Purbanchal University
Faculty of Engineering, Biratnagar, NEPAL
Seventh Semester's Course Structure
Program: Bachelor in Civil Engineering
Effective from 2021 (2078) Batch

Year-III   **Semester-VII**

S.N.	Course code	Subject	Credit Hours	L	T	P	Total	Internal		Final		Total
								Th.	P	Th.	P	
1	BCI7029	Design of reinforced concrete structure	3	3	3	2/2*	7	40	25	60	-	125
2	BCI7030	Hydropower Engineering	3	3	3	2/2*	7	40	25	60	-	125
3	BCI7031	Estimation and valuation	3	3	2	-	5	40	-	60	-	100
4	BCI7032	Civil Engineering Project I	1	1	1	-	2	-	50	-	-	50
5	BCI7033	Safety Engineering	2	2	1	-	3	20	-	30	-	50
6	BCI7034	Construction Project Management	3	3	2	-	5	40	-	60	-	100
7	BCI78--	Elective-I	3	3	2	-	5	40	-	60		100
		Total	**18**	**18**	**14**	**2**	**34**					**650**

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

Design of Reinforced Concrete Structures
BCI7029

Year: IV   **Semester: VII**

Teaching Hours/week				Examination Scheme						Total Marks
				Internal		Final				
				Theory	Practical	Theory		Practical		
Cr	L	T	P			Duration	Marks	Duration	Marks	
3	3	3	2/2	40	25	3	60	-	-	125

Course Objective:

The main objective of this course is to impart the knowledge and skill for the design of different elements of buildings structure using reinforced concrete. This course specially focuses on limit state method of design and students will be able to perform structural analysis of different elements of building structure corresponding to the codal provision and detailing of reinforcement.

Course Content:

1. Reinforced Concrete Structures   (2 hrs)
1.1 Introduction to Reinforced Concrete Structure
1.2 Design Philosophies of Reinforced Concrete Structure
1.3 Various Types of Loads and Stresses in Reinforced Concrete Structures

2. Working Stress Method   (4 hrs)
2.1 Conception of Materials Strength, Loading and Modular Ratio
2.2 Analysis of Singly Reinforced Beam

3. Limit State Method of Design   (3 hrs)
3.1 Introduction of Limit State Method as a Probabilistic Approach
3.2 Behavior of Concrete and Steel
3.3 Characteristic Strength of Materials, Characteristics Load and Partial Safety Factors
3.4 Limit State of Collapse: Flexure, Compression, Shear and Torsion
3.5 Limit State of Serviceability: Deflection, Cracking

4.0 Reinforcement Detailing   (3 hrs)
4.1 Concrete Cover

4.2 Minimum and Maximum Reinforcement in Beams, Slabs, Columns, etc.

4.3 Minimum and Maximum Sizes of Reinforcing Bars

4.4 Minimum and Maximum Spacing of Reinforcing Bars

4.5 Curtailment of Reinforcements and splices

4.6 Bar Bending Schedule

5.0 Design of Beam (10 hrs)

5.1 Design for Bending (Singly Reinforced, Doubly Reinforced and Flanged Section)

5.2 Design for Shear and Torsion

5.3 Design for Bond and Development Length

5.4 Introduction to Deflection and Crack Control

6.0 Design of Slab (7 hrs)

6.1 Types of Slab

6.2 Design of One-way Slabs (Restrained / Unrestrained)

6.3 Design of Two-way Slabs (Restrained / Unrestrained)

7.0 Design of Staircase (4 hrs)

7.1 Types of Staircases (Introduction to Longitudinally & Transversely Loaded Stair)

7.2 Design of Straight / Doglegged Staircase

7.3 Design of Open-well Stair (Concept and Procedure Only)

8.0 Design of Column (5 hrs)

8.1 Types of Columns.

8.2 Design of Axially Loaded Short Columns with lateral and helical ties

8.3 Design of Eccentrically Loaded Short Columns with lateral and helical ties

8.4 Introduction to Slender Column

9.0 Design of Footing (5 hrs)

9.1 Types of Footings

9.2 Design of Isolated Footings

9.3 Design of Strap Footing

9.4 Introduction to Combined Footings (Concept Only)

10.0 Pre-stressed Concrete Structure (2 hrs)

10.1 Introduction to Pre-stressed Concrete

10.2 Materials Used and Their Properties

10.3 Pre-stressing Systems and Anchorage

Laboratory Works:

1) Test of RCC Beam in Pure Bending
2) Rebar Detailing and Drawing of Beam, Column, Slab, Stair and Footing.
3) 2D Frame Analysis, Design and Detailing using FEM Software and Verification with Manual Calculation.

References:

1. Pillai U., Menon D. (1998). Reinforced Concrete Design, Tata McGraw-Hill Publishing Company Limited, New Delhi.
2. Jain A. K. (2012). Reinforced Concrete, Limit State Design, Nem Chand & Bros, Roorkee, Sixth Edition.
3. Sharma N. (2010). RCC Design and Drawings, S.K. Kataria & Sons, New Delhi.
4. Varghese P. C. (1997). Limit State Design of Reinforced Concrete, Prentice Hall of India. Pvt. Ltd., New Delhi.
5. IS 456 (2000). Plain and reinforced concrete-code of practice. Bureau of Indian Standards, New Delhi.
6. SP 16 (1980). Design Aids for Reinforced Concrete to IS 456:1980. Bureau of Indian Standards, New Delhi.
7. SP 34 (1987). Handbook on Concrete Reinforcement and Detailing. Bureau of Indian Standards, New Delhi.
8. NBC105:2020. Seismic Design of Buildings in Nepal, Ministry of Urban Development, Government of Nepal.

Evaluation Scheme:

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

Chapters	Hours	Mark Distribution *	Remarks
1		2	Th
2		4	Th/N
3		2+4	Th+Th
4		2+4	Th+Th
5		4+4	Th/N+N
6		8	N
7		8	N/Th
8		4+4	N+Th
9		8	N
10		2	Th
Total	**45**	**60**	

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

Detailed Course Contents:

Ch. No.	Topic		Subtopic	Depth								Hour	Remarks
				SD	D	DR	I	E	A	EX	N		
1	Reinforced Concrete Structures	1.1	Introduction to Reinforced Concrete Structure	✓	✓							2	
		1.2	Design Philosophies of Reinforced Concrete Structure	✓	✓			✓					
		1.3	Various Types of Loads and Stresses in Reinforced Concrete Structures		✓								
2	Working Stress Method	2.1	Conception of Materials Strength, Loading and Modular Ratio		✓		✓	✓				4	
		2.2	Analysis of Singly Reinforced Beam		✓		✓	✓			✓		
3	Limit State Method of Design	3.1	Introduction of Limit State Method as a Probabilistic Approach	✓	✓							3	
		3.2	Behavior of Concrete and Steel		✓		✓	✓					
		3.3	Characteristic Strength of Materials, Characteristics Load and Partial Safety Factors		✓			✓					
		3.4	Limit State of Collapse: Flexure, Compression, Shear and Torsion		✓		✓	✓					
		3.5	Limit State of Serviceability: Deflection, Cracking		✓		✓						

Ch. No.	Topic		Subtopic	Depth								Hour	Remarks
				SD	D	DR	I	E	A	EX	N		
4	Reinforcement Detailing	4.1	Concrete Cover		✓		✓		✓			3	
		4.2	Minimum and Maximum Reinforcement in Beams, Slabs, Columns, etc.		✓		✓		✓				
		4.3	Minimum and Maximum Sizes of Reinforcing Bars		✓		✓		✓				
		4.4	Minimum and Maximum Spacing of Reinforcing Bars		✓		✓		✓				
		4.5	Curtailment of Reinforcements and Splices		✓		✓		✓				
		4.6	Bar Bending Schedule		✓		✓	✓	✓				
5	Design of Beam	5.1	Design for Bending (Singly Reinforced, Doubly Reinforced and Flanged Section)		✓		✓			✓	✓	10	
		5.2	Design for Shear and Torsion		✓		✓			✓	✓		
		5.3	Design for Bond and Development Length		✓		✓				✓		
		5.4	Introduction to Deflection and Crack Control		✓		✓	✓					
6	Design of Slab	6.1	Types of Slab	✓	✓							7	
		6.2	Design of One-way Slabs (Restrained / Unrestrained)	✓	✓		✓	✓			✓		

Ch. No.	Topic		Subtopic	Depth								Hour	Remarks
				SD	D	DR	I	E	A	EX	N		
		6.3	Design of Two-way Slabs (Restrained / Unrestrained)	✓	✓		✓	✓			✓		
7	**Design of Stair**	7.1	Types of Stair (Introduction to Longitudinally & Transversely Loaded Stair)	✓	✓		✓	✓				6	
		7.2	Design of Straight / Doglegged Stair		✓		✓	✓			✓		
		7.3	Design of Open-well Stair (Concept and Procedure Only)		✓		✓	✓					
8	**Design of Column**	8.1	Types of Columns.	✓	✓							5	
		8.2	Design of Axially Loaded Short Columns with lateral and helical ties	✓	✓		✓	✓			✓		
		8.3	Design of Eccentrically Loaded Short Columns with lateral and helical ties	✓	✓		✓	✓			✓		
		8.4	Introduction to Slender Column	✓	✓		✓	✓					
9.0	**Design of Footing**	9.1	Types of Footings	✓	✓		✓					5	
		9.2	Design of Isolated Footings		✓		✓	✓			✓		
		9.3	Design of Strap Footing		✓		✓	✓			✓		
		9.4	Introduction to Combined Footings (Concept Only)		✓		✓	✓					
10.0		10.1	Introduction to Pre-stressed Concrete	✓	✓		✓	✓	✓			2	

Ch. No.	Topic		Subtopic	Depth								Hour	Remarks
				SD	D	DR	I	E	A	EX	N		
	Pre-stressed Concrete Structure	**10.2**	Materials Used and Their Properties	✓	✓			✓					
		10.3	Pre-stressing Systems and Anchorage	✓	✓		✓	✓	✓				

Note: Define(SD), Description (D), Derive (DR), Illustration (I), Explanation (E), Application (A), Experimentation (Ex), Numerical (N)

PURBANCHAL UNIVERSITY
SEMESTER FINAL EXAMINATION – 2025 (MODEL QUESTION)

LEVEL:- B. E. (Civil) IV/I
SUBJECT:- Design of RCC Structures   FULL MARKS:- 60
TIME:- 03:00 hrs.   PASS MARKS:- 24

Candidates are required to give their answers in their own words as far as practicable.
Assume suitable data, where necessary.

Attempt **All** questions. IS 456-2000 and SP16 are allowed.

Group A (2*4=8)

1. Differentiate between limit state and working stress method of design.
2. Why strength of concrete is considered as 45% in limit state method of design.
3. Differentiate between Reinforced cement concrete and pre-stressed concrete structures.
4. What is bar bending schedule and why is it important?

Group B (4*7=8)

5. Differentiate between balanced, under reinforced and over reinforced singly reinforced beam in working state method of analysis.
6. A reinforced concrete beam 300mm x 700mm is subjected to a service bending moment of 150KNm. Determine the area of reinforcement. Take M20 concrete and Fe500 steel.
7. A rectangular beam of 300mm width and 500mm effective depth is reinforced with 4-20mm diameter bars. Determine the shear reinforcement required to resist shear force of 75KN.

8. Determine the longitudinal steel required for short column 400mm x 600mm carrying a factored load of 1600KN and factored moment along major and minor axis 120KNm and 90KNm respectively. Take M20 concrete and Fe415 steel.
9. Draw reinforcement detailing of two-way slab and beam as per IS code.
10. Describe the design criteria of lateral ties and spiral ties in column as per IS code.
11. Prove that the depth of neutral axis decreases with the increase in grade of steel.

Group C (3*8=24)

12. Design a slab for a room 5 m $\times$ 4 m effective in size if super imposed load and floor finish are 8 KN/m^2 and 2 KN/m^2 respectively. Adopt M20 grade concrete and Fe415 steel. Slab is simply supported(unrestrained) on wall of 230mm thickness from all four side.
13. Design a doglegged stair for total floor height of 3m. The stair is simply supported on the wall of 230mm thickness. The clear width of stair and landing slab is 1m. Take Height of Riser =0.15m and Tread Width = 0.3m. Take live load of 4kN/m2 and Floor Finish of 1.5kN/m2.

OR

Write down the design procedure of Open-well staircase and its detailing.
14. Design an isolated footing for a square column 400mmx400mm carrying an axial load of 800 KN. The allowable bearing capacity of soil is 120 KN/m2 with 1.5 m depth of foundation. Take M20 concrete and Fe 415 steel.

HYDROPOWER ENGINEERING
BCI7030

Year: IV   **Semester: VII**

Teaching Hours/week				Examination Scheme						Total Marks
				Internal		Final				
				Theory	Practical	Theory		Practical		
Cr	L	T	P			Duration	Marks	Duration	Marks	
3	3	3	2/2	40	25	3	60	-	-	125

Course Objective:

The objective of this course is to make the students aware on the principle of hydropower, stages in development of hydropower and equip them with knowledge and skill to design major components of a hydropower system.

Course Contents:

1. **Introduction (3 hours)**
   1.1 Introduction to power and energy; sources of power, hydropower and its principle
   1.2 Classification of hydropower plants based on head, installed capacity, and storage
   1.3 Hydropower potentials and status of the world, region, and Nepal
   1.4 History of hydropower development in Nepal, including existing major hydel plants and major hydel projects in development phase
   1.5 Contribution of hydropower to grid stability: Electrical grid and energy mix

2. **Power and Energy Estimation (7 hours)**
   2.1 Gross and net head estimation
   2.2 Hydrological analysis: Processing of hydrological data; use of extreme and long-term hydrological data; development and uses of flow duration and mass curves
   2.3 Types of power and energy: Installed capacity; firm power and secondary power; firm energy and secondary energy (including estimation)
   2.4 Fixing installed capacity of a hydropower plant
   2.5 Load-related terminologies: Load curve, load variation (daily, weekly and seasonal), mean and peak load, load factor, capacity factor, utilization and diversity factors, Power duration curve,

3. **General Layout and Planning of Hydropower Projects (4 hours)**
   3.1 Layout of different types (storage, RoR, PRoR) of hydropower projects: Headworks, conveyance, powerhouse, tailrace
   3.2 Site selection of hydropower project, stages (cycle) of hydropower development

3.3 Phases of study of hydropower projects: Reconnaissance, Prefeasibility, Feasibility Studies and Detailed Design Study (topographical, hydrological, geological, energy and cost estimation aspects)

3.4 Reservoir sedimentation and regulation: Reservoir sizing; sources of sediment and sediment yield in river; life of the reservoir; sediment handling in reservoirs; reservoir regulation

3.5 Hydropower development planning: Process, policies and acts, and institutional setup in Nepal

4. Water Retaining Structures (9 hours)

4.1 Dams for water retention: Purpose and types (based on function, head, hydraulic consideration, materials, rigidity) of dams; criteria for a dam site selection; choice of dam depending upon site condition and economy.

4.2 General consideration for design of dams: Loads on dams and hydraulic requirements

4.3 Design of concrete gravity dam: Load combinations; stability and factor of safety; middle third rule; elementary profile of a dam

4.4 Foundation treatment: Grouting, remedies against piping and exit gradient

4.5 Design of earthen dams: Causes of failure; general considerations; phreatic line, seepage flow; and stability

5. Regulatory Structures (10 hours)

5.1 Intakes: Functional requirements; intakes of storage and run-off river projects and their types; design of intake of run-off river projects (side intake)

5.2 Hydraulic tunnel: Classification based on geometry and pressure; pressure and non-pressure tunnels; head loss in pressure tunnels; lining and supports for tunnel; tunnel diameter optimization

5.3 Settling basin: Types of settling basins; design of settling basin (particle and concentration approach); estimation of sediment volume in settling basin; estimation of frequency of flushing

5.4 Forebay and surge tank: Functional requirement and design of forebay; types, functional requirement and design of simple surge tank

5.5 Penstock: Water hammer and hydrodynamic pressure calculation; thickness of penstock, penstock diameter optimization

6. Spillway (4 hours)

6.1 Function, types and suitability of spillways

6.2 Provision of gates and its types

6.3 Cavitation in spillways and preventive measures

6.4 Energy dissipating structures: Their necessity and types; role of tail water depth on choice of energy dissipator

6.5 Design of stilling basin type energy dissipator

7. Hydro-Electrical Machines (8 hours)

   7.1 Turbines: Functions and selection criteria of different types of turbines (Pelton, Francis, Kaplan); specific speed of turbine; performance characteristics of different types of turbines; preliminary design of turbines (Pelton, Francis and Kaplan turbine)

   7.2 Pumps: Types and performance characteristics of pumps (centrifugal, and reciprocating pumps)

   7.3 Electro-Mechanical installation: Generators and their types

   7.4 Governors: Purpose and working principles

   7.5 Powerhouse and associated structures: Classification (surface and sub-surface) and dimensions of powerhouses; daft tube; tail race canal and their importance

Laboratory Works:

   (i)   Performance Characteristics of a Pelton Turbine.
   (ii)   Performance Characteristics of a Francis Turbine.
   (iii) Characteristics of Centrifugal Pump.
   (iv)   Characteristics of Reciprocating Pump

Field Visit:

Field visit of at least one hydropower project, group presentation and submission of individual report to the respective teacher.

References*:

1. Dandekar, M. M. & Sharma, K. N. (2013). *Water Power Engineering.* 2nd edition, Vikas Publishing House

2. Mosonyi, E. (1987), *Water Power Development, Volume I: Low-head Hydropower Plants.* 3rd edition, Academia Kaido, Budapest

3. Mosonyi, E. (1991), *Water Power Development, Volume II: High-head Hydropower Plants.* 3rd edition, Academia Kaido, Budapest

4. Novak, P., et al. (2007). *Hydraulic Structures.* 4th edition, Taylor and Francis

5. Arora, K.R. (2018). *Irrigation, Water Power and Water Resources Engineering.* 5th edition, Standard Publishers Distributors

6. Garg, S. K. (2019). *Irrigation Engineering and Hydraulic Structures.* 35th edition, Khanna Publishers

7. Gautam, N. P. & Katuwal, T. B. (2016). *Fundamental of Fluid Mechanics and Hydropower Engineering.* 2nd edition, Subhechchha and Sadhichchha Gautam Publisher

8. Baral, S. (2023). *Fundamentals of Hydropower Engineering*, 4th edition, National Book Centre

9. Singal, S. K., et al. (2023). *Small Hydropower.* 1st edition, Charlotte Cockle

Latest edition will be preferable.

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

Detailed Course Contents:

Ch. No.	Topic		Subtopic	Depth								Hour
				SD	D	DR	I	E	A	EX	N	
1	**Introduction**	1.1	Introduction to power and energy; sources of power, hydropower and its principle	✓	✓							3
		1.2	Classification of hydropower plants based on head, installed capacity, and storage		✓							
		1.3	Hydropower potentials and status of the world, region, and Nepal		✓							
		1.4	History of hydropower development in Nepal, including existing major hydel plants and major hydel projects in development phase		✓							
		1.5	Contribution of hydropower to grid stability: Electrical grid and energy mix	✓	✓							
2	**Power and Energy Estimation**	2.1	Gross and net head estimation	✓	✓		✓					7
		2.2	Hydrological analysis: Processing of hydrological data; use of extreme and long-term hydrological data; development and uses of flow duration and mass curves		✓				✓		✓	
		2.3	Types of power and energy: Installed capacity; firm power and secondary power; firm energy and secondary energy (including estimation)	✓	✓				✓		✓	
		2.4	Fixing installed capacity of a hydropower plant		✓						✓	
		2.5	Load-related terminologies: Load curve, load variation (daily, weekly and seasonal), mean and peak	✓	✓						✓	

Ch. No.	Topic		Subtopic	Depth								Hour
				SD	D	DR	I	E	A	EX	N	
			load, load factor, capacity factor, utilization and diversity factors, Power duration curve,									
3	General Layout and Planning of Hydropower Projects	3.1	Layout of different types (storage, RoR, PRoR) of hydropower projects: Headworks, conveyance, powerhouse, tailrace		✓		✓					4
		3.2	Site selection of hydropower project, stages (cycle) of hydropower development		✓			✓				
		3.3	Phases of study of hydropower projects: Reconnaissance, Prefeasibility, Feasibility Studies and Detailed Design Study (topographical, hydrological, geological, energy and cost estimation aspects)		✓							
		3.4	Reservoir sedimentation and regulation: Reservoir sizing; sources of sediment and sediment yield in river; life of the reservoir; sediment handling in reservoirs; reservoir regulation	✓	✓						✓	
		3.5	Hydropower development planning: Process, policies and acts, and institutional setup in Nepal		✓							
4	Water Retaining Structures	4.1	Dams for water retention: Purpose and types (based on function, head, hydraulic consideration, materials, rigidity) of dams; criteria for a dam site selection; choice of dam depending upon site condition and economy.	✓	✓							9

Ch. No.	Topic		Subtopic	Depth								Hour
				SD	D	DR	I	E	A	EX	N	
		4.2	General consideration for design of dams: Loads on dams and hydraulic requirements		✓							
		4.3	Design of concrete gravity dam: Load combinations; stability and factor of safety; middle third rule; elementary profile of a dam		✓	✓					✓	
		4.4	Foundation treatment: Grouting, remedies against piping and exit gradient		✓							
		4.5	Design of earthen dams: Causes of failure; general considerations; phreatic line, seepage flow; and stability		✓							
5	Regulatory Structures	5.1	Intakes: Functional requirements; intakes of storage and run-off river projects and their types; design of intake of run-off river projects (side intake)	✓	✓		✓				✓	10
		5.2	Hydraulic tunnel: Classification based on geometry and pressure; pressure and non-pressure tunnels; head loss in pressure tunnels; lining and supports for tunnel; tunnel diameter optimization	✓	✓							
		5.3	Settling basin: Types of settling basins; design of settling basin (particle and concentration approach); estimation of sediment volume in settling basin; estimation of frequency of flushing	✓	✓	✓					✓	
		5.4	Forebay and surge tank: Functional requirement and design of forebay; types, functional requirement and design of simple surge tank	✓	✓						✓	
		5.5	Penstock: Water hammer and hydrodynamic pressure	✓	✓						✓	

Ch. No.	Topic			Subtopic	Depth								Hour
					SD	D	DR	I	E	A	EX	N	
				calculation; thickness of penstock, penstock diameter optimization									
6	**Spillway**		6.1	Function, types and suitability of spillways	✓	✓							4
			6.2	Provision of gates and its types		✓							
			6.3	Cavitation in spillways and preventive measures		✓							
			6.4	Energy dissipating structures: Their necessity and types; role of tail water depth on choice of energy dissipator		✓		✓	✓				
			6.5	Design of stilling basin type energy dissipator	✓	✓						✓	
7	**Hydro-Electrical Machines**		7.1	Turbines: Functions and selection criteria of different types of turbines (Pelton, Francis, Kaplan); specific speed of turbine; performance characteristics of different types of turbines; preliminary design of turbines (Pelton, Francis and Kaplan turbine)		✓		✓	✓			✓	8
			7.2	Pumps: Types and performance characteristics of pumps (centrifugal, and reciprocating pumps)		✓			✓				
			7.3	Electro-Mechanical installation: Generators and their types		✓							
			7.4	Governors: Purpose and working principles		✓		✓					
			7.5	Powerhouse and associated structures: Classification (surface and sub-surface) and dimensions of powerhouses; daft tube; tail race canal and their importance	✓	✓			✓				

Final Examination Scheme:		
Chapters	Marks	Remarks
1	4	Th
2	10	Th + N or Th/N
3	8	Th + N
4	12	Th + N
5	12	Th + N
6	4	Th + N or Th/N
7	10	Th + N
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.*		

Chapter wise marks division in final examination:

Chapter	No of Short Questions (2M)	No of Medium Questions (4M)	No of Long Question (8M)
1	1	1	
2	1	1	1
3	1	1	
4	1	1	1
5	1	1	1
6	1	1	
7	1	1	1

Note: *Only 4 short questions and 7 medium questions will be asked from all chapters; 3 long questions will be asked from mentioned chapters in the table.*

Attempt all questions

<div align="center">Group A   (2*4=8)</div>

1. Classify and explain hydropower projects based on storage.

2. List out the major existing Storage, PROR and ROR projects in Nepal along with their capacity and state the suitability pumped storage project in Nepal.

3. Define gross head and net head and show them in accordance to impulse and reaction type turbine in figure.

4. Write about pump and its types.

<div align="center">Group B   (4*7=28)</div>

5. Mention the major studies and investigation carried out during prefeasibility studies.

6. Draw a typical layout of Run off River (ROR) hydropower scheme showing all the major components.

<div align="center">OR</div>

A runoff river plant operates at 25% load factor with an installed capacity of 1.6x104 kW when it works as a peak load plant. Find the minimum flow rate in the stream so that the plant may serve as base load plant. The efficiency and head are 85% and 20m respectively. Find also maximum LF of the plant when Q=35m^3/s.

7. Determine the sequent and normal depth at the stilling basin for the following data:

    Height of crest above d/s bed: 25m
    Design discharge: 200 m3/s
    Width of canal: 5m
    Bed slope 1:500
    Manning's coefficient: 0.017
    Coefficient discharge: 0.7

8. Selection the size of Francis turbine for a site where the net head is 100m and discharge is 139.928 m^3/s having efficiency of 94%. Determine also the elevation of turbine with reference to the water surface in tailrace. Assume the turbine will have to drive a 50 cycle generator.

9. Explain specific speed of turbines. Explain characteristics curve of turbines.

10. A penstock carries 8m^3/s of water at the head of 25m. The cost of pipe is given by 35 hd2. Rupees per m length where h denotes head and d diameter of the pipe. Annual fixed charges including investment and maintenance of the penstock pipe are 8% of the pipe line cost. If the coefficient of friction factor for the pipe flow is 0.025, overall electromechanical efficiency is 80% and selling power price is Rs 700 NRs/kW/annum. Calculate the most economical diameter of the penstock pipe for the project.

<div align="center">OR</div>

What are surge tank and forebay? Explain their applicability and importance in the hydropower plant.

11. Define elementary profile of a gravity dam and derive the base its base width.

Group C   **(8*3=24)**

12. Analyzing the long-term flow, the long term mean monthly flow of Tadi Khola flowing in Nuwakot District is listed to be 4.21, 2.92, 2.14, 1.55, 2.92, 4.86, 21.02, 38.8, 32.33, 16.17, 7.76, 5.82 m3/s from January to December. The downstream release is fixed to be 10% of driest monthly flow.   [1.5+1.5+3+2]
    (i)   What is the design discharge when it is set to be at 45% exceedance?
    (ii)   If the net head is 300m, plant efficiency is 85%, what will be the installed capacity of the project?
    (iii)   What is the firm flow, firm capacity, firm energy and secondary energy?
    (iv)   Compute the volume of the reservoir required to operate the station with firm capacity corresponding to the discharge 2m^3/s more than present firm flow?

13. Determine the factor of safety against overturning, factor of safety against sliding, maximum vertical stress, shear stress and normal stress at the toe for the dam shown in figure. Also determine if there is tension or not? Consider only the major forces acting on the dam and check for full reservoir condition. Assume unit weight of concrete and water are 24 kN/m^3, 10kN/m^3 respectively. Average shear strength of the material at horizontal section is 1400 kN/m^2. Coefficient of friction is 0.75.
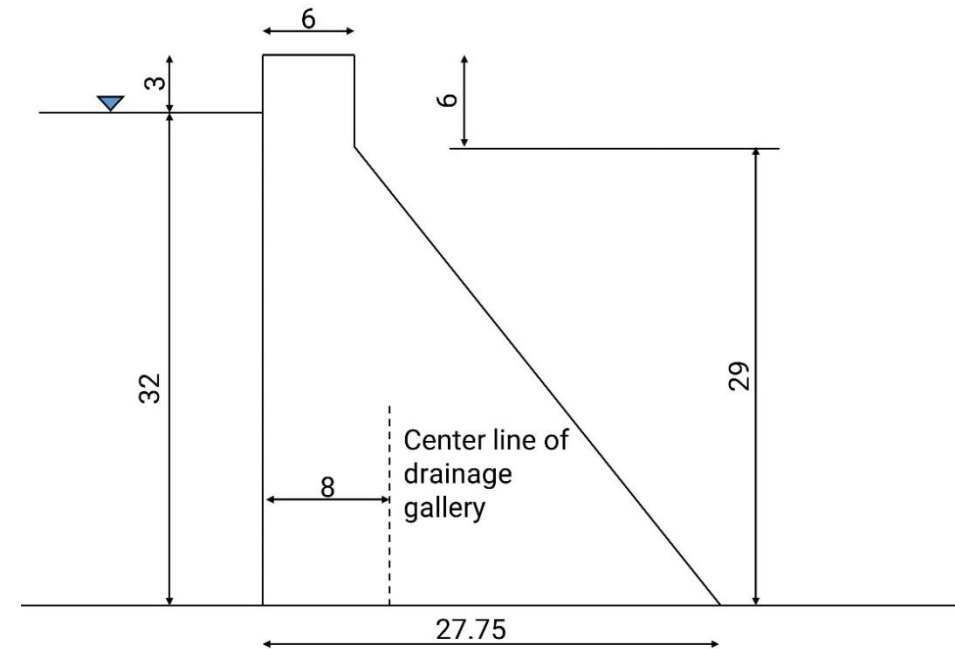
Note: All dimensions are in meter.

14. Define intake and describe its functional requirements. Taking those under consideration, design a side intake with coarse trash rack for a project in which river bed level is 3315.0m amsl, weir crest level (normal water level) is fixed to 3317.5m amsl. From hydrological analysis and in for proposed headworks design condition (for given undersluice bed level and opening, weir length and height), the highest flood level in 100 years return period is 3320.83m amsl and flood level in 20 years return period is 3319.55m masl. The canal water level is fixed as 3317.3m amsl. The turbine discharge of a project is 1.45m^3/s. Assume other suitable data for design.

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

ESTIMATION AND VALUATION
BCI7031

Year: IV   **Semester: VII**

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

Course Objective:

The objective of this course is to give the students basics knowledge of estimating, costing, Specification and valuation of civil engineering works. After completing this course, the students will also be able to analyze the rates, estimate material quantity of the various construction works and the valuation of the properties.

Course Content:

1.0 Introduction   **(3 hrs)**
        1.1 Definition, principle, Importance and purpose
        1.2 Estimated cost and actual cost
        1.3 System of Units
        1.4 Principle of Units of measurement.
        1.5 Units of measurement and payments for materials and items of
work
        1.6 Data requirement of estimating

2.0 Methods of Estimate.   **(2 hrs)**
        2.1 Methods of measurement of civil engineering works
        2.2 Various items of civil engineering works.
        2.3 Various methods of calculating quantities: center line method, long and short
wall method; crossing method
        2.4 Abstract of Cost (AOC) and Bill of Quantity (BOQ)

3.0 Types of Estimates   **(4 hrs)**
        3.1 Approximate estimates
        3.2 Detailed estimates
        3.3 Revised estimates
        3.4 Supplementary estimates
        3.5 Annual repair or annual maintenance estimates
        3.6 Extension and improvement of estimates
        3.7 Complete estimates
        3.8 Split up of cost of building cost

4.0 Detailed Quantity Estimates   **(18 hrs)**
  4.1 Building estimate
      4.1.1 Estimate of foundation for masonry and frame Structure
      4.1.2 Estimates masonry building
      4.1.3 Estimate of RCC Frame Structure building
      4.1.4 Estimate of Steel structure (Truss)
      4.1.5 Estimate of rebar for RCC Structure (Footing, Column,
      beam, Staircase and slab)
      4.1.6 Estimate of electrical and Sanitary work.
  4..2 Estimate of road
      4.2.1 Method of calculation of earthwork
      4.2.2 Estimate of earth work in plane area and hill area
      4.2.3 Estimate of flexible Pavement Road
  4.3 Estimation of engineering Structure
      4.3.1 Estimate of earth work in canal
      4.3.2 Estimate of R.C.C. bridge and Culvert.
      4.3.3 Estimate of Septic Tank and Soak Pit

5. Specification   **(5 hrs)**
  5.1 Introduction and Importance
  5.2 Purpose of specification
  5.3 Types of specification
  5.4 Specification writing Technique
  5.5 Detail of specification writing of civil engineering works
      5.5.1 Construction materials
      5.5.2 Civil works (Excavation, PCC, Brick Work, RCC, finishing work)
      5.5.3 Water supply, sanitary and electric work.

6. Analysis of Rates   **(8 hrs)**
  6.1 Introduction
  6.2 Purposes of rate analysis
  6.3 Importance of rate analysis
  6.4 Requirements of rate analysis
  6.5 Factors affecting the rate analysis
  6.6 Cost of items, Transportation cost, overheads and contingency.
  6.7 Construction Material and labour rate, Norms and standards of Nepal for rate analysis
  6.8 Procedure of rate analysis: for building works, for sanitary and water supply works,
  for road works, for irrigation works, for bridge works

7. Valuation   (5 hrs)

      7.1 Introduction

      7.2 Purpose of valuation

      7.3 Principles of valuation

      7.4 Terms used in valuation

      7.5 Methods of determining value of property

      7.6 Methods of valuation and report writing

Course Project:
Detailed Estimates and Costing of a Two and half storey Residential Building in a Particular Place of Nepal. (The Nepalese Norms and Standards of Rate Analysis should be followed)

Tutorial (Using software):
1. Estimate of foundation for masonry and frame Structure.
2. Estimate of single room building (load bearing and frame structure)
3. Estimate of two room building (load bearing and frame structure)
4. Estimate earth work of plane and hill road
5. Estimate of RCC bridge /slab culvert
6. Estimate of Septic and Soak pit
7. Estimate of reinforcement of RCC structure (footing, column, beam, slab and staircase)
8. Valuation report writing.

References*:

- Amarjit Aggarwal, Civil Engineering Quantity Surveying and Valuation, Katson Publishing House, 1985.
- B.N Dutta, Estimating and costing in civil engineering, Delhi: USB Publisher distributers Ltd.
- A.K Upadhya, civil Estimating and costing valuation engineering
- B.S. Patil, Contract and Estimation.
- V.N Vazirani and S.P Chandola, revised by S.V Deodhar, Civil Engineering, Estimating, Costing and Valuation, S.V Deodhar, Khanna Publishers
- Norms and Rate analysis of Government of Nepal
- Standard Specification of Government of Nepal
- District rate
- IS measurement code (IS:1200)

Latest edition will be preferable.

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

Detailed Course Contents:

Ch. No.	Topic		Subtopic	Depth								Hour	Remarks
				SD	D	DR	I	E	A	EX	N		
1	Introduction	1.1	Definition, principle, Importance and purpose	✓								1	
		1.2	Estimated cost and actual cost	✓									
		1.3	System of Units	✓									
		1.4	Principle of unit of measurement	✓								2	
		1.5	Unit of measurement and payments for materials and items of work		✓								
		1.6	Data required for estimation		✓								
2	Methods of Estimate.	2.1	Methods of measurement of civil engineering works		✓							2	
		2.2	Various items of civil engineering works.		✓								
		2.3	Various methods of calculating quantities: center line method, long and short wall method; crossing method		✓			✓					
		2.4	Abstract of Cost (AOC) and Bill of Quantity (BOQ)		✓			✓					
3	Types of Estimates	3.1	Approximate estimates	✓							✓	4	
		3.2	Detailed estimates	✓				✓					
		3.3	Revised estimates	✓	✓								
		3.4	Supplementary estimates	✓	✓								

Ch. No.	Topic		Subtopic	Depth								Hour	Remarks
				SD	D	DR	I	E	A	EX	N		
		3.5	Annual repair or annual maintenance estimates	✓	✓								
		3.6	Extension and improvement of estimates	✓	✓								
		3.7	Complete estimates	✓				✓					
		3.8	Split up of cost of building cost					✓					
4	**Detailed Quantity Estimates**	4.1	Building estimate										
		4.1.1	Estimate of foundation for masonry and frame Structure		✓						✓		
		4.1.2	Estimate of masonry (one and two room) building		✓			✓			✓		
		4.1.3	Estimate of RCC Frame structure building		✓			✓			✓	6	
		4.1.4	Estimate of steel structure (Truss)		✓			✓			✓		
		4.1.5	Estimate of rebar for RCC structure (Footing, Column, Beam, Staircase and Slab)					✓			✓		
		4.1.6	Estimate of electrical and Sanitary work.					✓					
		4.2	Estimate of road										
		4.2.1	Method of calculation of earthwork	✓	✓							6	
		4.2.2	Estimate of earthwork in plane area and hill area		✓			✓			✓		

Ch. No.	Topic			Subtopic	Depth								Hour	Remarks
					SD	D	DR	I	E	A	EX	N		
		4.2.3		Estimate of flexible pavement road					✔			✔		
		4.3		Civil Engineering structure										
		4.3.1		Estimate of earthwork of canal					✔			✔		
		4.3.2		Estimate of RCC Bridge and Culvert					✔			✔		
		4.3.3		Estimate of Septic Tank and soak pit					✔			✔		
5	Specification	5.1		Introduction and importance	✔	✔							5	
		5.2		Purpose of specification		✔								
		5.3		Types of specification					✔					
		5.4		Specification writing technique					✔					
		5.5		Detail specification writing of civil engineering work										
		5.5.1		Construction material					✔					
		5.5.2		Civil Works (Excavation, PCC, Brick Work, RCC, Finishing work etc.…)					✔					
		5.5.3		Water supply, sanitation, drainage and electric work					✔					
6	Analysis of Rates	6.1		Introduction									1	
		6.2		Purpose of rate analysis		✔								
		6.3		Importance of rate analysis		✔								

Ch. No.	Topic		Subtopic	Depth								Hour	Remarks
				SD	D	DR	I	E	A	EX	N		
		6.4	Requirement o rate analysis		✔								
		6.5	Factor affecting the rate analysis		✔							1	
		6.6	Cost item, Transportation cost, over-head and contingency					✔					
		6.7	Construction material and labour rate, norms and standards of Nepal for rate analysis					✔			✔	6	
		6.8	Procedure of rate analysis: For building work, sanitary and water supply work, road work, irrigation work, bridge work					✔			✔		
7	**Valuation**	7.1	Introduction		✔								
		7.2	Purpose of valuation		✔							2	
		7.3	Principles of valuation		✔								
		7.4	Terms used in valuation		✔								
		7.5	Method of determining value of property					✔			✔	3	
		7.6	Method of valuation and report writing					✔			✔		

Ch. No.	Topic		Subtopic	Depth								Hour	Remarks
				SD	D	DR	I	E	A	EX	N		
			Note: Define (SD), Description (D), Derive (D), Illustration (I), Explanation (E), Application (A), Experimentation (Ex), Numerical (N)										

Final Examination Scheme:

Chapters	Marks	Remarks
1	2	Th
2	2	Th
3	6	Th + N or Th/N
4	28	N
5	8	Th
6	8	Th + N or Th/N
7	6	Th + N or Th/N
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.		

Chapter wise marks division in final examination:

Chapter	No of Short Questions (2M)	No of Medium Questions (4M)	No of Long Question (8M)
1	1		
2	1		
3	1	1	
4		1	3
5		2	
6		2	
7	1	1	

Note: *Only 4 short questions and 7 medium questions will be asked from all chapters; 3 long questions will be asked from mentioned chapters in the table.*

PURBANCHAL UNIVERSITY
SEMESTER FINAL EXAMINATION – 2025 (MODEL QUESTION)

LEVEL: B. E. (Civil)
SUBJECT: Estimation and Valuation   FULL MARKS: 60

TIME: 03:00 hrs   PASS MARKS: 24

Assumed necessary suitable data if required.

Attempt all questions

Group A   (2*4=8)

1. Define estimation with its purpose.

2. Differentiate between AOC and BOQ.

3. How do you prepare detail estimate?

4. Define valuation and list out the method of valuation?

Group B   (7*4=28)

5. Prepare a preliminary estimate of 4 story building having plinth aera 1000 sqm. From given data:
    i)   Plinth area rate=5000 per sqm
    ii)   Extra for electric installation =7% of building cost
    iii)   Extra other service=2% of building cost
    iv)   Contingences=3%

6. Define specification and its types?

7. Write detail specification of RCC work in Foundation?

8. Estimate Quantity of reinforcement of given beam.

9. Calculate the quantity of material for 10 mm thick plaster work (1:5) in wall of length 4m height 3.2m

10. Prepared rate analysis of plaster work in wall for question no 9.
    Given , skill labour =12 no per 100 sqm
            Unskill labour =16 no. per 100 sqm

11. An old building has been purchased by a person at a cost of Rs. 2.5 lakhs excluding the cost of land. Calculate the amount of sinking fund at 5.5% interest assuming the life of building as 25 years and scrap value of the building as 10% of cost of purchase.

Group C   (8*3=24)

12. Calculate the quantity of following items from the given building drawing figure: 1.
    a.   Earthwork excavation.
    b.   Brick work in foundation

13. Estimate the quantity of earthwork of a portion of hill road from the following given data.
    a)   Formation width (B) in cutting=10m and in banking= 10m
    b)   Side slope for banking (s)=2:1 and for cutting (p)=1.5:1

Chainage(m)	RL of ground (m)	RL of formation level
0	1000	999
30	1001	1:100 downward
60	1001.5	1:150 upward

14 Calculate the quantity of following items from the given drawing figure :2(Septic tank).
    a.   Brick work   b. CC work   c. RCC work

*****

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

CIVIL ENGINEERING PROJECT-I
BCI7032

Year: IV   **Semester: VII**

Teaching Hours/week				Examination Scheme						Total Marks
				Internal		Final				
				Theory	Practical	Theory		Practical		
Cr	L	T	P			Duration	Marks	Duration	Marks	
1	1	1	-	-	50	-	-	-	-	-

Course Objective:

The objective of the course is to prepare the students with the necessary knowledge and skills to formulate a project in civil engineering or relevant discipline.

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.

The choice of project will depend upon the interests of the student (s), faculty and the resources available in the campus.

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 proposed project work will be carried out in two phases during the seventh and eighth semester as Civil Engineering Project-I and Civil Engineering Project-II respectively. Following tasks and corresponding report must be presented in order to pass this course:

- Background
- Project description/ need of the research
- Objective and scope of the project
- Literature review and the study of other relevant documents.
- Methodology
- Data collection and compilation

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 problems arise. They should then submit a draft report prior to the final report so that the guide can make necessary corrections. The final report should be submitted to the department 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.

Safety Engineering
BCI7033

Course Objectives:

This subject has been designed to impart the knowledge to civil engineering students regarding safety in their profession and also the disaster management. After completion of this course, the students will be able to;

  i. Explain the need of safety in civil engineering works,
  ii. Identify various types of hazards and implement the preventive measures,
  iii. Explain the role of various level of workers and officials, regarding safety

Course content:

1.0 Introduction to Safety Engineering   **(3 hrs)**
1.1 Introduction to safety engineering and its Scope
1.2 Interrelationships between human/machinery / environmental elements
1.3 Impact of human and machine characteristics on safety
1.4 Safety control devices; Signs, Signals, Instructions and Safety Codes

2.0 Attitude Towards Safety   **(2 hrs)**
2.1 Attitude towards safety
2.1 Attitude Survey
2.2 Value of safety survey
2.3 Report from safety personal
2.4 The interface between safety problems and concerned parties

3.0 Basic Safety Engineering   **(8 hrs)**
3.1 Hazard Identification and types of hazards
3.2 Hazard Evaluation
3.3 Hazard control and different cardinal rules of hazard control

4.0 Safety Performance   (4 hrs)
4.1 Injury Frequencies Survey (ISR-IFR).
4.2 Factors to be considered for Appraising Plant Conditions

5.0 Safety and Health Standards   (3 hrs)
5.1 Health hazards in the construction industries
5.2 Government standards of safety and health
5.3 Development of self-applied standards
5.4 Regulatory standards
5.5 Plant standards

6.0 Industrial Safety   (4 hrs)
6.1 Introduction
6.2 Employer Liability Laws
6.3 Workmen's compensation Laws
6.4 Agencies rendering safety services
6.5 Industrial Relations, Trade Unions and Safety Representatives

7.0 Safety Management   (6 hrs)
7.1 Role of Employees
7.2 Role of Supervisors
7.3 Motivating Management
7.4 Stress Management
7.5 Safety Management
7.6 Consideration of human errors
7.7 Contracts and Legislation

References:
- U.K, Dewan, J.M. "Safety, Security and Risk Management", APH Corporation, 1996

Final Examination Scheme:

Chapters	Marks	Remarks
1	4	
2	4	
3	6	
4	4	
5	4	
6	4	
7	4	
Total	30	

Note: There might be minor deviation in mark distribution.
Mandatory: Evaluation should be based on solving approach and steps.

Detailed Course Contents:

Ch. No.	Topic		Subtopic	Depth								Hour	Remarks
				SD	D	DR	I	E	A	EX	N		
1	Introduction to Safety Engineering	1.1	Introduction to safety engineering and its Scope	√	√				√			3	
		1.2	Interrelationships between human/machinery / environmental elements	√	√				√				
		1.3	Impact of human and machine characteristics on safety	√	√				√				
		1.4	Safety control devices; Signs, Signals, Instructions and Safety Codes	√	√				√				
2	Attitude Towards Safety	2.1	Attitude towards safety	√	√				√			2	
		2.2	Attitude Survey	√	√				√				
		2.3	Value of safety survey	√	√				√				
		2.4	Report from safety personal	√	√				√				
		2.5	The interface between safety problems and concerned parties	√	√				√				
3	Basic Safety Engineering	3.1	Hazard Identification and types of hazards	√	√				√			8	
		3.2	Hazard Evaluation	√	√				√				
		3.3	Hazard control and different cardinal rules of hazard control	√	√				√				

Ch. No.	Topic		Subtopic	Depth								Hour	Remarks
				SD	D	DR	I	E	A	EX	N		
4	Safety Performance	4.1	Injury Severity and Frequencies Survey (ISR-IFR)	√	√				√		√		
		4.2	Factors to be considered for Appraising Plant Conditions	√	√				√				
5	Safety and Health Standards	5.1	Health hazards in the construction industries	√	√				√			4	
		5.2	Government standards of safety and health	√	√				√				
		5.3	Development of self applied standards	√	√				√				
		5.4	Regulatory standards	√	√				√				
		5.5	Plant standards	√	√				√				
6	Industrial Safety	6.1	Introduction	√	√				√			4	
		6.2	Employer Liability Laws	√	√				√				
		6.3	Workmen's compensation Laws	√	√				√				
		6.4	Agencies rendering safety services	√	√				√				
		6.5	Industrial Relations, Trade Unions and Safety Representatives	√	√				√				
7	Safety Management	7.1	Role of Employees	√	√				√			6	
		7.2	Role of Supervisors	√	√				√				
		7.3	Motivating Management	√	√				√				
		7.4	Stress Management	√	√				√				

Ch. No.	Topic		Subtopic	Depth								Hour	Remarks
				SD	D	DR	I	E	A	EX	N		
		7.5	Safety Management	√	√				√				
		7.6	Consideration of human errors	√	√				√				
		7.7	Contracts and Legislation	√	√				√				
Note: Define (SD), Description (D), Derive (D), Illustration (I), Explanation (E), Application (A), Experimentation (Ex), Numerical (N)													

Model Question
Purbanchal University- 2025

Program: B. E. Civil
Semester: Seventh
Subject: Safety Engineering
F.M.: 30
P.M.: 12   **Time: 1.5 Hours.**

Answer All Questions:

 Group A: **[2×2=4]**
1. Mention the scope of safety engineering.
2. What do you mean by Ergonomics? Why is it important in safety engineering?

Group B:
[4×4=16]
1. What is an attitude survey and why is it necessary in a construction project.
2. Elaborate impact of human and machine characteristics on safety?
3. Define Acceptable and unacceptable risk with examples.
4. Explain the cardinal rule of hazard control.
5. What is Trade union? Explain about the Employer Liability Laws.

 Group C:

[2×5=10]

1. State Different Type of hazard and explain any three.
2. What is an engineering Contract? Explain the essentials of a valid contract.

***

Construction Project Management
BCI7034

Year: IV   **Semester: VII**

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

Course Objective:
- To establish an understanding of how construction industry operates including the Project lifecycle and participants involved.
- To introduce the principles of project management and its functions
- To provide the students with essentials of construction management including Procurement,planning, estimating, and scheduling
- To familiarize students with measuring and managing performance in Construction
- To present and discuss some tools to improve performance at project and Organizationallevel
- To increase the awareness of students on the emerging issues and advanced Processes inconstruction

Course Contents:

1.0 Introduction   **[2 hrs]**
    1.1 Construction management as a discipline
    1.2 Context of construction management
    1.3 Characteristics of the construction industry
    1.4 Domestic and global construction market

2.0 Construction Project Management   **[4 hrs]**
    2.1 Definition of a project
    2.2 Nature of construction projects
    2.3 Project life-cycle
    2.4 Principles of Project management
    2.5 Project management functions.

3.0   Site Management   **[3 hrs]**
    3.1 Responsibility of Site Engineer
    3.2 Supervising Work of Contractor
    3.3 Record Keeping

3.4 Site Order Book
3.5 Procedures to Prepare Bills
3.6 Measurement Book
3.7 Muster Roll

4.0 Construction Project Planning and Scheduling   **[8 hrs]**
  4.1 Scheduling process
  4.2 work breakdown structures
  4.3 Scheduling techniques
  4.4 Critical path method
  4.5 Resource management
  4.6 Project crashing.

5.0   Contract Management   **[6 hrs]**
  5.1 Method of Work execution
  5.2 Types of Contract
  5.3 Tendering Process – Preparation before Tendering; Tender Notice; Tender Document; Conditions of Contract; Prequalification; Tender; Evaluation; Selection and Award

6.0 Construction Equipment   **[4 hrs]**
  6.1 Equipment for excavation, fill, transportation and compaction
  6.2 Aggregate handing and concrete construction equipment
  6.3 Equipment for construction of pipes and caissons
  6.4 Cranes for lifting materials and parts
  6.5 Equipment for tunnel construction
  6.6 Equipment for hydraulic construction
  6.7 Equipment for highway and pavement construction

7.0 Project Risk Analysis and Management   **[4 hrs]**
  7.1Introduction to Project Risk.
  7.2 Types of Project Risk.
  7.3 Analysis of Major Sources of Risk
  7.4 Effective Management of Project Risk.
          7.4.1 Risk Management planning
          7.4.2 Risk Identification
          7.4.3 Qualitative and Quantitative Risk Analysis
          7.4.4 Risk Response Planning
          7.4.5 Risk Monitoring and Controlling
    7.5. Engineering Insurance

      7.5.1. Importance of Insurance in Engineering Construction
      7.5.2. Types of engineering insurance policies available in Nepal

8.0 Personnel Management in Construction Project [5 hrs]
8.1 Management principles: administration and organization principles
8.2 Centralization and leadership styles
8.3 Supervisory and leadership styles
8.4 Importance of communication
8.5 Information systems for decisions
8.6 Motivating and directing: human elements, elements, evaluation and merit rating
8.7 Personnel selection, testing and training
8.8 Trade unions and relation with management

9.0 Introduction to Project Financing [4 hrs]
9.1 Project finance
9.2 Capital Structure Planning
9.3 Capital Budgeting Decision.
9.4 Modality of project finance in context of Nepal

10.0 Controlling Project Integration and Work [5 hrs]
10.1 Work Scope Control
10.2 Product Quality Control
10.3 Labor Productivity Control
10.4 Equipment Productivity Control
10.5 Material Productivity Control
10.6 Work Schedule Control
10.7 Performance Control Using Earned Value Analysis

**Field visit of nearby construction site – 2 days.

References:

- Fewings, P., Construction Project Management, Taylor and Francis, New York
- Farland, M. C., Management – Principles and practice", M.C. Farland.
- Vazirani, V. N. and Chandola, S. P., Construction Management and Accounts.
- Staya Narayan, B., Construction Planning and Equipment
- Ruskin, A. M., and Eugene Estes, W., Project Management, Marcel Dekker Publishers,1982.
- Moder, J. J. and Philips, C., R. Project Management with CPM and PERT, Philips ,Van
  Nostrand Reinhold Publishers, Latest edition
- Chandra, P., Projects: Preparation, Appraisal, Implementation, Tata McGraw HillPublishing Company Ltd. New Delhi

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

Detailed Course Contents:

Ch. No.	Topic		Subtopic	Depth								Hour	Remarks
				SD	D	DR	I	E	A	EX	N		
1	Introduction	1.1	Construction management as a discipline	√	√				√			2	
		1.2	Context of construction management	√	√				√				
		1.3	Characteristics of the construction industry	√	√				√				
		1.4	Domestic and global construction market	√	√				√				
2	Construction Project Management	2.1	Definition of a project	√	√				√			4	
		2.2	Nature of construction projects	√	√				√				
		2.3	Project life-cycle	√	√				√				
		2.4	Principles of Project management	√	√				√				
		2.5	Project management functions	√	√				√				
3	Site Management	3.1	Responsibility of Site Engineer	√	√				√			3	
		3.2	Supervising Work of Contractor	√	√				√				
		3.3	Record Keeping	√	√				√				
		3.4	Site Order Book	√	√				√				

Ch. No.	Topic		Subtopic	Depth								Hour	Remarks
				SD	D	DR	I	E	A	EX	N		
		3.5	Procedures to Prepare Bills	√	√				√				
		3.6	Measurement Book	√	√				√				
		3.7	Muster Roll	√	√				√				
4	Construction Project Planning and Scheduling	4.1	Scheduling process	√	√				√			8	
		4.2	work breakdown structures	√	√				√				
		4.3	Scheduling techniques	√	√				√				
		4.4	Critical path method	√	√				√		√		
		4.5	Resource management	√	√				√				
		4.6	Project crashing.	√	√				√		√		
5	Contract Management	5.1	Method of Work execution	√	√				√			6	
		5.2	Types of Contract	√	√				√				
		5.3	Tendering Process – Preparation before Tendering; Tender Notice; Tender Document; Conditions of Contract; Prequalification; Tender; Evaluation; Selection and Award	√	√				√				
6	Construction Equipment	6.1	Equipment for excavation, fill, transportation and compaction	√	√				√			4	

Ch. No.	Topic		Subtopic	Depth								Hour	Remarks
				SD	D	DR	I	E	A	EX	N		
		6.2	Aggregate handing and concrete construction equipment	√	√				√				
		6.3	Equipment for construction of pipes and caissons	√	√				√				
		6.4	Cranes for lifting materials and parts	√	√				√				
		6.5	Equipment for tunnel construction	√	√				√				
		6.6	Equipment for hydraulic construction	√	√				√				
		6.7	Equipment for highway and pavement construction	√	√				√				
7	Project Risk Analysis and Management	7.1	Introduction to Project Risk.	√	√				√			4	
		7.2	Types of Project Risk.	√	√				√				
		7.3	Analysis of Major Sources of Risk	√	√				√				
		7.4	Effective Management of Project Risk.	√	√				√				
		7.4.1	Risk Management planning	√	√				√				
		7.4.2	Risk Identification	√	√				√				
		7.4.3	Qualitative and Quantitative Risk Analysis	√	√				√				
		7.4.4	Risk Response Planning	√	√				√				
		7.4.5	Risk Monitoring and Controlling	√	√				√				
		7.5.1	Importance of Insurance in Engineering Construction	√	√				√				

Ch. No.	Topic		Subtopic	Depth								Hour	Remarks
				SD	D	DR	I	E	A	EX	N		
		7.5.2	Types of engineering insurance policies available in Nepal	√	√				√				
8	Personnel Management in Construction Project	8.1	Management principles: administration and organization principles	√	√				√			5	
		8.2	Centralization and leadership styles	√	√				√				
		8.3	Supervisory and leadership styles	√	√				√				
		8.4	Importance of communication	√	√				√				
		8.5	Information systems for decisions	√	√				√				
		8.6	Motivating and directing: human elements, elements, evaluation and merit rating	√	√				√				
		8.7	Personnel selection, testing and training	√	√				√				
		8.8	Trade unions and relation with management	√	√				√				
9	Introduction to Project Financing	9.1	Project finance	√	√				√			4	
		9.2	Capital Structure Plannning	√	√				√		√		
		9.3	Capital Budgeting Decision	√	√				√		√		
		9.4	Modality of project finance in context of Nepal	√	√				√				

Ch. No.	Topic		Subtopic	Depth								Hour	Remarks
				SD	D	DR	I	E	A	EX	N		
10	Controlling Project Integration and Work	10.1	**Work Scope Control**	√	√				√			**5**	
		10.2	Product quality control	√	√				√				
		10.3	Labour productivity control	√	√				√				
		10.4	Equipment productivity control	√	√				√				
		10.5	Material productivity control	√	√				√				
		10.6	Work schedule control	√	√				√				
		10.7	Performance control using earned value analysis	√	√				√				
Note: Define(SD), Description (D), Derive (D), Illustration (I), Explanation (E), Application (A), Experimentation (Ex), Numerical (N)													

Final Examination Scheme:

Chapters	Marks	Remarks
1	2	Th
2	6	Th
3	4	Th
4	12	Th + N or Th/N
5	8	Th
6	6	Th
7	4	Th
8	8	Th
9	4	Th + N or Th/N
10	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.		

Chapter wise marks division in final examination:

Chapter	No of Short Questions (2M)	No of Medium Questions (4M)	No of Long Question (8M)
1	1		
2	1	1	
3		1	
4		1	1
5			1
6	1	1	
7		1	
8			1
9		1	
10	1	1	

Note: *Only 4 short questions and 7 medium questions will be asked from all chapters; 3 long questions will be asked from mentioned chapters in the table.*

Attempt all questions

Group A   **(2*4=8)**

1. Define management and construction management.

2. What are the merits of using construction equipments?

3. What are the major causes of Low labor productivity?

4. Explain on characteristics of construction industry.

Group B   **(4*7=28)**

5. Explain on principles of Project management.

6. Explain in brief on Gantt chart, link bar chart and milestone chart with example.

7. Define measurement book (MB) and its uses in the construction project.

8. Justify that risk transfer and risk reduction are techniques of risk response planning in any Project.

9. Explain about the Material Productivity Control.

10. A project consists of 600 ordinary share @ Rs. 100 per share and consists of 200 shares @ Rs 100 preference share at 18% interest per year and remaining loan of Rs.50,000 @ 12% interest. Earning before interest and tax in a year is Rs 75,000. Calculate EPS and book value of share if tax rate is 45%.

OR

Explain on capital structure planning.

11. Explain different types of equipment used in concrete construction with the help of sketches.

OR

Explain different types of equipment used in excavation with the help of sketches.

Group C   **(8*3=24)**

12. Draw a network diagram from the following information given below:

Activities	Duration (Months)	Predecessors
A	5	-
B	4	-
C	7	A
D	7	A
E	8	B, A
F	5	B, A
G	8	C

H	11	C
I	2	D, E, C
J	7	H, I, F

Find:
i) Critical activities, critical path, project completion period
ii. EST, EFT, LST, LFT, TF, Int F and Ind F

13. Define the procedures of procurement. Explain on types of contract.

OR

Explain on different methods of work executions.

14. Communication in blood of organization, Explain. What are different leadership styles of management?

OR

Why training is important is important after the recruitment? Explain on different test while selecting personnel.

*****

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