenance in rural road
8.2 Evaluation of rural road for maintenance
8.3 Performance based contract

9.0 Case Studies on the various design, construction, maintenance, and emerging trends in rural road development. (8 hrs)

References:

1. IRC SP 20: Rural Roads Manual, Indian Roads Congress, New Delhi, 2002.
2. IRC SP 62: Guidelines for the Design and Construction of Cement concrete pavement for rural road
3. IRC SP 72: Guidelines for the Design of Flexible Pavements for Low Volume Rural Roads
4. IRC SP 77: Manual for Design Construction & Maintenance of Gravel Roads
5. NRRS -2055 DoLIDAR
6. Road Side BioEngineering - Reference Manual, Department of Roads, 2002
7. Overseas Road Note 16- Transport Research Laboratory
8. Approach for the Development of Agricultural and Rural Road, DOLIDAR
9. Provincial Transport Master Plan (PTMP) Guidelines
10. Green roads in Nepal
11. Mountain Risk Engineering – ICIMOD

Marks distribution Pattern

SN	Chapter	Marks allocated	Remarks
1	1	4	
2	2	6	
3	3	10	
4	4	10	
5	5	10	
6	6	10	
7	7	8	
8	8	2	
Total		60	

** The above marks distribution can be with minor variations.

PURBANCHAL UNIVERSITY
SEMESTER FINAL EXAMINATION – 2025 (MODEL QUESTION)

LEVEL: B. E. (Civil)
SUBJECT: Rural Road Engineering (Elective II) **FULL MARKS**: 60
TIME: 03:00 hrs **PASS MARKS:** 24

Candidates are requested to give their answers in their own words as far as practicable. Assume any missing data suitably.

Attempt any ALL questions.

GROUP A **(2 x 4 = 8)**

1) Define Municipal Transport Master Plan.
2) Write two characteristics of low volume road.
3) Define Green road and its 2 advantages.
4) What do you mean by PBM?

GROUP B **(4 x 7 = 28)**

5) Explain the concept of rural network planning.
6) Explain the procedure of coding of municipal rural road.
7) Explain briefly the factors to be considered for rural road alignment selection.
8) Describe design standard of rural road for its cross-section elements.
9) Write briefly counter measures for slope protection.
10) Write down four advantages of bioengineering.
11) Describe about palisade and brush layering.

GROUP C **(3 x 8 = 24)**

12) Explain in brief Principles of green road construction.
13) Explain the design standard of rural road in brief.
14) Explain method of construction with material and quality control for bituminous surface dressing road.

STRATEGIC MANAGEMENT (ELECTIVE II)
BCI 8828

Year: IV **Semester: VIII**

Teaching Hours/week				Examination Scheme						Total Marks
				Internal		Final				
				Theory	Practical	Theory		Practical		
Credit Hours	L	T	P			Duration	Marks	Duration	Marks	
3	3	2	-	40	-	3 hrs	60	-	-	100

Course Objective:

To provide the students an understanding of importance of strategic management in today's competitive business environment.

Course contents:

Unit 1: Introduction to Strategic Management **4 hrs.**

1.1 Introduction of course,
1.2 definition of strategic management,
1.3 Concept of strategic management,
1.4 Phases of strategic management,
1.5 Benefits of strategic management,
1.6 Basic model of strategic management
1.7 Strategic decisions

Unit 2: Environment Scanning and Industry Analysis **6 hrs.**

2.1 Identifying external environmental variables:
2.2 PESTEL;
2.3 Industry Analysis: analyzing the Task Environment,
3.4 Porter's approach to Industry Analysis: threats of new entrants, rivalry among existing firms,
3.5 Threat of substitute products or services,
3.6 Bargaining power of buyers, bargaining power of suppliers, relative power of other stakeholders.

Unit 3: Internal Scanning: Organizational Analysis **6 hrs.**

3.1 Corporate Value Chain Analysis,
3.2 Organizational structures,
3.3 Corporate culture

Unit 4: Strategy Formulation: Corporate Strategy **4 hrs.**

4.1 Directional Strategies: growth, concentration and diversification,

4.5 Stability and retrenchment Portfolio Analysis: BCG Market Growth, Parenting Strategy.

Unit 5: Strategy Formulation: Business strategy **5 hrs.**

5.1 Porter's Competitive Strategies: low cost, differentiation, focus,

5.2 Cooperative Strategies: collusion, strategic alliances, mutual service consortia, joint venture, licensing agreement

Unit 6: Strategy Formulation: Functional Strategy and Strategic Choice **3 hrs.**

6.1 Internal factors: marketing & sales, R&D, operations, personnel, finance, strategic groups, strategic types, McKinsey 7s Framework

Unit 7: Strategy Implementation; Organizing for Action- Who, What and How? **3hrs.**

7.1 Who implements strategy, what must be done,

7.2 Developing programs, budget and procedures, Structure follows strategy

Unit 8: Strategy Implementation: Staffing and Directing **4 hrs.**

8.1 Staffing, Staffing follows Strategy,

8.2 Management by Objectives (MBO)

Unit 9: Evaluation and Control **4 hrs.**

9.1 Evaluation and control,

9.2 Measuring performance, Types of control

10. Case Study and student presentation **6 hrs.**

Recommended Books

1. Thomas l. Wheelen, J. David Hunger, Krish Rangarajan, 2006, Strategic Management and Business Policy, Pearson Education, India
2. Lawrence R. Jauch, Rajiv Gupta, William F. Glueck, Business Policy and Strategic Management, 2003, Frank Bros. & Co, India

Final Examination Question Format:

In accordance with the unit-wise weightage based on lecture hours, the final examination will be structured as follows. Candidates are required to answer all questions.

Group A: Very Short Answer Questions ***(4 × 2 = 8 marks)***

- This section will consist of four questions, each carrying 2 marks.

Group B: Short Answer Questions ***(7 × 4 = 28 marks)***

- This section will consist of seven questions, each carrying 4 marks.
- *Note:* Two additional questions will be provided as OR options in this section.

Group C: Long Answer Questions ***(3 × 8 = 24 marks)***

- This section will consist of three questions, each carrying 8 marks.
- *Note:* One additional question will be provided as an OR option in this section.

TRAFFIC ENGINEERING MANAGEMENT (ELECTIVE II)
BCI 8829

Year: IV **Semester: VIII**

Teaching Hours/week				Examination Scheme						Total Marks
				Internal		Final				
				Theory	Practical	Theory		Practical		
Credit Hours	L	T	P			Duration	Marks	Duration	Marks	
3	3	2	-	40	-	3 hrs	60	-	-	100

Course Objectives:

The main objective of the course "Traffic Engineering Management" is to impart knowledge about traffic management systematically and scientifically with the use of concept of engineering. Traffic management as a burning issue and is of high importance for the developing cities, it should be followed by the future traffic load analysis. Key topics of the course attempt to impart knowledge in the following contemporary concepts;

- Conceptual knowledge in traffic management system;
- Issues, relative importance and methods of Transport Management;

This course may be good platform for the Graduate (Masters' degree) course in traffic Engineering and Management.

Course Contents:

Unit 1: Introduction **2hrs**

1.1 Scope and significance of Traffic Engineering Management
1.2 Traffic planning and modeling using prototype
1.3 Traffic related problems in major cities
1.4 Transportation network and their characteristics

Unit 2: Urban Traffic Planning **3 hrs.**

2.1 Introduction to urban traffic planning
2.2 Calculation of traffic volume
2.3 Travel demand forecasting

Unit 3: Traffic Characteristics **3 hrs.**

3.1 Basic traffic characteristics- Speed, volume and concentration.

3.2 Relationship between Flow, Speed and Concentration

Unit 4: Traffic Management And Analysis: **5 hrs.**

4.1 Volume Studies- Objectives, Methods;

4.2 Speed studies- Objectives: Definition of Spot Speed, time mean speed and space mean speed;

4.3 Methods of conducting speed studies

Unit 5: Speed Studies:

5.1 Methods of conducting speed studies;

5.2 Presentation of speed study data;

5.3 Head ways and Graps;

5.4 Critical Gap;

5.5 Gap acceptance studies.

Unit 6: Highway Capacity And Level of Service: **5 hrs**

6.1 Basic definitions related to capacity

6.2 Level of service concept

6.3 Factors affecting capacity and level of service

6.4 Computation of capacity and level of service for two lane highways multilane highways and free ways

Unit 7: Parking Studies And Analysis: **5 hrs**

7.1 Types of parking facilities- on street parking and off street Parking facilities;

7.2 Parking studies and analysis.

Unit 8: Traffic Safety: **7 hrs**

8.1 Accident studies and analysis;

8.2 Causes of accidents- The Road, The vehicle, The road user and the Environment;

8.3 Engineering, Enforcement and Education measures for the prevention of accidents.

Unit 9: Traffic Control And Regulation: **5 hrs**

9.1 Traffic Signals- Design of Isolated Traffic Signal by Webster method,

9.2 Warrants for signalization, Signal Coordination methods, Simultaneous, Alternate, Simple progressic and Flexible progression Systems.

Unit 11: Traffic And Environment: **3 hrs**

10.1 Determintal effects of Traffic on Environment;

10.2 Air pollution; Noise Pollution;
10.3 Measures to curtail environmental degradation due to traffic.

Unit 12: Traffic Management in Nepal **2 hrs**

11.1 Overview of existing system and future trend
11.2 National Transport Policy, Five Year Plans
11.3 Existing planning process

Tutorials:

1. A case study on traffic measurement and analysis

References

1. Traffic Engineering and Transportation Planning- L.R. Kadiyali, Khanna Publishers.
2. Traffic Engineering- Therory & Practice – Louis J. Pignataro, Prentice Hall Publication.
3. Principles of Highways Engineering and Traffic Analysis- Fred Mannering & Walter P. Kilareski, John Wiley & 50ns Publication.
4. Transportation Engineering – An introduction- C. Jotin Khistry, Prentice Hall Publication.
5. Fundamentals of Transportation Engineering- C.S. Papacostas, Prentice Hall India.

Final Examination Question Format:

In accordance with the unit-wise weightage based on lecture hours, the final examination will be structured as follows. Candidates are required to answer all questions.

Group A: Very Short Answer Questions ***(4 × 2 = 8 marks)***

- This section will consist of four questions, each carrying 2 marks.

Group B: Short Answer Questions ***(7 × 4 = 28 marks)***

- This section will consist of seven questions, each carrying 4 marks.
- *Note:* Two additional questions will be provided as OR options in this section.

Group C: Long Answer Questions ***(3 × 8 = 24 marks)***

- This section will consist of three questions, each carrying 8 marks.
- *Note:* One additional question will be provided as an OR option in this section.

TRAFFIC SAFETY (ELECTIVE II)
BCI 8830

Year: IV **Semester: VIII**

Teaching Hours/week				Examination Scheme						Total Marks
				Internal		Final				
				Theory	Practical	Theory		Practical		
Credit Hours	L	T	P			Duration	Marks	Duration	Marks	
3	3	2	-	40	-	3 hrs	60	-	-	100

Course Objective:

The main objective of this course is to provide students with knowledge of road safety principles, accident causation, engineering, enforcement, education, and emergency response with special emphasis on Nepal's road safety issues, policies, and practices. The specific objectives are:

- Explain the importance of road safety, including its impacts.
- Identify common factors contributing to road crashes, such as road design, vehicle characteristics, human behavior, and environmental conditions.
- Describe the role of engineering, enforcement, and education in improving road safety and reducing crash risks.
- Apply fundamental road safety analysis techniques to identify safety problems and possible solutions.
- Assess basic road safety countermeasures and discuss their potential effectiveness in reducing crashes.

Course Contents

1.0 Introduction to Road Safety **(4 hrs)**

1.1 Concept, importance and scope of road safety
1.2 Global and national road safety scenario
1.3 Socio-economic impacts of road accidents
1.4 Trends of road crashes/fatalities in Nepal
1.5 Safety scenario comparison (crash records) of different modes of transportation
1.6 Global and National initiatives in Road Safety
1.7 Act and Regulations related to Road Safety in Nepal

2.0 Human-Vehicle-Infrastructure in Road crashes (5 hrs)

2.1 Factors involved in road crashes (Road user/human, vehicle, road and roadway environment)

2.2 Human

2.2.1 Road User/Human factors Driver characteristics

2.2.2 Human response process

2.3 Vehicles

2.3.1 Vehicle characteristics (static, dynamics, kinematics)

2.3.2 Vehicles safety standards and Roadworthiness

2.4 Roads and roadside environment

2.4.1 Lane width, shoulder, horizontal and vertical curves, widening, road surface, sight distance, drainage

3.0 Road Safety Data (4 hrs)

3.1 Importance of Crash and Road Data

3.2 Primary and Secondary Data

3.3 Technology available for recording system

3.4 Crash data recording system of traffic police

3.5 Crash Coding system

4.0 Analysis of crash data and Treatment Process (5 hrs)

4.1 Speed Estimation from crash

4.2 Crash Frequency, crash rates, crash patterns, crash trends over time

4.3 Probabilistic Method of crash estimation

4.4 Crash Pattern (Type), Possible Cause & Countermeasure

5.0 Road Safety Analysis (12 hrs)

5.1 Road Safety Audit/Inspection, objective and structure

5.2 Stages, components, process

5.3 Use of DoR road safety audit manual,

5.4 Safety checks for new road projects (Audit of road designs, feasibility stage audit, preliminary design stage audit, detailed design stage audit, preopening stage audit)

5.5 Safety inspection for existing roads

6.0 Engineering Measures and Speed Management (4 hrs)

6.1 Traffic signs and road markings used in Nepal

6.2 Traffic signals and intersection control

6.3 Delineation measures and guideposts.

6.4 Speed management and control

7.0 Road Safety Education and Public Awareness (3 hrs)

7.1 Definition and importance
7.2 Road users (Driver, Pedestrian, Motorcyclist, Bus Passenger, cyclist) guide
7.3 Road safety awareness publicity campaign

8.0 Case Studies and Project works (8 hrs)

8.1 Road Safety Inspection Practices
8.2 Identification of black spots in urban or highway corridors
8.3 Accident data analysis using real Nepal data

References:

- Austroads Road Safety Guidelines 2009/2015
- US Highway Safety Manual 2009
- DoR Road Safety Note 4: Road Safety Audit Manual 1997, Safer drains, Delineation; Safety Barriers; Identifying and treating accident sites

Final Examination Question Format:

In accordance with the unit-wise weightage based on lecture hours, the final examination will be structured as follows. Candidates are required to answer all questions.

Group A: Very Short Answer Questions ***(4 × 2 = 8 marks)***

- This section will consist of four questions, each carrying 2 marks.

Group B: Short Answer Questions ***(7 × 4 = 28 marks)***

- This section will consist of seven questions, each carrying 4 marks.
- *Note:* Two additional questions will be provided as OR options in this section.

Group C: Long Answer Questions ***(3 × 8 = 24 marks)***

- This section will consist of three questions, each carrying 8 marks.
- *Note:* One additional question will be provided as an OR option in this section.

UAV PHOTOGRAMMETRY (ELECTIVE-II)
BCI 8831

Year: IV **Semester: VIII**

Teaching Hours/week				Examination Scheme						Total Marks
				Internal		Final				
				Theory	Practical	Theory		Practical		
Credit Hours	L	T	P			Duration	Marks	Duration	Marks	
3	3	2	-	40	-	3 hrs	60	-	-	100

Course Objectives:

- To introduce the student with the fundamentals of photogrammetry, aerial photography, and image interpretation.
- Familiarize students with principles of stereoscopy, parallax, orientation, and transformation between image and object space along with the knowledge of drone technology, flight planning, data acquisition, and safety protocols.
- Develop skills in digital photogrammetry, including geo-referencing, aerial triangulation, and 3D surface modelling.
- Enable students to use UAV-derived products such as orthophotos, DEMs, DSMs, and 3D models for practical applications.
- Familiarize students to applications of UAV photogrammetry in engineering, terrain visualization, land cover mapping, change detection, and volume estimation.

Course Content:

1. Introduction to Photogrammetry (3 hrs)

Fundamentals of Photogrammetry and Photo interpretation, Principles of photography, photographic films, filters, aerial vs terrestrial camera, Role of drones in modern mapping

2. Types of Photographs **(3 hrs)**

Types of photographs; Vertical photographs – principal point; scale; Stereoscopy; Vertical exaggeration factors involved and determination; Overlap, side lap and flight planning

3. Drone based Aerial Photogrammetry **(4 hrs)**

Geometry of vertical/near-vertical aerial photographs: Orthographic vs. perspective projection, Map vs. photograph, Geometric elements of vertical aerial photographs: Relief Displacement on vertical aerial photographs

4. Parallax **(5 hrs)**

Parallax and parallax measurement – monoscopic and stereoscopic methods; Determination of horizontal ground length, direction and angles from photo coordinates

5. Transformation between Image and Object Space **(5 hrs)**

Aerial mosaics: comparison with maps; Elements of aerial photo interpretation – (a) landforms; (b) surface drainage patterns; (c) erosion features, (d) gray tones; (e) miscellaneous elements

6. Digital Photogrammetry **(2 hrs)**

Digital Photogrammetry: definition and scope; Photographs and images; Geo-referencing – Interior orientation, collinearity equations, Interior & exterior orientation

7. Space resection **(3 hrs)**

Space resection, Space forward intersection and limitations, Aerial triangulation and bundle block adjustment

8. Orientation **(8 hrs)**

Exterior orientation: Aero triangulation – single frame and block triangulation - pass points, tie points; ground control points; Satellite photogrammetry

9. Surface Modelling **(2 hrs)**

3-D surface modelling – DEMs, DSMs and DTMs

10. TIN **(3 hrs)**

Triangulated irregular networks; Gridded surfaces; interpolation methods; Contour representation; Terrain visualization

11. Close range Photogrammetry **(3 hrs)**

DEM user applications, Fundamentals of close-Range Photogrammetry

12. Applications in Engineering **(2 hrs)**

Application in Engineering and non-topographic fields

13. Drone Operation Regulations **(2 hrs)**

Drone Regulations, Registration and Permit, Restricted zones, UASR of CAAN

Practical Works:	
Week	Contents
1	Familiarization with Drone types, components, and accessories
2	Pre-flight checks and drone handling safety protocols
3	Mission planning using Drone flight planning software, conducting a sample aerial survey
4	Survey over a small area (campus or open ground) following planned flight paths
5	Familiarization with Drone types, components, and accessories
6	Pre-flight checks and drone handling safety protocols

7	Mission planning using Drone flight planning software, conducting a sample aerial survey
8	Survey over a small area (campus or open ground) following planned flight paths
9	Familiarization with Drone types, components, and accessories
10	Generating Digital Elevation Model (DEM) and Digital Surface Model (DSM) from UAV imagery
11	Creating and visualizing 3D textured models
12	Extracting land cover features from UAV Orthomosaic
13	Volume estimation of a stockpile or excavation site using UAV-derived 3D models
14	Change detection analysis using UAV datasets from two time periods

References:

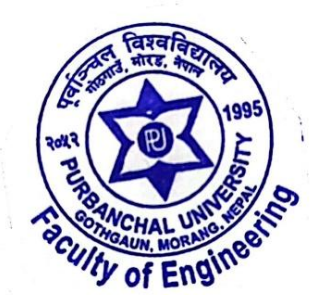
S. No.	Name of Books/ Authors/ Publishers	Year of Publication/ reprint
1	Wolf, P.R. Elements of Photogrammetry, McGraw Hill, New York	1974
2	Lueder, D.R., Aerial photographic interpretation, McGraw Hill Book Co.	1959
3	Slama, C.C. (Ed.) Manual of Photogrammetry, American Society of Photogrammetry, Fall Church, Virginia	1980
4	Mikhail, Edward M.; Bethal, James S.; Mcglove, J. Chris, Introduction to Modern Photogrammetry, John Wiley and Sons	2001
5	Wolf, Paul R. Dewitt, Bon A. Wilkinson, Benjamin E., Elements of Photogrammetry with Applications In GIS,	2014

	McGraw-Hill	
6	Lillesand and Keifer, Remote sensing and Image interpretation, John Wiley and Sons	2000
7	McGlone, C., Edward, M. and Bethel, Manual of Photogrammetry, J, American Society for Photogrammetry and Remote Sensing, Bethesda, Maryland, USA	2005
8	David F. Maune, Digital Elevation Model Technologies and Applications: The DEM user Manual, , American Society for Photogrammetry and Remote Sensing, Bethesda, Maryland, USA	2001
9	Leica Photogrammetry Suite – Orthobase and Orthobase Pro User Guide, Leica Geosystems, GIS & Mapping, Atlanta, USA	2003

Detailed Course Content:

DETAILED TOPICS- LECTURES	
S. No.	Contents
1.	Introduction to Photogrammetry
Fundamentals of Photogrammetry and Photo interpretation [**2hr**], Principles of photography, photographic films, filters, aerial vs terrestrial camera [**1hr**], Role of drones in modern mapping, cameras, types of photographs; Vertical photographs – principal point; scale; Stereoscopy [**1hr**]; Vertical exaggeration factors involved and determination; Overlap, sidelap and flight planning [**2hr**].	
2.	Aerial Photogrammetry (Drone)
Geometry of vertical/near-vertical aerial photographs: Orthographic vs. perspective projection [**2hr**], Map vs. photograph, Geometric elements of vertical aerial photographs: Relief Displacement on vertical aerial photographs [**2hr**]; Parallax and parallax measurement – monoscopic and stereoscopic methods [**2hr**]; Determination of horizontal ground length [**2hr**], direction and angles from photo coordinates [**1hr**].	
3.	Transformation between Image and Object Space
Aerial mosaics: comparison with maps; Elements of aerial photo interpretation– (a) landforms [**2hr**]; (b) surface drainage patterns; (c) erosion features, (d) gray tones; (e) miscellaneous element [**3hr**]; Digital Photogrammetry: definition and scope; Photographs and images; Geo-referencing – Interior orientation, collinearity equations, Interior & exterior orientation [**2hr**]; Space resection, Space forward intersection and limitations, Aerial triangulation and bundle block adjustment [**3hr**].	
4.	Drone Photogrammetry orientation
Exterior orientation: Aero triangulation – single frame and block triangulation [**4hr**] - pass points, tie points [**2hr**]; ground control points; Satellite photogrammetry [**2hr**].	
5.	Integrated Systems
3-D surface modeling – DEMs, DSMs and DTMs [**2hr**]; Triangulated irregular networks; Gridded surfaces; interpolation methods [**2hr**]; Contour representation; Terrain visualization; DEM user applications [**2hr**], Fundamentals of close Range Photogrammetry, Application in Engineering and non-topographic fields [**4hr**].	

6.	Drone Operation Regulations
Drone Regulations, Registration and Permit [**1hr**], Restricted zones, UASR of CAAN [**1hr**]	
DETAILED TOPICS- LAB	
S. No.	Contents
1.	Introduction & Safety
Familiarization with UAV types, components, and accessories, Pre-flight checks and drone handling safety protocols.	
2.	Flight Planning & Data Acquisition
Mission planning using UAV flight planning software, conducting a sample aerial survey over a small area (campus or open ground) following planned flight paths.	
3.	Image Pre-processing
Transferring UAV imagery from drone to processing system, Organizing images and metadata for photogrammetric processing.	
4.	Photogrammetric Processing
Creating tie points and performing aerial triangulation in photogrammetry software, Generating orthomosaic images from drone photographs.	
5.	Geo-referencing & Accuracy Assessment
Geo-referencing orthophotos using Ground Control Points (GCPs), Accuracy assessment of UAV-derived products (RMSE calculation).	
6.	3D Surface & Elevation Modeling
Generating Digital Elevation Model (DEM) and Digital Surface Model (DSM) from UAV imagery, Creating and visualizing 3D textured models.	



7.	Applications & Analysis
Extracting land cover features from UAV orthomosaics, Volume estimation of a stockpile or excavation site using UAV-derived 3D models, Change detection analysis using UAV datasets from two time periods.	

PURBANCHAL UNIVERSITY

SEMESTER FINAL EXAMINATION – 2025 (MODEL QUESTION)

LEVEL: B. E. (Civil)

SUBJECT: UAV Photogrammetry (Elective II) FULL MARKS: 60

TIME: 03:00 hrs PASS MARKS: 24

Group A: Short Answer Questions *(4 × 2 marks)*

Q1. Define photogrammetry. List any three objectives of UAV photogrammetry.

Q2. What is relief displacement in a vertical aerial photograph? State the factors affecting it.

Q3. Differentiate between DEM and DSM (any four points).

Q4. State the purpose of Ground Control Points (GCPs) in UAV photogrammetry.

Group B: Medium Questions *(7 × 4 marks)*

Q5. Explain stereoscopy and vertical exaggeration in photogrammetry.

Q6. A UAV flies at a height of 600 m above ground with a camera focal length of 120 mm. Calculate the photo scale.

Q7. Describe the procedure of UAV mission planning for a photogrammetric survey.

Q8. Explain interior orientation and exterior orientation in digital photogrammetry.

Q9. What is aerial triangulation? Explain its importance in UAV photogrammetry.

Q10. A UAV-derived orthophoto has an RMSE of 0.15 m. Comment on its suitability for engineering applications.

OR

A UAV survey uses 8 Ground Control Points (GCPs) and produces a horizontal RMSE of 0.22 m**.**

(a) Explain what RMSE indicates in UAV photogrammetry.
(b) Comment on the quality and usability of the data for topographic mapping and engineering planning**.**

Q11. Explain the concept of TIN and its applications.

OR

Explain gridded surface models in UAV photogrammetry. Compare gridded surfaces with TIN models in terms of data structure, accuracy, storage, and applications.

Group C: Long Answer Questions *(3 × 8 marks)*

Q12. With a neat sketch, explain the geometry of vertical aerial photographs and relief displacement.

OR

Explain parallax in aerial photographs. Describe the monoscopic and stereoscopic methods of parallax measurement and discuss how parallax is used to determine ground distances and elevations**.**

Q13. Describe the complete workflow of UAV photogrammetry from data acquisition to final product generation.

OR

Discuss the principles and steps involved in digital photogrammetry with reference to UAV imagery. Explain the roles of interior orientation, exterior orientation, and bundle block adjustment in producing accurate photogrammetric outputs.

Q14. A stockpile is surveyed using UAV photogrammetry. Explain the procedure of volume estimation and its advantages.