Purbanchal University

Faculty of Engineering

Biratnagar, Nepal

Third Semester's Course Structure

Program: Bachelor in Civil Engineering

Effective from 2021 (2078) Batch

Year-II **Semester-III**

S.N.	Course code	Subject	Credit Hours	L	T	P	Total	Internal		Final		Total
								Th.	P	Th.	P	
1		Mathematics-III	3	3	3	-	6	40		60	-	100
2		Strength of Materials	3	3	3	2/2	7	40	25	60	-	125
3		Fluid Mechanics	3	3	3	2/2	7	40	25	60	-	125
4		Survey I	3	3	1	4	8	40	25	60	25	150
5		Engineering Geology	3	3	1	2/2	5	40	25	60	-	125
6		Basic Electronics Engineering	2	2	1	2/2	4	20	25	30	-	75
7		Computer Programming	3	3	-	3	6	40	25	60	-	125
		Total	20	20	12	11	43					825

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

Purbanchal University

Faculty of Engineering, Biratnagar, Nepal

Syllabus

Level: Bachelor

Program: Bachelor in Biomedical/Civil/Computer/Electrical/Electronics Comm. & Automation/Geomatic Engineering

Subject: BSH---- MATHEMATICS III

Year: II **Semester: III**

Teaching Schedule Hours/Week					Examination Schedule						Total Marks
					Final				Internal Assessment		
					Theory		Practical		Theory Marks	Practical Marks	
Credit Hours	L	T	P	Total	Duration	Marks	Duration	Marks	40	-	100
3	3	3	-	6	3 Hrs.	60	-	-			

Note: **L:** Lecture **T:** Tutorial **P:** Practical

OBJECTIVES: The main objective of this course is to provide students a sound knowledge of Linear Algebra, Laplace Transform, Vector Calculus with Integral Theorems, Fourier series and Linear Programming Problems with respective applications.

1. Determinants and Matrices **11 Hrs**

1.1 Review of Matrices: types, transpose and inverse with properties (without proof) and applications

1.2 Review of Determinants: Introduction, Properties (without proof), applications

1.3 Vector spaces: Introduction, Dependent and independent Vectors, Linear transformation

1.4 System of linear equation and techniques to solve it (Gauss elimination method only), Elementary row operations, Gauss-Jordan method to find inverse of a matrix.

1.5 Rank of the matrix: Echelon Form and Normal Form, Application of the Rank

1.6 Eigen values and Eigen Vectors of matrix with applications, Cayley-Hamilton Theorem and its applications in finding inverse of a matrix

2. Laplace Transform **10 Hrs**

2.1 Introduction

2.2 Laplace Transforms of elementary functions

2.3 Properties of Laplace Transform

2.4 Inverse Laplace transforms

2.5 Application of Laplace Transform in solving differential equations with initial conditions

2.6 Convolution of Laplace transform, Inverse of Laplace transform using convolution

3. Line Integrals, Surface Integrals and Volume Integrals **13 Hrs**

3.1 Line Integrals: Introduction, evaluation, application as work done, independent of Path, Conservative fields

3.2 Surface Integrals: Introduction, evaluation, application as flux

3.3 Volume Integrals: Introduction, evaluation, Dirichlet's Integral

3.4 Integral Theorems

- Green's Theorem in the plane (without proof), its applications.
- Stoke's Theorem (without proof), its applications.
- Gauss' Divergence Theorem (without proof), its applications.

4. Fourier Series **6 Hrs**

4.1 Introduction, Periodic Functions, odd and even functions

4.2 Fourier Series: Introduction, evaluation (Period 2π and arbitrary period)

4.3 Half Range Fourier (sine and cosine) Series: Introduction, evaluation

4.4 Parseval's Formula

5. Linear Programming Problem **5 Hrs**

5.1 Review of Simplex method and duality (Converting in to dual)

5.2 Big-M Method and Two Phase Method

Text Book

1. Zill D., Wright W. S. and M. R. Cullen, *Advanced Engineering Mathematics*, Jones and Bartlett Publishers Inc.
2. Kreyszig, E. (1999), *Advanced Engineering Mathematics, 9th Edition*, John Wiley and Sons.
3. Peter V. O'Neil , *Advanced Engineering Mathematics* , 8th Edition , University of Alabama at Birmingham

Evaluation Scheme

Internal Assessment: 40

Final Examination: 60

Chapter-wise Marks Division for Final Exam

Unit	Chapter Name	Short questions (2 marks)	Long questions (4 marks)	Total Marks
1	Determinants and Matrices	4	2	16
2	Laplace Transform	3	2	14
3	Line Integrals, Surface Integrals and Volume Integrals	1	4	18
4	Fourier Series	2	1	8
5	Linear Programming Problem	-	1	4
	Total	10	10	60

NOTE: *There may be at most one OR question from each unit 1, unit 2 and unit 3. There will be altogether three OR questions in the final question paper.*

Sample Question Paper

PURWANCHAL UNIVERSITY
3rd SEMESTER (NEW)

Level- B.E (civil/ computer/Electronics and Communication/ Electrical/ B.Arch)

Subject- BOE, SH Engineering Mathematics – III
Time – 3:00 hrs

Full marks- 60
Pass marks- 24

GROUP -A

Answer all the questions: [10X2 = 20]

1. Find the value of determinant $\begin{vmatrix} 1 & w & w^2 \\ w & w^2 & 1 \\ w^2 & 1 & w \end{vmatrix}$
2. Define the Hermitian matrix with example
3. If A is the Hermatian matrix, then show that iA is skew Hermatian matrix.
4. Define adjoint and inverse of a 3x3 matrix.
5. Find the inverse transformation of $y_1 = 3x_1 - x_2$, $Y_2 = -5x_1 + 2x_2$
6. Find the Laplace transform of tcosat.
7. Find the inverse transform of $\frac{1}{s(s+1)}$,
8. Evaluate $\int_c \vec{f}.\overrightarrow{dx}$, where $\vec{f} = x^2y^2\vec{i} + y\vec{j}$ and c is the curve $y^2 = 4x$ from (0, 0) to (4,4).
9. Definer Fourier cosine series.
10. Show that the given functions are odd or even:
    (a) $\frac{e^x + e^{-x}}{2}$ (b) $2 - 3x^4 + \sin^2 x$

GROUP – B

Answer all questions (4 X 10 = 40)

11. Solve the system of linear equation s x- 2y+3z= 11, 3x+y-z= 2, 5x+3y+2z=3 by Gauss Jordan method.
12. Find the rank of the matrix $\begin{bmatrix} 1 & 2 & 1 & 0 \\ -2 & 4 & 3 & 0 \\ 1 & 4 & 2 & -8 \end{bmatrix}$ by reducing to normal form.

    Or

    Find the eigen values and eigen vectors of the matrix $\begin{bmatrix} 2 & 0 & 1 \\ 1 & 1 & 1 \\ 1 & -1 & 3 \end{bmatrix}$.
13. Find the inverse of Laplace transform of $\frac{1}{s^2(s^2+a^2)}$ by using convolution theorem.

14. Solve the equation by transform method
    $Y'' + y' - 2y = t$, $y(0) = 1$, $y'(0) = 0$

    Or

    Solve $\frac{dx}{dt} - y = e^t$, $\frac{dy}{dx} + x = \sin t$ given that $x(0) = 1$, $y(0) = 0$
15. Show that $\vec{F} = (x^2-yz)\vec{i} + (y^2 = zx)\vec{j}+(z^2-xy)\vec{k}$ is irrotational. Also find its scalar potential function.
16. Find the flux of $\vec{F}$ through surfaces where $\vec{F} = 3x\vec{i} +3y\vec{j} +3\vec{k}$ and part of the surface $x^2+y^2+z = 9$ with $z \geq 0$.
17. Evaluate by Green's theorem $\int (y - \sin x)dx + \cos x dy$ where c is the plane triangle enclosed by the lines $y = 0$, $x = \frac{\pi}{2}$ and $y = \frac{2x}{\pi}$.
18. Apply Stoke's theorem to evaluate $\int_c (x + y)dx + (2x - z)dy + (y + x)dz$, where c is the boundary of the triangle with vertices (2,0,0) ,(0,3,0) and (0,0,6).

    Or

    Evaluate $\iint_s (\vec{F} . \hat{n})ds$ where $\vec{F} = 2x\vec{i} + 3y\vec{j} + 4z\vec{k}$ and S is the surface of sphere $x^2 + y^2 + z^2 = 1$ by Gauss's divergence theorem.
19. Find the Fourier series $F(x) = 2x - x^2$ in the interval (0, 2).
20. By using Big M method, minimize $z = x_1-3x_2+2x_3$ subject to the condition

$$3x_1 - x_2+2x_3 \leq 7$$
$$- 2x_1 + 4x_2 \leq 12$$
$$- 4x_1 + 3x_2 + 8x_3 \leq 10$$
$$x_1, x_2, x_3 \geq 0$$

***

Purbanchal University

Faculty of Engineering, Biratnagar, Nepal

Syllabus

Level: Bachelor
Program: Bachelor in Civil Engineering
Subject: STRENGTH OF MATERIALS
Subject Code: BCI----

Year: II **Semester: III**

Teaching Schedule Hours/Week					Examination Schedule						Total Marks
					Final				Internal Assessment		
					Theory		Practical		Theory Marks	Practical Marks	
Credit Hours	L	T	P	Total	Duration	Marks	Duration	Marks	40	25	125
3	3	3	2/2	7	3 Hrs.	60	-	-			

Note: **L:** Lecture **T:** Tutorial **P:** Practical

Course Objective:

The purpose of the course is to provide basic knowledge to calculate stresses and deformations of objects under external loadings, to give knowledge of strength of materials on engineering applications and design problems.

Course Content:

1. **Direct Stresses and Strains (11 Hours)**
   - **1.1** Stresses and strains - normal stress-strain, shear stress-strain, Hook's law, Poisson's ratio, modulus of elasticity, modulus of rigidity, bulk modulus and their relationship
   - **1.2** Stress-strain diagrams for ductile and brittle material.
   - **1.3** Factor of safety and stress concentration
   - **1.4** Elongation of bars: varying cross-sections, tapered section
   - **1.5** Principle of superposition
   - **1.6** Compound bars subjected to axial tension and compression
   - **1.7** Thermal stresses: single bar, compound / composite bars

2. **Shear force and bending moment (5 Hours)**
   - **2.1** Revision of previous works(Type of support, load, determinate, indeterminate structure)
   - **2.2** The concept of superposition of internal forces
   - **2.3** Maximum bending moments and shearing forces and their positions for statically determinate frames.

3. **Moment of Inertia** **(4 Hours)**
   - **3.1** Moment of inertia of standard and built-up sections
   - **3.2** Polar moment of inertia
   - **3.3** Radius of gyration
   - **3.4** Principal moment of inertia

4. **Principal Stresses** **(5 Hours)**
   - **4.1** Introduction
   - **4.2** Stresses on an inclined plane subjected to two mutually perpendicular normal stresses
   - **4.3** Stresses on an inclined plane subjected to two mutually perpendicular normal and shear stresses
   - **4.4** Principal stresses and principal strains
   - **4.5** Mohr's circle diagram for stress

5. **Theory of Flexure** **(6 Hours)**
   - **5.1** Coplanar and pure bending, assumptions, derivation of bending equation.
   - **5.2** Introduction to elastic and plastic bending
   - **5.3** Radius of curvature, flexural stiffness
   - **5.4** Analysis of beams of symmetric cross-section
   - **5.5** Shear stress variation in rectangular and thin walled I beam
   - **5.6** Analysis of composite beams
   - **5.7** Concept of deflection in beams (simply supported beam)

6. **Torsion** **(3 Hours)**
   - **6.1** Introduction
   - **6.2** Assumptions and derivation of torsional equation
   - **6.3** Calculation of torsional moments in series and parallel combination of shafts
   - **6.4** Calculation of torsional stresses

7. **Thin-Walled Pressure Vessels** **(3 Hours)**
   - **7.1** Definition and characteristics of thin-walled vessels
   - **7.2** Types of stresses in thin-walled vessels
   - **7.3** Calculation of stresses and strains in thin-walled vessels

8. **Compound Stresses Failure Theories** **(5 Hours)**
   - **8.1** Introduction
   - **8.2** Load acting eccentrically to one and both axes
   - **8.3** Condition for no tension in the section
   - **8.4** Introduction to failure theories

9. **Introduction to Buckling** **(3 Hours)**
   - **9.1** Definition of buckling

9.2 Buckling of columns
9.3 Effective length

Laboratories:

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

References:

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

**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 of Strength of Materials:

Ch No.	Topic		Subtopic	Depth								Hour	Remarks
				SD	D	DR	I	E	A	EX	N		
1	**Direct Stresses and Strains**	1.1	Stresses and strains - normal stress-strain, shear stress-strain, Hook's law, Poisson's ratio, modulus of elasticity, modulus of rigidity, bulk modulus and their relationship		✓	✓		✓			✓	**11**	
		1.2	Stress-strain diagrams for ductile and brittle material. 1.2.1 Ultimate stress, allowable stress,		✓	✓				✓			
		1.3	Factor of safety and stress concentration	✓	✓								
		1.4	Elongation of bars: varying cross-sections, tapered section		✓	✓					✓		
		1.5	Principle of superposition		✓						✓		
		1.6	Compound bars subjected to axial tension and compression		✓	✓					✓		
		1.7	Thermal stresses: single bar, compound / composite bars	✓		✓					✓		
2	**Shear force and bending moment**	2.1	Revision of previous works(Type of support, load, determinate, indeterminate structure)					✓				**5**	
		2.2	The concept of superposition of internal forces					✓					
		2.3	Maximum bending moments and shearing forces and their positions for statically determinate frames.								✓		

Ch No.	Topic		Subtopic	Depth								Hour	Remarks
				SD	D	DR	I	E	A	EX	N		
3	**Moment of Inertia**	3.1	Moment of inertia of standard and built-up sections		✓		✓				✓	**4**	
		3.2	Polar moment of inertia	✓									
		3.3	Radius of gyration	✓									
		3.4	Principal moment of inertia		✓	✓					✓		
4	**Principal Stresses**	4.1	Introduction	✓	✓							**5**	
		4.2	Stresses on an inclined plane subjected to two mutually perpendicular normal stresses			✓					✓		
		4.3	Stresses on an inclined plane subjected to two mutually perpendicular normal and shear stresses			✓					✓		
		4.4	Principal stresses and principal strains	✓	✓		✓						
		4.5	Mohr's circle diagram for stress	✓		✓					✓		
5	**Theory of Flexure**	5.1	Coplanar and pure bending, assumptions, derivation of bending equation.	✓	✓	✓						**6**	
		5.2	Introduction to elastic and plastic bending	✓	✓								
		5.3	Radius of curvature, flexural stiffness	✓									
		5.4	Analysis of beams of symmetric cross-section	✓									
		5.5	Shear stress variation in rectangular and thin walled I beam	✓		✓					✓		
		5.6	Analysis of composite beams	✓		✓					✓		

Ch No.	Topic		Subtopic	Depth								Hour	Remarks
				SD	D	DR	I	E	A	EX	N		
		5.7	Concept of deflection in beams (simply supported beam)	✓		✓				✓	✓		
6	**Torsion**	6.1	Introduction	✓								**3**	
		6.2	Assumptions and derivation of torsional equation	✓		✓							
		6.3	Calculation of torsional moments in series and parallel combination of shafts				✓				✓		
		6.4	Calculation of torsional stresses				✓			✓	✓		
7	**Thin-Walled Pressure Vessels**	7.1	Definition and characteristics of thin-walled vessels	✓	✓		✓					**3**	
		7.2	Types of stresses in thin-walled vessels	✓		✓	✓						
		7.3	Calculation of stresses and strains in thin-walled vessels								✓		
8	**Compound Stresses Failure Theories**	8.1	Introduction	✓								**5**	
		8.2	Load acting eccentrically to one and both axes	✓		✓				✓			
		8.3	Condition for no tension in the section	✓									
		8.4	Introduction to failure theories		✓								
9	**Introduction to Buckling**	9.1	Definition of buckling	✓								**3**	
		9.2	Buckling of columns		✓	✓	✓			✓			
		9.3	Effective length	✓					✓		✓		
Note: Define(SD), Description (D), Derive (D), Illustration (I), Explanation (E), Application (A), Explanation (Ex), Numerical (N)													

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

Chapter wise marks division in final examination:

Chapter	No of Short Questions (2 Marks)	No of Medium Questions (4 Marks)	No of Long Question (8 Marks)
1	1	1	1
2	1	1	1
3	1	1	1
4	1	1	
5	1	1	
6	1	1	
7	1	1	
8	1	1	
9	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 EXAM – 2023 (MODEL QUESTION)

LEVEL: B. E. (Civil)
SUBJECT: Strength of material FULL MARKS: 60
TIME: 03:00 hrs PASS MARKS: 24

Attempt all questions

Group A (4x2=8)

Q.1. Define Kernel in a circular cross section of column.
Q.2. Define hoop stress and longitudinal stress.
Q.3. Describe flexural stiffness.
Q.4. Write down the assumptions made for derivation of torsional equation.

Group B (7x4=28)

Q.5. Derive the expression of a bar of uniform cross section under its own weight.

Q.6. A reinforced concrete pipe having 70cm diameter outside and 5cm wall thickness is full of water. If the pipe is simply supported and has a span of 5m, determine the bending stress at 2m from left support. Take unit weight of water 25KN/$m^3$and that for water = 9.81KN/m^3.

Q.7. A thin-walled cylindrical shell made up of copper plate has been filled with liquid at atmospheric pressure. An additional 50cm^3 of liquid is then pumped into 2m long cylinder whose internal diameter is 25cm and wall thickness is 12mm. Find the values of maximum pressure developed on walls of this cylinder due to extra liquid.

Q.8. A hollow steel shaft of the 20 cm outer diameter and 17 cm internal diameter is rotating with a speed of 600 rpm. If the permissible shearing stress for the material is 120MN/m^2 and maximum torque is 1.3 times the mean torque. Determine the power transmitted by the shaft.

Q.9. A rectangular column of size 300mmx500mm is subjected to a load of 50KN at an eccentricity of 45mm along one of the axes. Determine the maximum and minimum stresses at the longer face of the column.

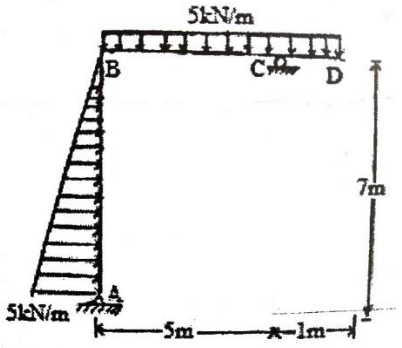
Q.10. A column of timber is 6m long and hinged at one end and fixed at other. Determine the crippling load and safe load for column if the column is a box type with outer sides 30cmx40cm and thickness 10cm. Take factor of safely as 2.5 and modulus of elasticity E=10KN/mm^2. If the timber is to fail in compression before failure due to buckling, find the limiting value of compressive stress.

Q.11. A plane element of a body is subjected to a compressive stress of 300 MPa in x-x direction and a tensile stress of 200MPa in the y-y direction. Each of the above stresses is subjected to a shear stress of 100 MPa such that when it is associated with the compressive stress, it tends to rotate the element in an anticlockwise direction. Find analytically, the normal and shear stresses on a plane inclined at an

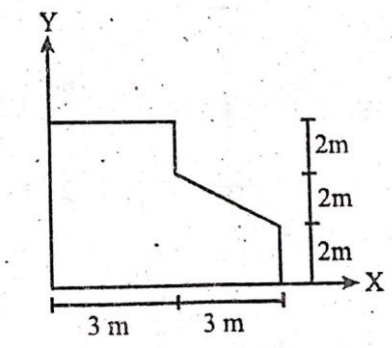
angle of 30 degree with the x-x axis. Find and draw the principal planes and principal stresses

Group C **(3x8=24)**

Q.12. Analyze the frame shown in figure. Draw axial force diagram, shear force diagram and bending moment diagram.



Q.13. Find principal moment of inertia for the given section.



Q.14. A reinforced concrete column 300x300 mm is reinforced with 8 steel rods with a total area of 1820 mm^2.The column carries an axial load of 400 KN. If the modulus of elasticity of steel is 18 times that of concrete, find the stresses in concrete and steel.

*****

Purbanchal University

Faculty of Engineering, Biratnagar, Nepal

Syllabus

Level: Bachelor
Program: Bachelor in Civil Engineering
Subject: FLUID MECHANICS
Subject Code: BCI----

Year: II **Semester: III**

Teaching Schedule Hours/Week					Examination Schedule						Total Marks
					Final				Internal Assessment		
					Theory		Practical		Theory Marks	Practical Marks	
Credit Hours	L	T	P	Total	Duration	Marks	Duration	Marks	40	25	125
3	3	3	2/2	7	3 Hrs.	60	-	-			

Note: **L:** Lecture **T:** Tutorial **P:** Practical

Course Objective:

The purpose of the course is to provide basic knowledge of fluid mechanics i. e., the basics of fluid statics, kinematics, dynamics and their applications in engineering particularly in civil engineering.

Course Content:

1. **Introduction (1 hour)**
   - 1.1 Concept of Fluid and comparison with solids
   - 1.2 Classification of Fluids
   - 1.3 Application of Fluid Mechanics in Civil Engineering
   - 1.4 Concept of Continuum and control volume

2. **Physical Properties of Fluid (3 hours)**
   - 2.1 Density, Specific Weight, Specific Volume, Specific Gravity, Compressibility, Surface Tension, Capillarity, Vapor Pressure and Cavitation, Viscosity and Newton's Law of Viscosity

3. **Fluid Statics (17 hours)**
   - 3.1 Intensity of Pressure and Pressure force
   - 3.2 Pressure-Depth Relationship
   - 3.3 Pascal's Law
   - 3.4 Absolute, Gauge, Atmospheric and Vacuum Pressure

3.5 Measurement of Pressure: Manometers (Piezometer, u-tube manometer, differential manometer, sensitive manometers)
3.6 Pressure on Plane Submerged Surface, Pressure Diagram and Center of Pressure
3.7 Pressure on Curved Surface
3.8 Forces on Gates (Plane and Curve), Dams and Other Water Retaining Structures
3.9 Buoyancy and Floatation
3.10 Meta Center, Meta-Centric height
3.11 Condition of Equilibrium Stability of submerged and floating bodies
3.12 Fluid within a Rigid Body Subjected to Motion (Acceleration and Rotation)

4. Fluid Kinematics (5 hours)

4.1 Lagrangian and Eulerian Approaches of Describing Fluid Flow
4.2 Types of flow as Steady and Unsteady, Uniform and Non-Uniform, Laminar and Turbulent
4.3 One, Two and Three dimensional Flow
4.4 Stream Lines, Streak Lines, Path Lines, Stream Tube
4.5 Principle of Conservation of Mass
4.6 Derivation of Equation of Continuity in Cartesian Co-ordinates; Continuity equation for two-dimensional and one-dimensional flow
4.7 Introduction of Continuity Equation in Polar Co-ordinates
4.8 Velocity and acceleration of fluid particles; Local and Convective acceleration

5. Fluid Dynamics (17 hours)

5.1 Various Forces Acting on Fluid
5.2 Euler's Equation of Motion
5.3 Derivation of Bernoulli's Equation from Euler’s Equation; various forms of energies in fluid flows
5.4 Bernoulli's equation for real fluid
5.5 Application of Bernoulli's Equation to Orifice and Mouthpiece
5.6 Determination of hydraulic coefficients
5.7 Venturimeter, Orifice-meter, Nozzlemeter and Pitot Tube
5.8 Derivation of Momentum Equation
5.9 Application of Momentum Equation to calculate Forces on Pipe Bends, Reducers, etc.
5.10 Force Exerted by Jets on Moving and Stationary Vanes of different shapes
5.11 Concept of Angular Momentum; Problems of Sprinklers
5.12 Varying Head Flow: Emptying and Filling of Tanks; Examples of rectangular, cylindrical (vertical) and hemispherical tanks

6. Boundary Layer Theory (2 hours)

6.1 Concept of Boundary Layer

6.2 Boundary Layer concept along a thin layer (Laminar Zone, Turbulent Zone, Transition Zone as well as Laminar Sub-layer)

6.3 Boundary Layer Thickness, Displacement Thickness, Momentum Thickness, Energy Thickness

6.4 Smooth and Rough Boundary examples

Laboratory Works:

1. Newton's Law of Viscosity (Optional)
2. Force on Submerged Surface
3. Study of Flow Patterns
4. Verification of Bernoulli's Principle
5. Flow through orifice and mouthpiece
6. Calibration of Flowmeters: venturimeter
7. Impact of Jet
8. Cavitation demonstration (Optional)
9. Manometers and pressure measuring device demonstration (Optional)
10. Determination of Metacentric Height (Optional)
11. Pascal's Law Demonstration (Optional)

References*:

1. Bansal, R. K. (2019). *A Textbook of Fluid Mechanics and Hydraulic Machines*. 10th edition, Laxmi Publications
2. Cengel, Y. A. & Cimbala, J. M. (2013). *Fluid Mechanics: Fundamentals and Applications.* 3rd edition, Mcgraw-Hill
3. Dulal, K.N. (2022). *Fluid Mechanics*. 1st Edition, Pratibha Pustak Sadan.
4. Kumar, D. S. (2013). *Fluid Mechanics and Fluid Power Engineering*. 8th edition, S. K. Kataria and Sons
5. Modi, P. N. & Seth, S. M. (2015). *Hydraulics and Fluid Mechanics including Hydraulic Machines*. 20th edition, Standard Book House
6. Sangroula, D. P. (2018). *Fundamentals of Fluid Mechanics*. 3rd edition, Green Books
7. Streeter, V. L., Wylie, E. B. & Bedford, K. W. (2010). *Fluid Mechanics*. 9th edition, Mcgraw-Hill

**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 of Fluid Mechanics:

Ch No.	Topic		Subtopic	Depth								Hour	Remarks
				SD	D	DR	I	E	A	EX	N		
1	**Introduction**	1.1	Concept of Fluid and comparison with solids	✓	✓		✓					**1**	
		1.2	Classification of Fluids	✓									
		1.3	Application of Fluid Mechanics in Civil Engineering		✓								
		1.4	Concept of Continuum and control volume	✓									
2	**Physical Properties of Fluid**	2.1	Density, Specific Weight, Specific Volume, Specific Gravity, Compressibility, Surface Tension, Capillarity, Vapor Pressure and Cavitation	✓			✓				✓	**1**	Short Question-Answers for numerical
		2.2	Viscosity and Newton's Law of Viscosity	✓		✓	✓		✓		✓	**2**	
3	**Fluid Statics**	3.1	Intensity of Pressure and Pressure force	✓								**2**	
		3.2	Pressure-Depth Relationship	✓		✓					✓		
		3.3	Pascal's Law	✓		✓							
		3.4	Absolute, Gauge, Atmospheric and Vacuum Pressure	✓	✓							**4**	
		3.5	Measurement of Pressure: Manometers (Piezometer, u-tube manometer, differential manometer, sensitive manometers)	✓	✓	✓	✓		✓		✓		
		3.6	Pressure on Plane Submerged Surface, Pressure Diagram and Center of Pressure	✓	✓	✓	✓		✓		✓	**4**	
		3.7	Pressure on Curved Surface	✓	✓		✓		✓		✓		

Ch No.	Topic		Subtopic	Depth								Hour	Remarks
				SD	D	DR	I	E	A	EX	N		
		3.8	Forces on Gates (Plane and Curve), Dams and Other Water Retaining Structures								✓	3	
		3.9	Buoyancy and Floatation	✓	✓						✓	3	
		3.10	Meta Center, Meta-Centric height	✓									
		3.11	Condition of Equilibrium Stability of submerged and floating bodies	✓	✓						✓		
		3.12	Fluid within a Rigid Body Subjected to Motion (Acceleration and Rotation)	✓	✓							1	
4	**Fluid Kinematics**	4.1	Lagrangian and Eulerian Approaches of Describing Fluid Flow	✓	✓							1	
		4.2	Types of flow as Steady and Unsteady, Uniform and Non-Uniform, Laminar and Turbulent	✓									
		4.3	One, Two and Three dimensional Flow	✓									
		4.4	Stream Lines, Streak Lines, Path Lines, Stream Tube	✓									
		4.5	Principle of Conservation of Mass	✓								4	
		4.6	Derivation of Equation of Continuity in Cartesian Co-ordinates; Continuity equation for two-dimensional and one-dimensional flow	✓		✓					✓		
		4.7	Introduction of Continuity Equation in Polar Co-ordinates	✓									

Ch No.	Topic		Subtopic	Depth								Hour	Remarks
				SD	D	DR	I	E	A	EX	N		
		4.8	Velocity and acceleration of fluid particles; Local and Convective acceleration	✓							✓		
5	**Fluid Dynamics**	5.1	Various Forces Acting on Fluid	✓								**1**	
		5.2	Euler's Equation of Motion	✓		✓							
		5.3	Derivation of Bernoulli's Equation from Euler's Equation; various forms of energies in fluid flows.	✓	✓	✓	✓			✓	✓	**2**	
		5.4	Bernoulli's equation for real fluid	✓									
		5.5	Application of Bernoulli's Equation to Orifice and Mouthpiece		✓	✓			✓	✓	✓	**3**	
		5.6	Determination of hydraulic coefficients	✓	✓	✓				✓	✓		
		5.7	Venturimeter, Orifice-meter, Nozzlemeter and Pitot Tube	✓	✓	✓	✓		✓	✓	✓	**3**	
		5.8	Derivation of Momentum Equation	✓		✓						**2**	
		5.9	Application of Momentum Equation to calculate Forces on Pipe Bends, Reducers, etc.								✓		
		5.10	Force Exerted by Jets on Moving and Stationary Vanes of different shapes			✓				✓	✓	**2**	
		5.11	Concept of Angular Momentum; Problems of Sprinklers	✓		✓					✓	**2**	
		5.12	Varying Head Flow: Emptying and Filling of Tanks; Examples of rectangular, cylindrical (vertical) and hemispherical tanks		✓	✓					✓	**2**	
6	**Boundary Layer Theory**	6.1	Concept of Boundary Layer	✓								**2**	

Ch No.	Topic		Subtopic	Depth								Hour	Remarks
				SD	D	DR	I	E	A	EX	N		
		6.2	Boundary Layer concept along a thin layer (Laminar Zone, Turbulent Zone, Transition Zone as well as Laminar Sub-layer)		✓		✓						
		6.3	Boundary Layer Thickness, Displacement Thickness, Momentum Thickness, Energy Thickness	✓									
		6.4	Smooth and Rough Boundary examples		✓		✓						
Note: Define(SD), Description (D), Derive (Dr), Illustration (I), Explanation (E), Application (A), Experimentation (Ex), Numerical (N)													

Final Examination Scheme:		
Chapters	Marks	Remarks
1	2	Th
2	6	Th + N or Th/N
3	18	Th+N
4	6	Th + N or Th/N
5	24	Th+N
6	4	Th + N or Th/N
Total	60	
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:

Chapters	No of Short Questions (2 Marks)	No of Medium Questions (4 Marks)	No of Long Question (8 Marks)
1	1		
2	1	1	
3	1	2	1
4	1	1	
5	1	2	2
6	1	1	

Note: *Only 4 short questions will be asked from all chapters.*

PURBANCHAL UNIVERSITY
SEMESTER FINALEXAM – 2023 (MODEL QUESTION)
LEVEL: B. E. (Civil)
SUBJECT: Fluid Mechanics
FULL MARKS: 60 PASS MARKS: 24
TIME: 03:00 hrs.

Attempt all questions

Group A (2*4=8)

Q.1. List out the application of Fluid Mechanics in Civil Engineering.

Q.2. If the specific gravity of a given liquid is 0.88 and the density of standard liquid used to determine specific gravity is 1250 kg/m^3, determine its weight density.

Q.3. Explain the drawbacks of piezometers.

Q.4. Differentiate between steady and unsteady flows.

Group B (4*7=28)

Q.5. A cubical block weighing 5N and having 30 cm edge is allowed to slide down an inclined plane surface making an angle of 30o with the horizontal on which there is a uniform layer of oil 0.05 cm thick. If the terminal velocity of the block is 11 cm/s, determine the dynamic viscosity of oil in poise and kinematic viscosity in stokes if ρ_{oil} = 800 kg/m^3.

Q.6. Explain (with figure) how the total pressure exerted by the liquid on the submerged surface is calculated by pressure diagram.

Q.7. State Pascal's Law. Prove the statement provided by Pascal's Law.

Q.8. Determine the third component of velocity such that they satisfy the continuity equation. The first two components are given as
$U = x^2 + y^2 + z^2$
$V = xy^2 – yz^2 + xy$

Q.9. Water is flowing with a velocity of 12 m/s and under a pressure of 240 kPa. If the height above the datum is 20m, calculate the total energy per unit weight of water.

Q.10. Explain how hydraulic coefficients are determined experimentally for orifices.

OR

Derive an expression that calculates the discharge through the venturimeter.

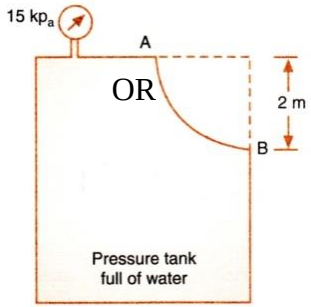
Q.11. If the velocity profile in a laminar boundary layer is approximated by a parabolic profile as: $\frac{u}{U} = \frac{2y}{\delta} - \left[\frac{y}{\delta}\right]^2$
where u is the velocity at depth y, δ is the boundary layer when u tends to free stream velocity U. Calculate displacement thickness and momentum thickness.

OR

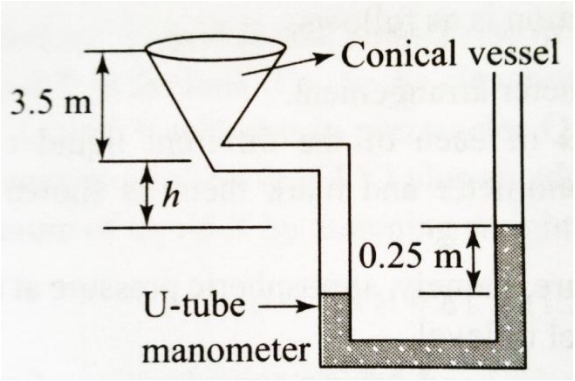
The head of water over an orifice of diameter 40 mm is 10 m. Find the actual discharge and the actual velocity of the jet at vena contracta.Take C_d=0.6 and C_v=0.98.

Group C (8*3=24)

Q.12. A tank is filled with water under pressure and the pressure gauge fitted at the top indicates a pressure of 15 kPa. A tank measures 2.5 m perpendicular to the plane of the paper, and the curved surface AB of the top is the quarter of a circular cylinder of radius 2 m. Determine (a) horizontal and vertical components of fluid pressure on the curved surface AB, and (b) magnitude and direction of the resultant force.



A conical vessel is connected to a U-tube containing mercury and water. When the vessel is empty, the manometer reads 0.25 m. Find the difference in readings of two limbs of the manometer when the vessel is completely filled with water.

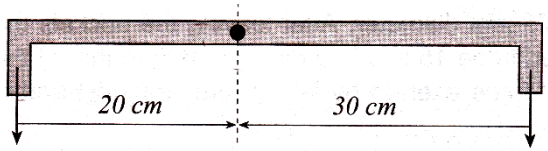


Q.13. A horizontal venturimeter with inlet diameter 20cm and throat diameter 10 cm is used to measure the flow of water. The pressure at the inlet is 17.658 N/cm2 and the vacuum pressure at the throat is 30 cm of mercury. Find the discharge of water through the venturimeter. Take Cd = 0.98

Also calculate the difference between the surface levels of mercury in two legs of the manometer.

OR

A lawn sprinkler has 0.8 cm diameter nozzles at two ends of a rotating arm and discharges water at 10 m/s. Determine the torque required to hold the rotating arm stationary. Also determine the constant speed of rotation of the arm if free to rotate.



Q.14. Derive an expression for the force exerted by the liquid jet on a moving (curved) vane when the jet strikes at the center of the vane.

A 2.5 cm dia jet of water strikes a symmetrical vane tangentially at one end and leaves from the other end. After impingement, the jet gets deflected through 140^o by the vane. Calculate the force exerted by the jet on the vane if the discharge is 0.065 m^3/s.

*****

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

Purbanchal University

Faculty of Engineering, Biratnagar, Nepal

Syllabus

Level: Bachelor
Program: Bachelor in Civil Engineering
Subject: SURVEY-I
Subject Code: BCI----

Year: II **Semester: III**

Teaching Schedule Hours/Week					Examination Schedule						Total Marks
					Final				Internal Assessment		
					Theory		Practical		Theory Marks	Practical Marks	
Credit Hours	L	T	P	Total	Duration	Marks	Duration	Marks	40	25	150
3	3	1	4	8	3 Hrs.	60	-	25			

Note: **L:** Lecture **T:** Tutorial **P:** Practical

Course Objective:

The objective of this course is to provide knowledge about basic principles and conventional methods of surveying, and knowledge about horizontal & vertical control.

Course Content:

1. **Introduction** **(4 hours)**
   - 1.1. Introduction to Surveying and its importance in Civil Engineering
   - 1.2. Historical Development in surveying
   - 1.3. Objective and principle of surveying
   - 1.4. Divisions and types of surveying
   - 1.5. Introduction to plans and maps
   - 1.6. Scales and its types in Surveying and mapping
   - 1.7. Conventional survey techniques : Chain survey, Compass survey and plane table survey

2. **Measurements & Errors** **(2hours)**
   - 2.1 Units, System of Units, significant figures and rounding off numbers
   - 2.2 Errors, Sources and types
   - 2.3 Precision, Accuracy and permissible error

3. **Distance Measurement** **(6 hours)**
   - 3.1 Types of Distance Measurements: Direct Measurement, Measurement by Optical means and Electronic methods
   - 3.2 Ranging: Direct and Indirect
   - 3.3 Instruments and accessories for distance measurement
   - 3.4 Distance Measurements by Taping : Plain and slope ground
   - 3.5 Introduction to Corrections in distance measurements
   - 3.6 Obstacles in distance measurement

4. Angle Measurement (7 hours)

4.1 Angles, Azimuths and Bearing & its types
4.2 Designation of Bearing & conversion from one system to another
4.3 Concept of Compass and its temporary adjustment
4.4 Calculation of included angle from bearing and bearing from included angle
4.5 Introduction to local attraction, magnetic declination and its variations
4.6 Conventional angle measuring instrument: Theodolite
4.7 Introduction to Total station: Basic definition, Parts of total station and characteristics (features) of Total station
4.8 Temporary adjustment of Total station
4.9 Field procedure for angle measurement by using Total station
4.10 Uses of Total station

5. Traverse Survey (Horizontal control) (8 hours)

5.1 Introduction to control survey and its types
5.2 Introduction to traverse and its types
5.3 Principle, importance and methods of Traversing
5.4 Field procedure for traversing
5.5 Check in traverse (open and closed)
5.6 Traverse computation and adjustment (Gale's Table)for geometrically closed and link traverse
5.7 Plotting of traverse survey
5.8 Sources of errors in traversing

6. Vertical control, Height and Elevations (8 hours)

6.1 Introduction and principle of levelling
6.2 Basic technical terms used in levelling
6.3 Leveling instruments and accessories
6.4 Types of levelling
6.4.1 Spirit leveling: Simple, Differential, Profile, Cross section and Reciprocal levelling
6.5 Temporary and permanent adjustment of level, two peg test
6.6 Special terms used in levelling
6.7 Levelling Computations & Adjustment
6.8 Curvature and refraction correction
6.9 Sources of errors in levelling

7. Trigonometrical levelling (4 hours)

7.1 Introduction
7.2 Base of the object accessible
7.3 Base of the object inaccessible: instrument stations in the same vertical plane and instrument stations not in the same vertical plane
7.2. Correction for curvature and refraction in plane trigonometrical leveling
7.3. Instruction on field applications

8. Tacheometry **(2 hours)**

8.1 Introduction
8.2 Principle of optical distance measurements
8.3 Systems of tacheometric measurements: Stadia method with vertical staff
8.4 Sources of errors and precision of tacheometric survey

9. Contouring **(4 hour)**

9.1 Introduction
9.2 characteristics of contours
9.3 Contour interval and factors affecting it
9.4 Methods of contouring (direct and indirect)
9.5 Interpolation of contours
9.6 Use of contour map

Practical:

1. Linear distance measurement using tape by direct and indirect method (Plain and slope ground)
2. Demonstration of prismatic compass and Theodolite
3. Demonstration on level and Two peg test
4. A field survey using level to transfer RL (Fly Levelling)
5. A field survey using level to determine profile and cross-section
6. Trigonometrical levelling
7. Demonstration of Total station
8. Topographic surveying and plotting of topographic map

References*:

1. Agor, R. (2016). *A text book of surveying and leveling*(Twelth). Khanna Publishers
2. Chandra, A. M. (2005). *Surveying: Problem Solving with theory and objective type questions*. New Age International.
3. Ghilani C. D. & Wolf P. R. (2015). *Elementary surveying : an introduction to geomatics* (Fourteenth). Pearson.
4. Punmia, B. C., Jain, A. K., & Jain, A. K. (2022). *Surveying Vol. I* (Seventeenth). Laxmi Publications
5. Punmia, B. C., Jain, A. K., & Jain, A. K. (2019). *Surveying Vol. II* (Sixteenth). Laxmi Publications
6. Schofield, W. (2007). *Engineering surveying: theory and examination problems for students(*sixth*)*. Elsevier.

**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 of SURVEY-I:

Ch. No.	Topic		Sub-topic	Depth								Hour	Remarks
				SD	D	DR	I	E	A	Ex	N		
1	Introduction	1.1	Introduction to Surveying and its importance in Civil Engineering	✓				✓				4	
		1.2	Historical Development in surveying	✓									
		1.3	Objective and principle of surveying		✓			✓					
		1.4	Divisions and types of surveying	✓	✓			✓					
		1.5	Introduction to plans and maps	✓									
		1.6	Scales and its types in Surveying and mapping	✓	✓								
		1.7	Conventional survey techniques : Chain survey, Compass survey, Plane table survey	✓									
2	Measurements & Errors	2.1	Units, System of Units, significant figures and rounding off numbers	✓								2	
		2.2	Errors, Sources and types	✓	✓								
		2.3	Precision, Accuracy and permissible error	✓									
3	Distance Measurement	3.1	Types of Distance Measurements: Direct Measurement, Measurement by optical means and Electronic methods	✓	✓			✓				6	
		3.2	Ranging – Direct and Indirect	✓	✓			✓					
		3.3	Instruments and accessories for distance measurement	✓									
		3.4	Distance Measurements by Taping :Plain and slope ground		✓			✓					
		3.5	Introduction to Corrections in distance measurements	✓									

Ch. No.	Topic		Sub-topic	Depth								Hour	Remarks
				SD	D	DR	I	E	A	Ex	N		
		3.6	Obstacles in distance measurement		✓		✓				✓		
4	Angle Measurement	4.1	Angles, Azimuths and Bearing & its types	✓	✓							7	
		4.2	Designation of Bearing & conversion from one system to another	✓	✓						✓		
		4.3	Concept of Compass and its temporary adjustment	✓	✓								
		4.4	Calculation of included angle from bearing and bearing from included angle								✓		
		4.5	Introduction to local attraction, magnetic declination and its variations	✓									
		4.6	Conventional angle measuring instrument: Theodolite	✓									
		4.7	Introduction to Total station: Basic definition, Parts of total station and characteristics (features) of Total station	✓	✓								
		4.8	Temporary adjustment of Total station		✓								
		4.9	Field procedure for angle measurement by using Total station		✓			✓					
		4.1	Uses of Total station		✓								
5	Traverse Survey (Horizontal control)	5.1	Introduction to control survey and its types	✓								8	
		5.2	Introduction to traverse and its types	✓	✓								
		5.3	Principle, importance and methods of Traversing	✓	✓								
		5.4	Field procedure for traversing		✓			✓					
		5.5	Check in traverse (open and closed)		✓								
		5.6	Traverse computation and adjustment (Gale's Table)for geometrically closed and link traverse	✓	✓						✓		

Ch. No.	Topic		Sub-topic	Depth								Hour	Remarks
				SD	D	DR	I	E	A	Ex	N		
		5.7	Plotting of traverse survey		✓								
		5.8	Sources of errors in traversing	✓	✓								
6	Vertical control, Height and Elevations	6.1	Introduction and principle of levelling	✓	✓							8	
		6.2	Basic technical terms used in levelling.	✓									
		6.3	Leveling instruments and accessories		✓								
		6.4	Types of levelling	✓	✓								
		6.5	Spirit leveling: Simple, Differential, Profile, Cross section and Reciprocal leveling	✓	✓	✓		✓					
		6.6	Temporary and permanent adjustment of level, two peg test	✓	✓			✓					
		6.7	special terms used in leveling	✓									
		6.8	Levelling Computations & Adjustment								✓		
		6.9	Curvature and refraction correction	✓	✓								
		6.1	Sources of errors in levelling	✓	✓								
7	Trigonometrical levelling	7.1	Problems of heights and distances: Base of the object accessible and inaccessible	✓	✓	✓					✓	4	
		7.2	Correction for curvature and refraction in plane trigonometrical levelling	✓	✓								
		7.3	Instruction on field applications		✓								
8	Tacheometry	8.1	Introduction	✓								2	
		8.2	Principle of optical distance measurements		✓				✓				

Ch. No.	Topic		Sub-topic	Depth								Hour	Remarks
				SD	D	DR	I	E	A	Ex	N		
		8.3	Systems of tacheometric measurements:Stadia method with vertical staff		✓	✓							
		8.4	Sources of errors and precision of tacheometric survey	✓	✓								
9	Contouring	9.1	Introduction	✓								4	
		9.2	characteristics of contours	✓			✓	✓					
		9.3	Contour interval and factors affecting it	✓	✓			✓					
		9.4	Methods of contouring (direct and indirect)	✓	✓		✓						
		9.5	Interpolation of contours		✓								
		9.6	Use of contour map		✓								

Note: SD=Define, D= Description, Dr=Derive, I=Illustration, E= Explanation, A= Application, Ex= Example, N= Numerical

Final Examination Scheme:		
Chapters	Marks	Remarks
1	6	Th
2	2	Th
3	8	Th+N
4	10	Th + N
5	10	Th + N
6	10	Th + N
7	6	Th + N
8	2	Th
9	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 (2 Marks)	No of Medium Questions (4 Marks)	No of Long Question (8 Marks)
1	1	1	
z2	1		
3	1	1	1
4	1	1	1
5	1	1	1
6	1	1	1
7	1	1	
8	1		
9	1	1	

Note: *Only 4 short questions, 7 medium questions and 3 long questions will be asked from all chapters.*

PURBANCHAL UNIVERSITY
SEMESTER FINAL EXAM – 2023 (MODEL QUESTION)

LEVEL: B. E. (Civil)
SUBJECT: Survey-I FULL MARKS: 60
TIME: 03:00 hrs PASS MARKS: 24

Attempt all questions

Group A (2*4=8)

Q.1. What is surveying? Write its objectives.
Q.2. Differentiate between precision and accuracy.
Q.3. Write the bearing systems applied in field.
Q.4. What is interpolation of contour? List out the methods of interpolation.

Group B (4*7=28)

Q.5. What is ranging? Explain about the indirect ranging.

Or

Describe the basic principles of surveying.

Q.6. Find the bearings of the survey lines from given table if the bearing of line AB is S 39°48’20” E

Station	Included Angle
A	86°30’02”
B	80°59’34”
C	91°31’29”
D	100°59’15”

OR

What is total station? Explain its features.

Q.7. What is the principle of levelling? Describe the temporary adjustment of level.

OR

When is reciprocal levelling done? Explain the procedure of reciprocal levelling.

Q.8. What is contour interval? Explain about the factors governing the contour interval.

Q.9. Derive the tacheometric relation for horizontal and vertical distance for the inclined line of sight with vertically held staff.

Q.10. The top ‘T’ of the tower is observed from two stations A & B , 60m apart so that the angles TAB and TBA are 60˚ and 50˚ respectively. The angles of elevations of T from A and B are 30˚15’ and 29˚ respectively. The readings on the B.M of RL 1000m were 2.27m &0.5m from A & B respectively. Find the RL of the top of the tower ‘T’.

Q.11. Write the field procedure for traversing.

Group C (8*3=24)

Q.12. List out the direct distance measurement methods.
A line ABC crosses a river, B and C being on the near and distant banks respectively. Perpendiculars BD and AE 30.5m and 50.5m long respectively are drawn such that C, D and E are in a straight line. If the chainage A and B are 505.5m and 555.5m respectively, calculate the chainage of C.

Q.13. The following consecutive readings were taken with a level and a 4m leveling staff on a ground at common interval of 20m:

0.789, 1.080, 1.345, 1.851, 2.015, 2.589, 3.753, 1.905, 0.658, 2.003, 2.902, 3.984. 0.998, 0.598, 1.585.

The R.L. of 1st point is 1000m at a chainage of 0+060. Calculate R.L. of each point and gradient of line joining first and last point.

OR

Calculate the missing readings shown by a cross (x) in the following observations:

Station	B.S.	I.S.	F.S.	Rise	Fall	R.L.
A	0.915					
B	1.400		X	0.335		
C	X		2.000		0.600	
D	1.370		0.975		0.800	
E		0.550		X		30.00
F	0.915		X	0.300		
G	X		0.645	X		
H	0.38		2.60		0.640	
I			1.28		X	

Q.14. Calculate the latitude and departures and closing error for the following traverse and adjust using Bowditch method. If the co-ordinate of A is (1000mN, 1000mE), compute the independent co-ordinate of all the stations.

Line	Length (m)	Bearing
AB	89.31	$45^0 10'$
BC	219.76	$72^0 05'$
CD	151.18	$161^0 52'$
DE	159.10	$228^0 43'$
EA	232.26	$300^0 12'$

*****

Purbanchal University

Faculty of Engineering, Biratnagar, Nepal

Syllabus

Level: Bachelor
Program: Bachelor in Civil Engineering
Subject: Engineering Geology
Subject Code: BCI----

Year: II **Semester: III**

Teaching Schedule Hours/Week					Examination Schedule						Total Marks
					Final				Internal Assessment		
					Theory		Practical		Theory Marks	Practical Marks	
Credit Hours	L	T	P	Total	Duration	Marks	Duration	Marks	40	25	125
3	3	1	2/2	5	3 Hrs.	60	-	-			

Note: **L:** Lecture **T:** Tutorial **P:** Practical

Course Objective:

The purpose of the course is to provide knowledge of engineering geology to the students such that they can understand the significance of engineering geology in the field of civil engineering.

Course Content:

1. **Introduction (2 hours)**
   - 1.1 Definition of geology/Engineering geology (IAEG)
   - 1.2 Branches of geology
   - 1.3 Objective and scope of engineering geology in civil engineering

2. **Origin of Earth and Tectonics (3 hours)**
   - 2.1 History of Earth (Origin, Age, Component, Geological Time Scale, Origin of life)
   - 2.2 Internal structure of Earth
   - 2.3 Plate tectonics and origin of the Himalaya
   - 2.4 Physical features of Earth (continental and oceanic)

3. **Crystallography and Mineralogy (2 hours)**
   - 3.1 Crystal, Crystal elements and crystal systems
   - 3.2 Minerals, Physical and optical properties of common rock-forming minerals, Engineering significance

4. **Petrology (6 hours)**
   - 4.1 Petrology, Petrogenesis, Petrography
   - 4.2 Rock cycle, Classification of rock
   - 4.3 Igneous rock - Classification, Texture, Structures, and Engineering significance
   - 4.4 Sedimentary rock - Classification, Texture, Structures, and Engineering significance
   - 4.5 Metamorphic rock - Classification, Texture, Structures, and Engineering significance

5. **Structural Geology (6 hours)**
   - 5.1 Definition, Attitude of rocks (Planar and linear features), Representation and expression
   - 5.2 Rock deformation and reason, Types of geological structures
   - 5.3 Primary and Secondary structures - Definition, Formation, and Morphology, Classification of secondary geological structures (Fold, Fault, Joint, and Unconformity)
   - 5.4 Field identification and engineering significance of primary and secondary geological structures

6. **Geomorphology and Geological Hazards (6 hours)**
   - 6.1 Introduction, Hazards, Vulnerability, and Risk
   - 6.2 Geomorphological processes (Weathering and erosion)
   - 6.3 Geological agents and various landforms produced by their actions (Running water, Glacier, Wind, Groundwater)
   - 6.4 Geological Hazards: Mass movement, Earthquake, Flood, GLOF. Introduction to landslide hazard/susceptibility mapping

7. **Hydrology and River Morphology (4 hours)**
   - 7.1 Introduction – River morphology and landforms produced due to river
   - 7.2 River channel morphology and its engineering significance
   - 7.3 Groundwater and its movement, Basic terminologies, Aquifer system (Aquifer, Aquiclude, Aquitard, Aquifuge)
   - 7.4 Engineering significance of aquifer system, Aquifer system in context of Nepal, Over-exploitation of groundwater, Groundwater problem in urban areas

8. **Rock Mass and Rock Mass Classification (5 hours)**
   - 8.1 Intact rock and Rock mass, Engineering properties of rock mass
   - 8.2 Rock Mass Classification systems: Introduction to Terzaghi- rock load classification system, Deree-RQD index classification, Bieniawski's Rock Mass Rating (RMR), Barton's Q-system, Importance in civil engineering projects
   - 8.3 Stereographic Projection, Plane/Pole, Kinematic analysis of rock-slope, Joint Rosette diagram

9. **Engineering Geological Site Investigation (7 hour)**
   - 9.1 Aims, Types, and Methods
   - 9.2 Maps, their types, and interpretation: Topographic map, Satellite imagery, SAR image, Geological map, Engineering geological map
   - 9.3 Engineering geological consideration on site selection for Bridge, Dam, Reservoir, Canal, and Road
   - 9.4 Engineering geological consideration on site selection for tunnel and other underground structures, Documentation during tunneling
   - 9.5 Exploration and reserve estimation for construction material
10. **Geology of Nepal (4 hours)**
   - 10.1 Geological and tectonic division of the Nepal Himalaya
   - 10.2 Major discontinuities system of the Nepal Himalaya and their engineering significance
   - 10.3 Physiographical division of the Nepal Himalaya
   - 10.4 Engineering geological hazards in different geological units of Nepal

Practical:

a. Identification of physical and optical properties of common rock forming minerals Identification of physical and optical properties of rocks
b. Study of geological structures
c. Preparation and interpretation of topographic maps, geological map, and engineering geological map.
d. Relation between apparent dip and true dip, borehole problems, calculating thickness of bedrock
e. Kinematic analysis of rock slope- Stereographic Projection
f. Effect of weathering profile in rock mass strength, Rock Mass Classification
g. Reserve estimation of construction material

A **three-day fieldwork** to provide practical on-site knowledge on Petrology, Structural geology, Geomorphology, Geo-hazards, River morphology, Rock mass, and Engineering geological site investigation. Students will submit report after the fieldwork (***Attendance in fieldwork is compulsory).***

References:

1. Bell, F. G. (2007). *Engineering Geology.* Elsevier.
2. Deoja, B., Dhital, M., Wagner, A., & K.B, T. (1991). *Mountain Risk Engineering Handbooks I and II.* ICIMOD.
3. Dhital, M.R., *Geology of the Nepal Himalaya, Springer International Published, Switzerland, (2015)*
4. Krynine, D., & Judd, W. R. (2005). *Principles of Engineering Geology and Geotechnics.* CBS Publishers.
5. Poudel, K. R. (2006). *Geology for Civil Engineers.*
6. Price, D. (2009). *Engineering Geology- Principles and Practice.* (M. H. de Freitas, Ed.) Springer.
7. Tamrakar, N. (2011). *Handbook of Engineering Geology.* Buddha Academic.

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 of Engineering Geology:

Ch No.	Topic		Subtopic	Depth								Hour	Remarks
				SD	D	DR	I	E	A	EX	N		
1	Introduction	1.1	Definition of geology/Engineering geology (IAEG),	✓	✓							2	
		1.2	Branches of geology	✓	✓								
		1.3	Objective and scope of engineering geology in civil engineering	✓	✓								
2	Origin of Earth and Tectonics	2.1	History of Earth (Origin, Age, Component, Geological Time Scale, Origin of life)	✓			✓					3	
		2.2	Internal structure of Earth	✓	✓	✓							
		2.3	Plate tectonics and origin of the Himalaya			✓	✓	✓					
		2.4	Physical features of Earth (continental and oceanic)		✓	✓	✓						
3	Crystallography and Mineralogy	3.1	Crystal, Crystal elements and crystal systems		✓							2	
		3.2	Minerals, Physical and optical properties of common rock-forming minerals, Engineering significance		✓	✓	✓						
4	Petrology	4.1	Petrology, Petrogenesis, Petrography	✓								6	
		4.2	Rock cycle, Classification of rock		✓	✓		✓					
		4.3	Igneous rock - Classification, Texture, Structures and Engineering significance				✓	✓	✓				
		4.4	Sedimentary rock - Classification, Texture, Structures and engineering significance				✓	✓	✓				
		4.5	Metamorphic rock - Classification, Texture, Structures and engineering significance				✓	✓	✓				

Ch No.	Topic		Subtopic	Depth								Hour	Remarks
				SD	D	DR	I	E	A	EX	N		
5	Structural Geology	5.1	Definition, Attitude of Rocks (Planar and linear features), Representation and expression	✔		✔	✔					6	
		5.2	Rock deformation and reason, Types of geological structures	✔			✔	✔					
		5.3	Primary and secondary structures- Definition, Formation, and Morphology, Classification of secondary geological structures (Fold, Fault, Joint and Unconformity)	✔		✔	✔	✔					
		5.4	Field identification and engineering significance of primary and secondary geological structures	✔		✔	✔	✔					
6	Geomorphology and Geological Hazards	6.1	Introduction, Hazards, Vulnerability and Risk	✔								6	
		6.2	Geomorphological processes (Weathering and erosion)	✓			✔	✔					
		6.3	Geological agents and various landforms produced by their actions (Running water, Glacier, Wind, Ground water)	✔		✔	✔						
		6.4	Geological hazards: Mass movement, Earthquake, Flood, GLOF, Introduction to landslide hazard/susceptibility mapping	✔	✔	✔	✔	✔					
7	Hydrogeology and River Morphology	7.1	Introduction (River morphology) and landforms produced due to river	✔	✔		✔	✔				4	
		7.2	River channel morphology and its engineering significance	✔	✔		✔	✔					
		7.3	Groundwater and its movement, Basic terminologies, Aquifer system (Aquifer, Aquiclude, Aquitard, Aquifuge)	✔	✔		✔	✔					
		7.4	Engineering significance of aquifer system, Aquifer system in context of Nepal. Over-exploitation of		✔		✔	✔					

Ch No.	Topic		Subtopic	Depth								Hour	Remarks
				SD	D	DR	I	E	A	EX	N		
			groundwater, Groundwater problems in urban areas										
8	Rock Mass and Rock Mass Classification	8.1	Intact rock and Rock mass, Engineering properties of rock mass	✓	✓							5	
		8.2	Rock Mass Classification Systems: Introduction to Terzaghi-rock load classification system, Deree-RQD index classification, Bieniawski's RMR, Barton's Q system, Importance in civil engineering projects		✓		✓		✓		✓		
		8.3	Stereographic Projection, Plane/Pole, Kinematic analysis of rock slope, Joint Rosette diagram,			✓	✓	✓	✓		✓		
9	Engineering Geological Site Investigation	9.1	Aims, Types, and Methods	✓			✓	✓				7	
		9.2	Maps, their types, and interpretation: Topographic map, Satellite imagery, SAR image, Geological map, Engineering geological map	✓			✓	✓		✓			
		9.3	Engineering geological consideration on site selection for Bridge, Dam, Reservoir, Canal, Road				✓	✓					
		9.4	Engineering geological consideration on site selection for tunnel and other underground structures, Documentation during tunneling		✓		✓	✓					
		9.5	Exploration and reserve estimation for construction material				✓	✓			✓		
10	Geology of Nepal	10.1	Geological and tectonic division of the Nepal Himalaya				✓	✓				4	
		10.2	Major discontinuities system of the Nepal Himalaya and their engineering significance				✓	✓					
		10.3	Physiographical division of the Nepal Himalaya				✓	✓					
		10.4	Engineering geological hazards in different geological units of Nepal		✓								
Note: Define (SD), Description (D), Diagram (DR), Illustration (I), Explanation (E), Application (A), Numerical (N)													

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

Chapter wise marks division in final examination:

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

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

PURBANCHAL UNIVERSITY
SEMESTER FINAL EXAM – 2022 (MODEL QUESTION)

LEVEL: B. E. (Civil)
SUBJECT: Engineering Geology
Year/Semester: II/IFULL MARKS: 60
TIME: 03:00 hrs. PASS MARKS: 24

Attempt all questions

Group A **[2x4]**

1. Define Engineering Geology according to IAEG. List out the different branches of geology.

2. Write down the conditions for wedge failure.

3. Differentiate between magnitude and intensity of an earthquake.

4. Define overbreak. What are the factors affecting overbreak?

Group B **[4x7]**

5. Describe the theory of plate tectonics with respect to formation of Himalaya.

6. Define minerals. Explain the symmetry elements of crystal with suitable figure.

7. What do you understand by river channel morphology? Explain with examples the suitable river channel regarding hydropower development in Nepal.

8. Describe various landforms produced by the action of glacier.

9. Define attitude of rock. If the dip direction of a sandstone bed is N200E, find out the strike of the sandstone bed with appropriate illustration.

10. Classify fold on basis of position of axial plane.

11. Describe the geological division of Himalaya with suitable cross-section.

Group C **[8x3]**

12. Discuss rock cycle and enumerate the engineering significance of three rock types.

13. Write the aims of site investigation. Three boreholes A, B, C were drilled in a flat terrain to investigate depth of bedrock. Borehole a lies N 450W from borehole B at distance of 900 m and borehole C lies S200E from borehole B at distance of 700 m. Sandstone bedrock is encountered in following depth of each borehole.

Borehole A: Top (-350 m), Bottom (-410 m)

Borehole B: Top (-310 m), Bottom (-370 m)

Borehole C: Top (-390 m), Bottom (-450 m)

Find out attitude of sandstone bedrock with true thickness.

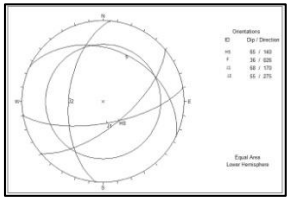
OR

What is site investigation? Describe in detail about the various phases of engineering geological site investigation.

14. Describe Q-system. Write your understanding on Spacing and RQD as an important jointing parameter of RMR.

OR

Describe joint rosette. Suggest the possible mode of failure with reasons from the data and figure below.



*****

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

Purbanchal University

Faculty of Engineering, Biratnagar, Nepal

Syllabus

Level: Bachelor

Program: Bachelor in Civil Engineering

Subject: BASIC ELECTRONICS ENGINEERING

Subject Code: BEC----

Year: II **Semester: III**

Teaching Schedule Hours/Week					Examination Schedule						Total Marks
					Final				Internal Assessment		
					Theory		Practical		Theory Marks	Practical Marks	
Credit Hours	L	T	P	Total	Duration	Marks	Duration	Marks	20	25	75
2	2	1	2/2	4	1.5 Hrs.	30	-	-			

Note: **L:** Lecture **T:** Tutorial **P:** Practical

Course Objective: To familiarize the students of Civil Engineering with basic concept of electronic devices.

1. Introduction **(1 Hrs)**

1.1 Introduction to Basic Electronics

1.2 Use of Basic Electronics in Civil Engineering

2. Diodes **(6 Hrs)**

2.1 PN junction diode, characteristics of PN junction diode

2.2 Zener diode, LED, Photodiodes, Schottky diode and their applications

2.3 Unregulated and regulated: DC power supply

2.4 Half wave and full wave Rectifier

3. Transistor **(6 Hours)**

3.1 BJT and FET: operation and configuration

3.2 BJT as amplifier and switch

3.3 FET: Operation, Types and Configuration

3.4 FET as an amplifier

4. Logic gates **(4Hrs)**

4.1 Basic gates (AND, OR, NOT)

4.2 Derived gates and Universal gates
4.3 Applications

5. Transducer and application (9 Hrs)

5.1 Physical Variables
5.2 Definition of transducer
5.3 Types (Strain gauge, LVDT, Ultrasonicsensor, Accelerometer, Tachometer, LASER devices, Total station)
5.4 Errors in measurement

6. Operational Amplifier (4 Hrs)

6.1 Basic Model, Ideal and non-ideal characteristics
6.2 Inverting and non-inverting modes
6.3 Adder and Subtractor

Practicals:

1. VI characteristics of PN junction diode
2. Half wave and full wave rectifier with and without filter capacitor
3. Observe the output of op-amp in inverting and non-inverting configuration
4. Observe the output of LVDT

References:

1. Theodorre S. Bogart, "Electronic Devices and Circuits"
2. Robert Boyelstad, " Electronic Devices and Circuits"
3. A.S. Sedra and K.C. Smith, "Microelectronic Circuits", 6th Edition, Oxford University Press
4. J.B. Gupta, "Electronic Devices and Circuits"

Final Examination Scheme:

Chapters	Hours	Marks	Remarks
1	**1**	**2**	
2	**6**	**6**	
3	**6**	**6**	
4	**4**	**4**	
5	**8**	**8**	
6	**5**	**4**	
Total	**30**	**30**	
			Note: There might be minor deviation in mark distribution. ***Mandatory: Marks should be evaluated based on solving steps.***

Evaluation Scheme;

Marks Division

Question Type	No. of Questions	Marks	Total Marks
Short	2	2	4
Medium	4	4	16
Long	2	5	10
Total			30

Question pattern:

Chapter	Hours	Marks
1.	8	8
2	8	6
3	4	4
4	5	6
5	5	6

Detailed Course Contents of Basic Electronics Engineering

Ch No.	Topic		Subtopic	Depth								Hour	Remarks
				SD	D	DR	I	E	A	EX	N		
1	Introduction	1.1	Introduction to Basic Electronics	✓								1	
		1.2	Use of Basic Electronics in Civil Engineering	✓					✓				
2	Diodes	2.1	PN junction diode, characteristics of PN junction diode.	✓	✓		✓		✓			6	
		2.2	Zener diode, LED, Photodiodes, Schottky diode and their applications	✓	✓		✓		✓		✓		
		2.3	Unregulated and regulated DC power supply	✓	✓		✓		✓				
		2.4	Half wave and full wave rectifier	✓	✓		✓		✓				
3	Transistor	3.1	BJT and FET: operation and configuration	✓	✓		✓					6	
		3.2	BJT as amplifier and switch	✓	✓		✓						
		3.3	FET: Operation, types and configuration	✓	✓		✓						
		3.4	FET as an amplifier	✓	✓		✓						

Ch No.	Topic		Subtopic	Depth								Hour	Remarks
				SD	D	DR	I	E	A	EX	N		
4	Logic Gates	4.1	Basic gates (AND, OR, NOT)	✓	✓		✓					4	
		4.2	Derived gates and Universal gates	✓					✓				
5	Transducer and application	5.1	Physical variables	✓	✓		✓	✓	✓			9	
		5.2	Definition of transducer	✓	✓		✓	✓	✓				
		5.3	Strain gauge, LVDT, Ultrasonic sensor, Accelerometer, Tachometer, LASER devices, Total station.	✓	✓		✓	✓	✓				
		5.4	Errors in measurement	✓	✓								
6	Operational Amplifier	6.1	Basic Model, Ideal and non-ideal characteristics	✓	✓		✓	✓			✓	4	
		6.2	Inverting and non-inverting modes	✓		✓	✓		✓		✓		
		6.3	Adder and subtractor	✓			✓				✓		

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

Model Question

2023

Purbanchal University

Program: B.E. Civil, Final

F.M:30 P.M:12

Time: 1:30hrs

Subject: BEC---- Basic Electronics Engineering

Answer all questions

Group A **2×2=4**

1. Define basic gates with their symbols and truth tables.
2. Write the applications of op amp.

Group B **4×4=16**

3. What are the different configurations of BJT? Explain BJT as an amplifier.
4. Draw and explain the block diagram of regulated dc power supply.
5. Write the ideal and non ideal characteristics of op amp.
6. What is FET? Differentiate between BJT and FET. State the types FET.

Group C **2×5=10**

7. The current flowing in a certain PN junction diode at room temperature is 2×10^{-7}A when a large reverse voltage is applied. Calculate the current flowing when 0.1 V forward biased is applied at room temperature.
8. What are the uses of different types of sensors in the field of civil engineering?

THE END

Purbanchal University

Faculty of Engineering, Biratnagar, Nepal

Syllabus

Level: Bachelor

Program: Bachelor in Civil Engineering

Subject: Computer Programming
Subject Code: BCE----

Year: II **Semester: III**

Teaching Schedule Hours/Week					Examination Schedule						Total Marks
					Final				Internal Assessment		
					Theory		Practical		Theory Marks	Practical Marks	
Credit Hours	L	T	P	Total	Duration	Marks	Duration	Marks	40	25	125
3	3	-	3	6	3 Hrs.	60	-	-			

Note: **L:** Lecture **T:** Tutorial **P:** Practical

Course objectives:

To provide a thorough understanding of the fundamentals of C programming to a student so that he/she will be able to code, compile and test C programs as well as to take up Systems programming or Advanced C programming course.

Course Details:

1. Problem Solving Using Computers 2 Hours

1.1 Problem Definition
1.2 Problem Analysis
1.3 Algorithm Development & Flowcharting
1.4 Coding
1.5 Compilation, Debugging & Execution
1.6 Testing
1.7 Program Documentation

2. Introduction to C 1 Hour

2.1 Historical Development of C
2.2 Importance of C
2.3 Basic Structure of C Programs

2.4 Executing a C Program

3. C Fundamentals 2 Hours

3.1 Character Set
3.2 Identifiers & Keywords
3.3 Data Types and modifier
3.4 Constants, Variables
3.5 Declarations and initialization of variables
3.6 Escape Sequences
3.7 Preprocessors Directives
3.8 typedef statement
3.9 Symbolic Constants

4. Operators & Expression 3 Hours

4.1 Operators:
4.1.1 Arithmetic, Relational, Logical, Bitwise, Assignment, Increment, Decrement, sizeof(), Conditional operators
4.2 Precedence, Associativity, and order of evaluation

5. Input and Output 3 Hours

5.1 Types of I/O
5.2 Format Specifier
5.3 Reading & Writing data
5.4 Formatted and Unformatted I/O statements

6. Control Statements 6 Hours

6 6.1 Repetitive control statements: for, while, do-while
6.2 Conditional control statements: if, if else, Nested if, else if ladder, switch
6.3 Unconditional control statements: break, continue, goto
6.4 exit( ) function

7. Functions 6 Hours

7.1 Advantages of using Function
7.2 User Defined & Library Functions
7.3 Function Prototypes, definition & return statement
7.4 Call by Value & Call by reference
7.5 Concept of Local, Global & Static variables
7.6 Recursive Function
7.7 Storage Classes and Visibility, Automatic or local variables, Global variables, Static variables, External variables

8. Arrays and Strings 6 Hours

8.1 Introduction
8.2 Single and Multi-dimension arrays
8.3 Processing an array
8.4 Passing arrays to Functions
8.5 Arrays of Strings
8.6 String Handling Function

9. Pointers 6 Hours

9.1 Fundamentals
9.2 Pointer Declarations and initialization
9.3 Accessing value through a pointer
9.4 Pointer to a pointer
9.5 Similarities between Pointers and one dimensional arrays
9.6 Pointer with one dimensional and two dimensional arrays
9.7 Passing Pointers to Functions
9.8 Dynamic Memory Allocation

10. Structures and Unions 6 Hours

10.1 Defining a Structure
10.2 Arrays of Structures
10.3 Structures within Structures
10.4 Processing a Structure
10.5 Structures & Pointers
10.6 Passing Structures to Functions
10.7 Union & its importance

11. Data Files 3 Hours

11.1 Opening & Closing a Data File
11.2 Creating a Data File
11.3 Error Handling during I/O Operations
11.4 Processing a Data File

12. Graphics 1 Hour

12.1 Initialization
12.2 Graphical mode
12.3 Simple programs using built in graphical function

Laboratories:

There shall be lab exercises covering concepts mentioned in syllabus of C programming.

References:

1. Kelly & Pohl, " A Book on C ", Benjamin/Cummings
2. Brian W. Keringhan & Dennis M. Ritchie, " The „C" Programming Language",PHI 3. Brtons G. Gotterfried, "Programming with „C"", Tata McGraw-Hill 4. Stephen G. Gotterfried, "Programming in C", CBS Publishers & Distributors 5. E. Balguruswamy, "Programming in C", Tata McGraw-Hill
6. Yashvant Kanetkar, "Let us C", BPB Publications