Purbanchal University

Faculty of Engineering

Biratnagar, Morang

Micro Syllabus and Model Question

Program: Bachelor in Civil Engineering

Semester: First

Effective from: 2021 (2078) Batch

S.N	Course code	Subjects	Credit Hours	Lecture/Week (Hrs)	Tutorial/Week (Hrs)	Practical /Week (Hrs)
First Semester						
1		**Chemistry**	**3**	**3**	**2**	**2**
2		**Mathematics I**	**3**	**3**	**2**	**-**
3		**Applied Mechanics-I (Statics)**	**3**	**3**	**3**	**-**
4		**Civil Engineering Materials**	**3**	**3**	**1**	**2**
5		**Basic Electrical Engineering**	**2**	**2**	**1**	**2/2**
6		**Engineering Drawing-I**	**3**	**1**	**-**	**3**
7		**Workshop Technology**	**2**	**1**	**-**	**2**
		Total:	**19**	**16**	**9**	**10**

Course Title: Chemistry
Course no: BEG
Credit hours: 3

Full Marks: Th. 60+40 **Pr.**:25
Pass Marks: Th. 24+16 **Pr** : 10

Nature of course: Theory (3 Hrs.) + Lab (2 Hrs.)

Goals: Students will be able to enhance their knowledge in physical chemistry, inorganic chemistry, organic chemistry and applied chemistry.

Lesson Plan

Unit	Course content-breakdown	Lecture Hours	Remarks
1	**Environmental Chemistry** 1.1 Air Pollution: 1.2 Air Pollutants (Particulates and Gaseous) and their sources(TSP,PM10,PM2.5,SOx,NOx,CO,CO2 and O3) 1.3 Impacts of air pollutants and solutions for its control 1.4 Water Pollution and its type. 1.5 Sources of water pollutants, their impacts and possible remedies for their control. 1.6 Soil Pollution and soil pollutants. Sources of soil pollution, their impacts and solutions for their control measures	8 hrs.	
2	**Electrochemistry** 2.1Electrolytic and Galvanic Cell. ***Electrolyte, non-electrolyte, conductor & non-conductor, type of electrochemical cell, Details of galvanic cell, electrode potential, standard electrode potential.*** 2.2 Standard Hydrogen Electrode (SHE***), Measurement of standard electrode potential of Zinc and Copper electrode*** 2.3 Nernst's equation, ***Derivation & Numerical.*** 2.4 Determination of pH using glass electrode, ***theory only.*** 2.5 Corrosion of metal ***(electrochemical theory of rusting of iron),*** electrochemical series & ***its application*** and Prevention of rusting. (Solving related numerical)	8 hrs.	
3	**Ionic Equilibrium** 3.1 Ostwald's Dilution law, ***Derivation, Limitation, Numerical.*** 3.2 P^H and P^H scale, ***definition, relation between pH & pOH, calculation of pH of strong and weak acid and base.*** 3.3 Buffer and its mechanism, ***definition, types, buffer range, buffer capacity.*** 3.4 Derivation of Henderson's equation for pH calculation of buffer solution. (Solving related numerical)	6 hrs.	
4	**Transition Elements** 4.*1 Introduction, Position in Modern Periodic table*, Periodic properties of Transition metals, ***3d series elements & electronic configuration.*** 4.2 Characteristics and properties of Transition metals. 4.3 Oxidation states 4.4 Complex formation and Magnetic properties. 4.5 Colour formation	6 hrs.	
5	**Co-ordination complex** 5.1 Co-ordination compound, ***Additional compound, double salt, complex salt, related terms of coordination compound, ligand.***	6 hrs.	

	5.2 Werner's co-ordination theory 5.3 Sidgwick model. 5.4 Nomenclature of co-ordination complex. 5.5 Valence bonds the theory (VBT), ***Postulates & application***. 5.6 Structure and magnetic properties of tetrahedral complexes, square planar complexes and octahedral complexes (inner and outer). ***limitations of VBT.***		
6	**Stereoisomerism** 6.1 Geometrical isomerism Cis and Trans structure and also Z and E Configurations. 6.2 Optical isomerism Conditions required for optical isomerism 6.3 Enantiomers (Dextro and Levo isomers) 6.4 Diastereomers and Meso compounds 6.5 Racemic mixture and resolution.	6 hrs.	
7	**Types of Organic reactions** 7.1 Substitution reaction S_N1 and S_N2, ***Definition, kinetics, mechanism, stereochemistry, reactivity, factors affecting this type of reaction***. 7.2 Elimination reaction E1 and E2, ***Definition, kinetics, mechanism, Orientation (Saytzeff's rule), reactivity, factors affecting this type of reaction***. 7.3 Addition reaction Examples, ***Markonikovs rule & Kharash effect***. 7.4 Re-arrangement reaction examples	6 hrs.	
8	**Organo metallic compound, Explosives and Paints** 8.1 Preparation, properties and uses of organometallic compound ;***Grignard Reagent.*** 8.2 Explosives and their types (High explosive and low explosive***).*** 8.3 Preparation, properties and action of TNT, TNG and Nitrocellulose. 8.4 Paints and enamels their properties and applications, ***types & characteristics.***	6 hrs.	
9	**Polymers and Applied Chemistry** 9.1 Polymers and their type (Composition, conductivity and degradation), ***homopolymer & co-polymer, conducting, & non-conducting, biodegradable & non-biodegradable.*** 9.2. Synthetic Polymer Polystyrene, Nylon6.6, PTFE, Silicones and Fiber reinforced Plastics (FRP) 9.3 Natural Rubber and Synthetic rubber, neoprene, buna rubber and vulcanization of rubber 9.4 Hazards and their chemical control in petroleum refineries and LPG bottling plants, ***basic concept & safety measures only.***	8 hrs.	

Practical

1. To determine the alkanity of the given sample of water (sample A and B)
2. To determine the total hardness of water sample.
3. To determine the permanent hardness of water sample.
4. To determine the amount of free chlorine in the given sample of water.
5. To determine the Iron from Mohr's salt.
6. To estimate the amount of Barium in given sample.
7. To estimate the amount of sulphate in given sample.
8. To determination pH of soils
9. To determine the pH of unknown buffer by using standard buffer.

Note: External viva examination is recommended for better performance in practical operation.

Homework

Assignment: Assignment should be given throughout the semester

References Books:

1. R.K.Sharma &B.P. Panthi; *A text book of Engineering Chemistry*. 3rd edition.Heritage pub. Pvt.Ltd.(2018).
2. Arun Bahl, B.S. Bahl & G.D. Tuli; *Essential of Physical Chemistry*,S. Chand & Company.Ltd, New Delhi,(2012).
3. S.H.Maron &C. Prutton; *Principle of Physical Chemistry*,4th edition, oxford & IBH pub. Co, (1992).
4. R.D.Madan, Satya Prakash , *Modern Inorganic Chemistry*;S. Chand company Ltd,(1994).
5. J.D. Lee; *Concise Inorganic chemistry*;5th edition ,John Wiley and sons;Inc,(2007).c
6. R.T.Morrison & R.N. Boyd; *Organic chemistry*.6th &7th edition, prentice-Hall of india Pvt,Ltd.(2008).
7. B.S Bahl and A.Bahl, *A text book of Organic Chemistry*; S, Chand publication, New Dehli.India,(2012).
8. Charles E, Dryden, *Outline of Chemical Technology*,edition and revised by M,Gopal Rao and Marshall sitting affiliated East –West press Pvt. Ltd. New Delhi, (2010).
9. J. Bhattarai ;*Frontiers of Corrosion Science* ,1st edition, kshitiz pub.ktm, (2010)
10. N.M. Khadka, S.D. Gautam & P.N. Yadav; *A core Experimental Chemistry*; 2nd edition. Bench Mark pvt. Ltd. (2009).

Model Question

Full marks: 60
Pass marks: 24
Time: 3 hours.

Bachelor Level/ First Year/First Semester/ Science

Chemistry (BEG)

Candidates are required to give their answers in their own words as far as practicable. The figures in the margin indicate full marks.

Group-A

Very Short Answer Questions **[2x4=8]**

1. Unit 3 [2]
2. Unit 4 [2]
3. Unit 6 [2]
4. Unit 8 [2]

Group- B

Short Answer Questions [7x4=28]

1. Unit 1 [4]
2. Unit 3 [4]
3. Unit 5 [4]
4. Unit 6 [4]
5. Unit 8 [4]
6. Unit 9 [4]
7. Unit 3 [4]

One short question in choice is expected from unit 1.

Group- C

Long Answer Questions [8x3=24]

1. Unit 2 [8]
2. Unit 4 [8]
3. Unit 7 [8]

One OR question in expected from unit 9

PURBANCHAL UNIVERSITY
I SEMESTER FINAL EXAMINATION 2022

LEVEL:- B. E. Civil
SUBJECT:- BEG104HS Chemistry
TIME:- 03:00 hrs.

(Model Question)

FULL MARKS:- 60
PASS MARKS:- 24

Candidates are requested to give their answers in their own words as far as practicable. Figures in the margin indicate full marks.

Attempt ALL questions

GROUP : A

Very short question: **[4 × 2 = 8]**

1. What is Ostwald's dilution law. Write its limitations. **[2]**
2. What is an effective atomic number? Explain with an example. **[2]**
3. What are cis and trans isomers? Explain with an example. **[2]**
4. Show your familiarity with high explosives. **[2]**

GROUP : B

Short question: **[7 × 4 = 28]**

5. What are the major factors affecting Urban air pollution also mention their impacts. **[4]**
6. What is a buffer solution? Derive the Henderson's equation for basic buffer solution. **[4]**
7. Give the Key points of Valence bond theory. **[4]**
8. What are the essential conditions for optical isomerism. Show the optical activity for lactic acid. **[4]**
9. What is Grignard's reagent? How is it prepared? How does ethyl magnesium bromide react with methanal and carbon dioxide? **[4]**
10. Why do natural rubber differ from polyethene? Give one preparation of Teflon and its two important applications. **[4]**
11. Calculate the pH of commercially available 0.1M acetic acid, which is 3.2% ionise at this dilution. Also find the concentration of hydronium ions and hydroxide ions. **[4]**

OR

What do you mean by soil pollution? Why is it always problematic in urban areas rather than rural area. Explain. **[4]**

GROUP : C

Long question: **[3 × 8 = 24]**

12. Derive Nernst's equation. Calculate the emf of Zn/Ag electrochemical cell at 39°C, when the concentration of Zn^{++} and Ag^{+} are 0.15M and 0.5M respectively. Given $E^0_{Zn^{++}/Zn} = -0.76V$ and $E^0_{Ag^{+}/Ag} = +0.80$ **[4+4]**
13. What are the true transition elements? Explain the characteristics of 3d series transition elements with reference to (a) electronic configuration and (b) color formation. **[2+3+3]**
14. How do you distinct nucleophilic substitution and elimination reaction. Give the mechanism of hydrolysis of tertiary butyl bromide in the presence of aqueous alkali. **[2+6]**

OR

Write the classification of polymers on the basis of composition. Give the preparation and application of Nylon 6,6 and FRP.. **[2+3+3]**

Engineering Mathematics-I
BEG101SH

Year: I | Semester: I

Teaching Hours/week				Examination Scheme						Total Marks
				Internal		Final				
				Theory	Practical	Theory		Practical		
Cr	Theory	Tutorial	Practical			Duration	Marks	Duration	Marks	
3	3	3		40		3hrs	60	-	-	100

Objective: The main objective of the course is to provide the students a sound knowledge of calculus (differential and integral), vector algebra and analytic geometry through theoretical explanations and numerical examples via problem solving techniques and applications.

Micro-Syllabus

Chapter 1: Derivatives and their Application

1.1 Review of limit, continuity and differentiability

1.2 Tangents and Normals: Equation of tangents and normal to the curves, Angle between two curves, Pedal equations.

1.3 Higher Order Derivatives, and Leibnitz's Theorem: Leibnitz's Theorem (without proof) and its applications to numerical problems.

1.4 Power Series of Single valued functions: Taylor's series (without proof) and Maclaurin's series (without proof), expansion of trigonometric, exponential and logarithmic functions using Macluarin's series.

1.5 Indeterminate forms and L' Hospital's Rule (without proof): Indeterminate forms and use of L'Hospital's rule to find the limit.

1.6 Curvature: Radius and chord of curvature

1.7 Asymptotes of Cartesian Curves

1.8 Partial Derivatives: Euler's theorem (proof only for two variables) and its applications.

1.9 Extreme values of functions of two and three variables: Criterion for extreme values, use of Lagrange's Multiplier.

Chapter 2: Antiderivatives and its Applications

2.1 Review of indefinite and definite integrals

2.2 Properties of definite integrals

2.3 Improper Integrals

2.4 Differentiation under integral sign: Lebinitz's Integral Rule (statement only) and problem related to constant limit of integration.

2.5 Reduction formula and Beta Gamma functions: Reduction of

$$\int x^n e^x dx, \quad \int \sin^n x\, dx, \quad \int \cos^n x\, dx, \quad \int \tan^n x\, dx, \quad \int cosec^n x\, dx,$$

$$\int \sec^n x\, dx \quad \int \cot^n x\, dx$$

Definition, properties, relation between Beta and Gamma function (without proof), numerical application of Beta Gamma function.

2.6 Applications of integrals: ideas of curve tracings; area, arc-length, volume and surface area in cartesian form: Basic concept of curve tracing related to ellipse, parabola, astroid, hypocycloid and loops generating Cartesian curves, curves bounded by horizontal and vertical assymptotes. Arc length, Area, Surface area and volume of solid of revolution related to above curves.

2.7 Multiple Integrals: Double Integral in Cartesian form; Triple Integral in rectangular form.

2.8 Change of order of integration in double integral: Cartesian form only.

Chapter 3: Plane Analytic Geometry

3.1 Translation and Rotation of axes.

3.2 Parabola: standard equations, tangent and normal: Standard equation of parabola, equation of tangents and normal, condition of tangency and condition of normality to the standard equations of parabola and related numerical problems.

3.3 Ellipse and Hyperbola: Standard Equations, foci, directrices, latera recta, equations of tangent and normal: Standard equation of ellipse and hyperbola, equation of tangents and normal, condition of tangency and condition of normality to the standard equations of ellipse and hyperbola and related numerical problems.

3.4 General Equation of conic sections.

Chapter 4: Vector Algebra

4.1 Review of product of two vectors.

4.2 Product of three and four vectors with applications.

4.3 Reciprocal System of vector triads.

4.4 Vector Equation of lines (parametric form, symmetric form and related numerical problems) and planes in space (line of intersection of two planes and angle between two planes) by vector method.

REFERENCE BOOKS:

1. M. B. Singh and B. C. Bajracharya, *Differential Calculus*, Sukunda Pustak Bhawan, Kathmandu, Nepal.
2. G. B. Thomas and R. L. Finney, *Calculus and Analytic Geometry*, Addison Wesley Publishing Company.
3. M. B. Singh and B. C. Bajracharya, *A textbook of Vector Analysis*, National Book Center, Kathmandu, Nepal
4. D. G. Zill an M. R. Cullen, *Advanced Engineering Mathematics*, 3rd Edition, Jones and Bartlett Publishers Inc.
5. E. Kreyszig , *Advanced Engineering Mathematics* , 9th Edition, John Wiley and Sons, Inc.
6. G. D. Pant and G. S. Shrestha, *Integral Calculus and Differential Equation*, Sunila Prakashan, Kathmandu, Nepal.
7. S. P. Shrestha, H. D. Chaudhary and P. R. Pokhrel, *A Text book of Engineering Mathematics*- Volume I, Vidhyarthi Pustak Bhandar, Kathmandu, Nepal.
8. S. P. Pradhanang and N. B. Khatakho, *Engineering Mathematics*- Volume I, Vidhyarthi Pustak Bhandar, Bhotahity, Kathmandu, Nepal.

Evaluation Scheme

Marks Division

Question Type	No. of Questions	Marks	Total Marks
Short	10	2	20
Long	10	4	40

Chapter wise marks division in final examination

SN	Chapter	Number of short questions	Number of long questions	Total
1	Derivatives and their Application	3	3	6
2	Antiderivatives and its Applications	4	3	7
3	Plane Analytic Geometry	2	2	4
4	Vector Algebra	1	2	3
Total		10	10	20

Notes:

- Three long questions with one "OR" and three short questions from 1.2 to 1.9 and each question from different topics.
- One long question and two short questions from 2.2 to 2.5; one long question with "OR" and two short questions from 2.6; one long question from 2.7 to 2.8.
- One long and one short questions from 3.1 to 3.2; one long with "OR" and one short question from 3.3 to 3.4
- Two long questions and one short question from 4.2 to 4.4 with one "OR" long question.

PURBANCHAL UNIVERSITY

I SEMESTER (MODEL QUESTION)

LEVEL:- B. E. Civil / Computer / Electronics, Communication and Automation / Electrical / B. Architecture I/I

SUBJECT:- BEG101SH, Engineering Mathematics-I

FULL MARKS:- 60

TIME:- 03:00 hrs.

PASS MARKS:- 24

Group A

Attempt all questions. [10 x 2 = 20]

1) State L' Hospital's rule. What are indeterminate forms?

2) Define asymptotes of a curve. Find the vertical asymptotes of $x^2y - 9y + 3 = 0$.

3) Define curvature and radius of curvature of a curve. Illustrate with figure.

4) Integrate: $\int_0^{\frac{\pi}{2}} \frac{\sin x}{\sin x+\cos x}\, dx$

5) Find the area of the region bounded by $y = x^2$, $x = 2$ and x-axis.

6) Evaluate the improper integral $\int_0^{\infty} \frac{1}{x^2+9} dx$.

7) Discuss the symmetry for the curve $x^3 + y^3 = 7xy$ with reasons.

8) Define foci, centers and directrices of an ellipse. Illustrate with a figure.

9) Find the equation of tangent to the parabola $y^2 = x$ at (1, 1)

10) Find the value of n if $2\vec{i}-\vec{j}+\vec{k}$, $\vec{i}+2\vec{j}+3\vec{k}$ and $3\vec{i}+2\vec{j}+n\vec{k}$ are coplanar.

Group B

Attempt all questions. **[10 x 4 = 40]**

11) If $y = (\text{Sin}^{-1}x)^2$, prove that $(1-x^2)y_{n+2} - (2n+1)x\,y_{n+1} - n^2\,y_n = 0$

12) Applying the Maclaurin's theorem find the expansion of $logsecx$ as far as the term x^6 and hence find the expansion of $tanx$.

13) Find the pedal equation of the curve $r^2 = a^2cos2\theta$.

OR

Find the minimum value of $x^2 + y^2 + z^2$ when $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 1$

14) Use Gamma function to evaluate: $\int_0^a x^3(a^2 - x^2)^{5/2}\, dx$.

15) Find the area of the hypocycloid $(\frac{x}{a})^{2/3} + (\frac{y}{b})^{2/3} = 1$

OR

Prove that the volume and surface area of a sphere of radius r is $\frac{4}{3}\pi r^3$ *and* $4\pi r^2$, respectively.

16) Evaluate $\int_0^\infty \int_x^\infty \frac{e^{-y}}{y} dydx$ by changing the order of integration.

17) Transform the equation $3x^2 - 2xy + 4y^2 + 8x - 10y + 8 = 0$ by translating the axis in to an equation with linear terms missing.

18) Find the equations of tangents drawn from the point $(-15, -7)$ to the ellipse $\frac{x^2}{4} + \frac{y^2}{9} = 1$. Find the acute angle between them.

OR

Find the axis, the vertex, latus rectum and focus of the parabola $16x^2 - 24xy + 9y^2 - 104x - 172y + 44 = 0$.

19) Find the linear relation between four vectors $\vec{a}, \vec{b}, \vec{c}, \vec{d}$.

20) Find the equation of plane through (1,2, 3) and (3,2,1) perpendicular to the plane $4x - y + 2z = 7$ by vector method.

OR

Find the equation of the line of intersection of the planes 3x – 6y -2z = 15 and 2x – y + 3z = 5 in symmetric form by using vector method

Applied Mechanics-I
BEG__CI

Year: I **Semester: I**

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

Course Objective:

This course has been developed to provide the basic knowledge of engineering mechanics where in laws of physics are applied to solve engineering problems. This course will helps the students to understand structural engineering theory in later courses.

Detailed Course Contents:

Ch. No.	Topic		Subtopic	Depth								Hour	Remarks
				SD	D	DR	I	E	A	EX	N		
1	Introduction	1.1	Definition & scope of mechanics, engineering mechanics and static	✓						✓		5	
		1.2	Concepts of particle, rigid body, deformed & fluid bodies	✓						✓			
		1.3	Equation of static equilibrium in 2D & 3D		✓								
		1.4	Free body diagram	✓	✓		✓						
		1.5	System of units							✓			

2	Forces	2.1	Definition & principles of forces	✓								7	
		2.2	Types of forces (coplanar, collinear, concurrent, parallel, external & internal forces)	✓			✓			✓			
		2.3	Principle of transmissibility & its limitations	✓	✓		✓			✓			
		2.4	Resolution & composition of forces				✓	✓					
		2.5	Lami's theorem, Varignon's theorem, triangle, parallelogram & polygon law of forces	✓		✓	✓				✓		
		2.6	Moment of forces about a point & axis (in scalar & vector form)	✓		✓					✓		
		2.7	Definition of couple & proof of it as a free vector	✓		✓							
		2.8	Resolution of force into force & a couple & vice versa				✓				✓		
		2.9	Resultant of a system of forces (wrench, parallel, coplanar, concurrent & general)	✓	✓		✓			✓	✓		
3	Distributed Force	3.1	Definition & derivation of center of gravity & centroid (composite figure & direct integration method)	✓		✓	✓					6	
		3.2	Centroid of lines, areas and volumes	✓		✓	✓				✓		
		3.3	Definition of second moment of area (moment of Inertia) and radius of gyration	✓	✓		✓				✓		
		3.4	Parallel and perpendicular axis theorem, MOI of common figures (e.g. rectangle, triangle, circle and ellipse) and uniform thin rod	✓		✓	✓				✓		
		3.5	MOI of built up section.								✓		
		3.6	MOI by direct integration method.								✓		

4	Friction	4.1	Introduction	✓								4	
		4.2	Laws of dry friction	✓									
		4.3	Static friction, co-efficient of friction & angle friction	✓			✓						
		4.4	Condition of sliding or tipping		✓								
		4.5	Application to static problems						✓		✓		
5	Introduction to Structures	5.1	Structural components (beam, frame, truss, 2-D plate, cable, arch, grid)	✓			✓					3	
		5.2	Difference between plane and space structures.	✓			✓						
		5.3	Difference between mechanism & structures	✓			✓						
		5.4	Types of loading & supports		✓		✓			✓			
		5.5	Determinacy (internal & external) and stability (statical & geometrical)		✓				✓		✓		
6	Introduction to Analysis of Beam	6.1	Definition and types of beam	✓			✓					8	Any types of determinant beam with any types of static loading
		6.2	External and internal forces in beam	✓			✓						
		6.3	Definition and sign convection of axial forces, shear forces and bending moment	✓			✓						
		6.4	Relationship between load, shear force & bending moment			✓			✓				
		6.5	Axial force, shear force & bending moment diagram								✓		
7	Introduction to Analysis of Frame	7.1	Definition & type of frame (rigid, deficient, redundant)	✓			✓					6	Portal frame and cantilever frame (without internal hinge, inclined and overhanging member) with combination of point load, moment and UDL.
		7.2	Determinacy & stability								✓		
		7.3	Axial force, shear force & bending moment diagram								✓		

8	Introduction to Analysis of Truss	8.1	Definition & types of plane (according to support condition purpose of utilization, degree of complexity)	✓			✓				✓	6	
		8.2	Determinacy & Stability pf plane								✓		
		8.3	Analysis of plane truss (method of joints & method of section)								✓		
		8.4	Introduction of space truss	✓			✓						
Note: Define(SD), Description (D), Derive (D), Illustration (I), Explanation (E), Application (A), Explanation (Ex), Numerical (N)													

Final Examination Scheme:

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

References:

1. Beer F.P., & Johnston, E.R. (1987). *Mechanics for Engineers-Statics and Dynamics.* 4th edition, Mcgraw-Hill.
2. Hibbeler, R.C., & Gupta, A. (2009). *Engineering Mechanics-Statics and Dynamics.* 11th edition. Pearson Education.
3. Shames, I.H. (1990). *Engineering Mechanics-Statics and Dynamics*. 3rd edition. Prentice Hall of India.

PURBANCHAL UNIVERSITY
I SEMESTER FINAL EXAMINATION – 2022 (MODEL QUESTION)
LEVEL: B. E. (Civil)
SUBJECT: Applied Mechanics I

TIME: 03:00 hrs.

FULL MARKS: 60
PASS MARKS: 24

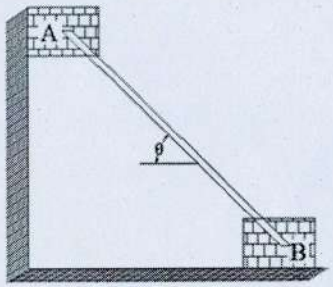
Attempt all questions

1.

a. What are the points to be considered while drawing FBD? [2]

b. Explain statically determinant and indeterminate structure with example. [2]

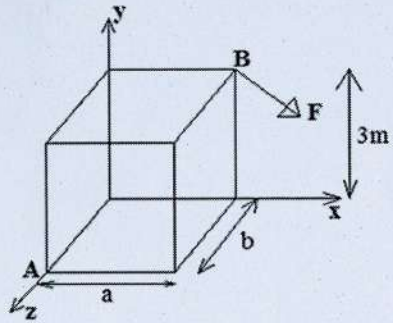
c. Two identical blocks, A along the vertical wall and B on the floor are kept stationary with the help of connected struts, as in figure If sliding impends when $\theta = 45^\circ$, determine the coefficient of friction, assuming it to be same at both the floor and the wall. [6]



2.

a. Show that couple is a free vector. [2]

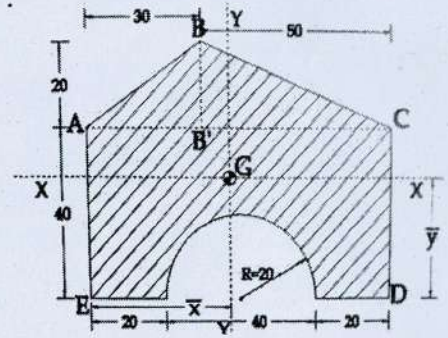
b. The moment of the force $\vec{F}$=(3i-4j-5k) acting at B about point A is given by $\vec{M}$= (-3i+19j-17k). Determine the dimension 'a' and 'b' of the rectangular box. [8]



3.

a. Proof parallel axis theorem. [2]

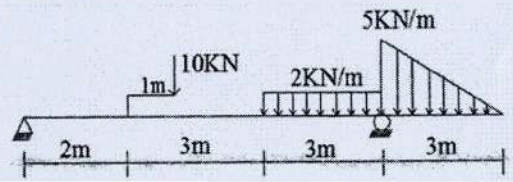
b. Find the centroid and determine the moment of inertia about its centroidal axes for the given shaded portion of the figure given below. [2+3+3]



4.

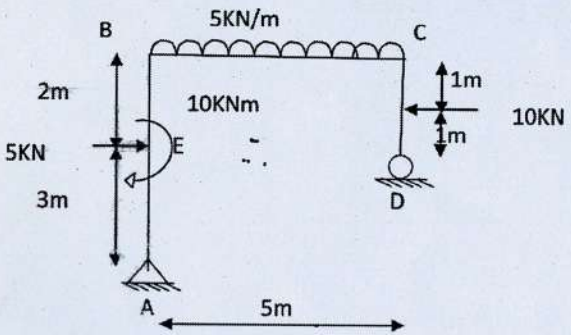
a. Describe different types of beam. [2]

b. Analyze and draw SFD, BMD for the beam shown. [4+2+2]



5.

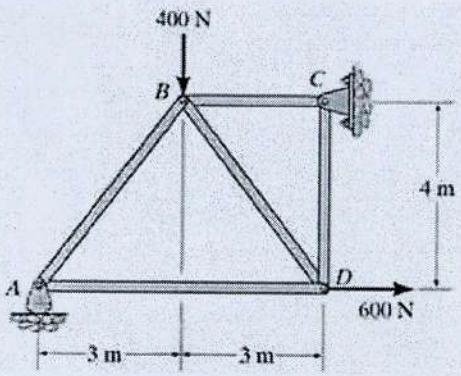
a. Analyze and draw axial force, Shear force and Bending Moment Diagram for the given loaded frame as shown in figure Indicate salient points. [5+1+2+2]



6.

a. Write down the assumptions of truss. [2]

b. Determine the force in each members of the truss shown below. [8]



Civil Engineering Materials

BEG___CI

Year: I **Semester: I**

Teaching Hours/week				Examination Scheme						Total Marks
				Internal		Final				
				Theory	Practical	Theory		Practical		
Cr	L	T	P			Duration	Marks	Duration	Marks	
3	3	1	2	40	10	3	60		15	125

Course Objective:

To provide knowledge and concept of civil engineering materials (composition, manufacturing, properties and uses) that can be used in the construction works of civil structures.

Course Contents:

1. Introduction to Construction Materials **(4 hrs)**

- 1.1 Scope of construction materials
- 1.2 Selection criteria of construction materials
- 1.3 Classification of construction materials
- 1.4 Properties of construction materials
  - *1.4.1. Physical*
  - *1.4.2. Mechanical*
  - *1.4.3. Chemical*
  - *1.4.4. Electrical*
  - *1.4.5. Thermal*
- 1.5 Concept of Stress-Strain relationship and Griffith's theory
- 1.6 Hardness and toughness tests of construction materials

2. Building stones **(5 hrs)**

- 2.1 Introduction *(Definition and Classification)*
- 2.2 Sieve analysis *(Dry Process, IS standard)*
- 2.3 Aggregate (fine and coarse)
- 2.4 Bulking of sand
- 2.5 Characteristics of good building stones
- 2.6 Selection of stones
- 2.7 Deterioration and preservation of stone
- 2.8 Natural bed of stone
- 2.9 Dressing of stone *(Purpose and its uses)*

3. Clay products **(6 hrs)**

- 3.1 Introduction

3.2 Ingredients of brick earth
3.3 Manufacture of bricks *(General process only, Surface)*
3.4 Characteristics of good bricks
3.5 Classification of bricks
3.6 Standard test on bricks *(water absorption, Compressive)*
3.7 Tiles and their types *(according to surface treatment & purpose)*
3.8 Introduction to typical Nepali traditional Brick (Terracotta Bricks)

4. Cementing materials **(6 hrs)**

4.1 Clay
4.2 Lime
4.3 Types, properties, and uses of lime
4.4 Properties and uses of pozzolanic materials
4.5 Cement
4.6 Type, properties, and uses of cement
4.7 Ingredients of cement
4.8 Manufacture of cement
4.9 Cement clinker and its composition
4.10 Standard test on cement *(consistency, soundness test, setting time, compressive test)*
4.11 Cement water proofer and admixtures

5. Mortar **(2 hrs)**

5.1 Introduction
5.2 Classification of mortar
5.3 Function of mortar and Preparation Process (Cement, lime & mud)
5.4 Selection of mortar

6. Timber **(6 hrs)**

6.1 Introduction
6.2 Structure of tree and microstructure of wood *(Introduction only)*
6.3 Classification of tree
6.4 Characteristics of good timber
6.5 Seasoning of timber
6.6 Defects of timber
6.7 Deterioration and preservation of timber
6.8 Bamboo as a construction material
6.9 Commercial products of timber

7. Metals and alloys **(6 hrs)**

7.1 Introduction *(definition)*
7.2 Type, properties, and uses of iron
7.3 Composition and properties of steel
7.4 Deformation of steel

7.5 Heat treatment process
7.6 Nonferrous metal *(composition, Properties and uses of the listed metal copper, aluminum, zinc, tin)*
7.7 Microstructure study of steel
7.8 Elastic and plastic behavior *(as of chapter 1)*
7.9 Deformation of steel
7.10 Commercial product of metals (Structural Steel)

8. Paints and varnishes **(4 hrs)**

8.1 Function, ingredient, type and uses of paints and varnishes
8.2 Distemper and its types *(Surficial)*
8.3 Anti-termite treatment

9. Asphalt, bitumen, and tar **(4 hrs)**

9.1 Introduction
9.2 Properties of asphalt, bitumen, and tar
9.3 Uses of asphalt, bitumen, and tar
9.4 Asphalt concrete *(Introduction)*
9.5 Standard test on bitumen *(Introduction only)*

10. Miscellaneous materials **(2 hrs)**

10.1 Glass and its types
10.2 Plastic materials
10.3 Insulating materials
10.4 Gypsum products
10.5 Composite materials
10.6 Rubber

Laboratories:

1. Sieve analysis (fine and coarse aggregate)
2. Bulking of sand
3. Water absorption test and bulk specific gravity test on brick
4. Compressive strength test of brick and stone
5. Consistency test of cement
6. Setting time test of cement (initial and final)
7. Compressive strength of mortar
8. Toughness (Charpy) test on steel and timer

Field Visit: 3 days field visit on manufacturing of steel, cement, asphalt materials, brick, timber and miscellaneous materials.

Project Work: Case study on any one construction material site.

Final Examination Scheme:

Chapters	Type	Remarks
1	Short, Very Short	
2	Long, Very Short	
3	Short, Very Short	
4	Long, Short	
5	Short, Very Short	
6	Long, Very Short	
7	Long, Short	
8	Short, Very Short	
9	Short, Very Short	
10	Short, Very Short	
Total	**60**	

Question Division

S.no	*Question Type*	*Marks*	*Number*	*Total*
1	*Long Question*	*8*	*3*	*24*
2	*Short Question*	*4*	*7*	*28*
3	*Very Short Question*	*2*	*4*	*8*
Total				*60*

References:

1. Singh, P. (2013). *Civil Engineering Material.* Katson Books.
2. Thornton, P. A., & Colangela, V. J. (1985). *Fundamental of Engineering Materials.* Prentice Hall Publishing Company.
3. Rajput, R. K. (2000). *Engineering Materials, 2nd* (Doctoral dissertation, Ed. S. Chand Company Limited, New Delhi.

PURBANCHAL UNIVERSITY

I SEMESTER MODEL QUESTION ,2022

PROGRAM:- B.E Civil [I/I]
SUBJECT:- [BEG159CI] Civil Engineering Material
TIME: - 3:00 hrs.

FULL MARKS: - 60
PASS MARKS:-24

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

Model Questions:

Very short: **[2x4=8]**

a. What are the types of Construction materials? (Ch-1) [2]

Or

Define hardness and toughness (Ch-1) [2]

b. What is the fineness modulus? (Ch-2) [2]

Or

What is bulking of sand (Ch-2) [2]

c. Define tile & mention the types of tiles. (Ch-3) [2]

d. Define setting time of Cement (Ch-4) [2]

Short Question **[4x7=28]**

e. Why civil engineering materials are important for civil engineering (Ch-1) [4]

f. Explain the composition of bricks and their function (Ch-3) [4]

g. Describe about the selection of mortar. (Ch-5) [4]

h. Explain heat treatment with its objective. (Ch-7) [4]

i. Explain about the constituents of oil paints. (Ch-8) [4]

Or

Write about anti termite treatment (Ch-8) [4]

j. Differentiate between asphalt and tar. (Ch-9) [4]

k. Write short notes on Gypsum products & Rubber (Ch-10) [4]

Or

Describe about glass and its types (Ch-10) [4]

Long Question **[8x3=24]**

a. Define Sieve Analysis. Discuss the characteristic of good building stones. (Ch-2) [8]

b. Explain the manufacturing process of Cement with neat flow diagram. (Ch-4) [8]

c. What is the difference between soft wood and hard wood? Explain defects in Timber with neat sketches. (Ch-6) [8]

or

Explain about the microstructure of steel. (Ch-7) [8]

As per the Model Question

Chapters	No of Long questions [8x3]	No of Short questions [4x7]	No of Very short questions [2x4]	Marks	Remarks
1		1	1	6	
2	1		1	10	
3		1	1	6	
4	1		1	10	
5		1		4	
6	or		or		Optional
7	1	1		12	
8		1		4	
9		1		4	
10		1		4	
Total				60	

Basic Electrical Engineering

Year: I **Subject Code: BEG….EL** **Semester :I**

Teaching Hours/week				Examination Scheme						Total Marks
				Internal		Final				
				Theory	Practical	Theory		Practical		
Cr	L	T	P			Duration	Marks	Duration	Marks	
2	2	1	2/2	20	25	1.5	30	-	-	75

Course Objective: The basic objective of the course is to know basic concept of Electrical Enginering and to Attain the Knowledge of DC, Single Phase and Three Phase AC

Hrs. Req.	As per syllabus	Topic as per syllabus	Topic to be taught
1.5	Chapter 1: General Electric System No. of Hours: 6	1.1 Constituent part of an Electric System (source, load, communication & control)	Define elements of an electric circuit: source, load, path(conductor), switches (control), fuess(protection) with circuit diagram
		1.2 Current flow in a circuit	Define and Explain Current with derivation
		1.3 Electromotive force and Potential Difference	Define EMF and PD and list the differences between them
		1.4 Ohm's Law, its applications and limitations	Statement, Explanation,Application and Limitation of Ohm's Law
1.5		1.5 Resistors and Resistivity	Define Resistors, State laws of Resistance and derive it and solve numerical based on it
2		1.6 Temperature rise and Temperature Coefficient of resistance	Define,Explain and Derive temperature coefficient of resistance and numerical based on it
1		1.7 Voltage and Current Sources	Define and classify the source, limitt to independent sources only.
2	Chapter 2: DC Circuits No. of Hours: 6	2.1 Series and Parallel Combination of resistors	Define, Explain, Derive equvalent resistance, Current and voltage division rule and solve Numerical based on series and parallel combination
1.5		2.2 Kirchhoff's Law and their applications	State, Explain and mention the types of kirchhoff's law and their application
1.5		2.2.1 Mesh Analysis	Explain mesh analysis and it's procedure and solve Numerical
1		2.2.2 Nodal Analysis	Explain nodal analysis and it's procedure and solve Numerical
1	Chapter 3: Network Theorems No. of Hours: 6	3.1 Star-delta transformation and Delta-star transformation	Provide conversion formula Explain and Solve Numericals
1.5		3.2 Superposition Theorem	Statement, Explain and list procedure and Solve Numerical , Application
2		3.3 Thevenin's Theorem	Statement, Explain and list procedure and Solve Numerical , Application
1.5		3.4 Maximum power transfer theorem	Statement, Explain and list procedure and Solve Numerical , Application
2	Chapter 4:Inductance & Capacitance in an Electric Circuit No. of Hours: 4	4.1 Capacitor and its Capacitance, Capacitor in series and parallel	Define, Explain and Derive expression for equivalent Capacitance in series and Parallel, Energy stored in capacitor
2		4.2 Inductor and its Inductance, Inductor in series and parallel	Define, Explain and Derive expression for equivalent Inductor in series and Parallel, Energy stored in inductor, Concept of self and mutual inductance
2		5.1 Generation of AC	Faradays's law of Electromagnetic Induction, Generation of 1 Phase AC, explanation with waveform
2		5.2 Waveform and Terms used in AC	Define basic terms: frequency, time period, cycle, peak value, current and voltage waveform together, phase difference

	Chapter 5: AC Fundamentals No. of Hours: 8	5.3 Average and R.M.S values of Current and Voltage 5.4 Phasor representation	Define Average, RMS value, form and peak factor and phasor representation
2		5.5 AC through Resistance, Inductance and Capacitance	Define, Explain and Derive AC through R, L and C with Phasor diagram and waveforms and Numericals and concept of j operator
2		5.6 AC through RL, RC, and RLC and their phasor representation	Define, Explain and Derive AC through series RL, RC and RLC with Phasor diagram, waveforms and Numericals
1		5.7 Power and Power factor in AC	Define Power (apparent, active and reactive) with Power triangle and define power factor and explain importance of power factor
1		5.8 Concept of three phase system.	1- and 3-phase system from number of conductors perspective, comparison of 3 phase and single phase ac system, Basic Defination: line and phase Voltage and Current, power.

Marks Distribution				
Chapters	**Marks**	**Marks Sub Distribution**		
1	6	1- Numerical of 4 marks either on Laws of resistance or Temp. Coefficient 2- Theory of 2 marks		
2	6	1- Numerical of 4 marks either on mesh or nodal Analysis 2- Theory of 2 marks	1- Numerical of 3 marks either on mesh or nodal Analysis 2- Numerical of 3 marks on series and parallel reduction	1- Numerical of 4 marks either on mesh or nodal Analysis or series & Parallel 2-Theory of 2 marks on series and parallel or Mesh or nodal
3	6	1- Numerical of 4 marks either on Super Position or Thevenin theorem or Star or Delta Conversion 2 - Theory of 2 marks	1- Numerical of 3 marks either on Super Position or Thevenin theorem 2- Derivation of 3 marks	1- Numerical of 3 marks either on Super Position or Thevenin theorem or Star delta 2- Derivation of 3 marks
4	4	1. Theory of 2 marks 2 - Derivation of 2 marks		
5	8	1- Numerical of 4 marks on R.L and C or Combination 2- Derivation of 2 marks 3. Definition of 2 marks	1- Numerical of 4 marks on R.L and C 2- Numerical of 4 marks on Combination	
Total	**30**			

Final University QuestionFormat:
No. of question: 5
Each question Carry Equal Marks of 6
Each question may have sub question
Attempt all 5 question

PURBANCHAL UNIVERSITY

MODEL QUESTION

LEVEL: - B. E. (Civil) First Semester/Final
SUBJECT: Basic Electrical Engineering **FULL MARKS: - 30**
TIME: - 01:30 hrs. **PASS MARKS: - 12**

All question Carry equal Marks

1. a. Define Resistance and state the laws of resistance. 2

b. A coil connected across a constant DC source of 120V, Draws a current of 12 A at temperature 25℃. After 5 hours of operation, its temperature rises to 65 ℃ and current reduces to 8 A. Calculate:

i. current when temperature is increased to 80 ℃ 4

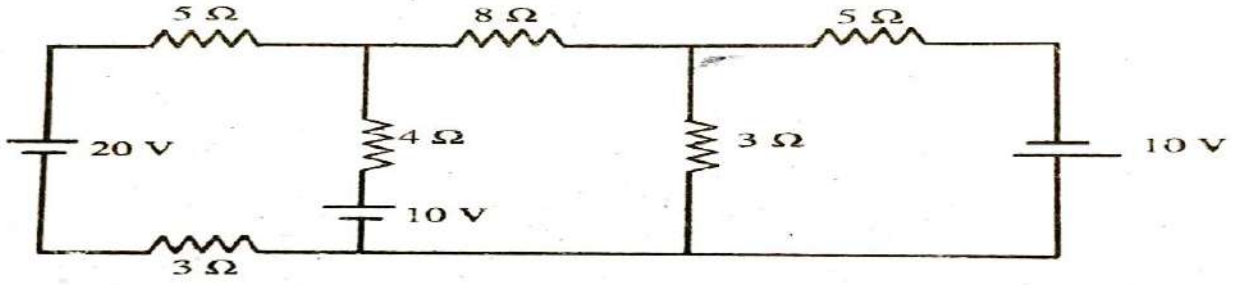
ii. Temperature coefficient of resistance at 30 ℃

OR

b. An aluminium wire 7.5 m long is connected in parallel with a copper wire 6m long. When a current of 5A is passed through the parallel combination, it is found that the current in the aluminium wire is 3A. The diameter of aluminium wire is 1mm. Determine the diameter of copper wire, the resistivity of copper is 0.017 μΩm and that of alumimium is 0.028 μΩm. 4

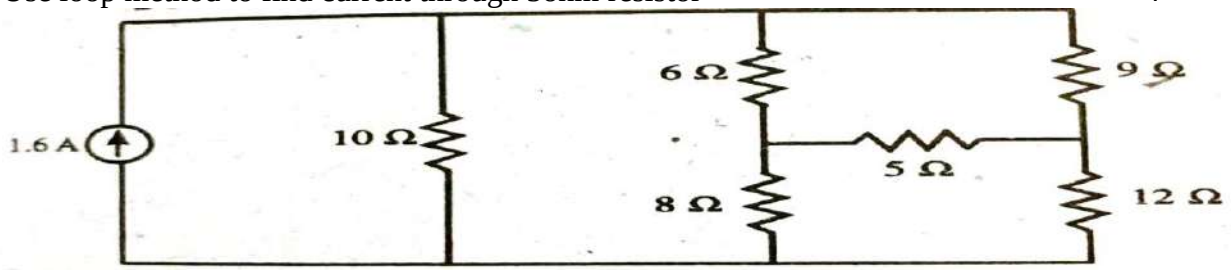
2. a. List the properties of resistance connected in series and obtain the expression for voltage division rule. 2

b. Use Nodal analysis to find the current through 8ohm resistor. 4



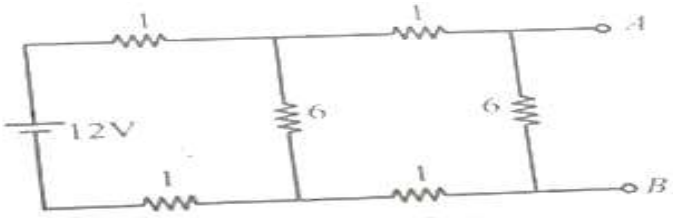
OR

b. Use loop method to find current through 5ohm resistor 4



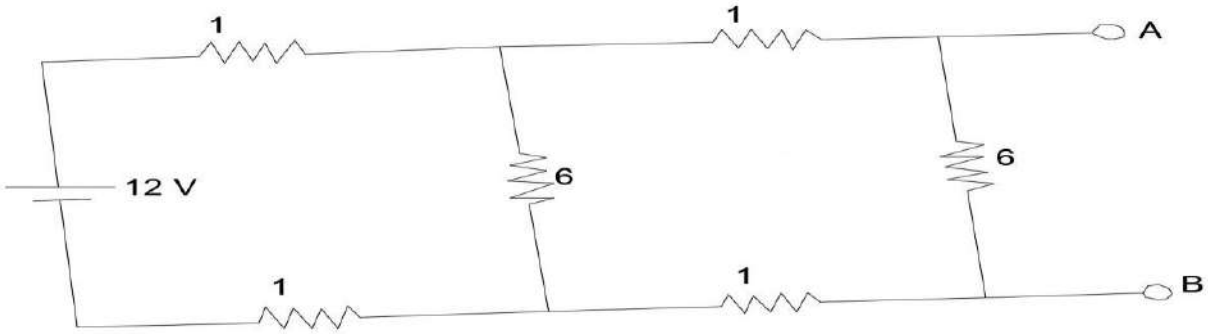
3. a. State and Explain Maximum power transfer theorem. 2

b. Using Thevenin theorem, calculate current through 8ohm resistor of the circuit shown below 4



OR

b. Calculate Current flowing through 2ohm using Superposition theorem



4. a. Derive the expression of energy stored in an inductive coil 2

b. Derive the relationship between voltage and current for a purely inductive circuit excited by ac voltage source and also show that the average power consumed by a purely inductive circuit is zero. 4

OR

b. A circuit of 20ohm resistance in series with capacitance of 200 micro-farad, connected across 50 Hz supply. The current through the circuit is 10.8sin314t A. Determine the voltage across each component and across the circuit. 4

5. a. Explain about series and parallel combination of capacitors 2

b. Derive the expression for impedance and power factor for R-L-C series circuit when AC voltage is applied across it and also draw the phasor diagram 4

OR

b. A series R-L-C circuit having R = 100ohm, L = 0.12 H and C = 28.27 micro-farad is fed from a 100 v, 50 Hz supply. Find the current flowing in the circuit, active and reactive power and draw phasor diagram 4

Engineering Drawing-I

BEG__ME

Year: I **Semester: I**

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

Course Objectives:

To develop basic projection concepts with reference to points, lines, planes and geometrical solids. To develop sketching and drafting skills to facilitate communication.

Course Contents:

1. Instrumental Drawing, Technical Lettering Practices & Techniques **(2 hrs)**

1.1 Equipment and materials; Description of drawing instruments, auxiliary equipment and Drawing materials

1.2 Techniques of Instrumental Drawing, securing paper, proper use of T-squares, triangles, scales, dividers, and compasses, crashing shields, French curves, Inking pens

1.3 Lettering strokes, letter proportions, use of pencils and pens, uniformity and appearance of letters, freehand techniques, inclined and vertical letters and numerals, upper and lower cases, standard English lettering forms

2. Dimensioning **(4 hrs)**

2.1 Fundamentals and Techniques; Size and location dimensioning, SI Conventions. Use of Scales, measurement units, reducing and enlarging drawings

2.2 General Dimensioning practices, placement of dimensions; aligned and unidirectional recommended practice

3. Applied Geometry **(8 hrs)**

3.1 Plane Geometrical construction; Bisecting and trisecting lines and angles, proportional Division of lines, Construction of angles, triangles, square, polygons. Construction using Tangents and circular areas.

3.2 Techniques to reproduce a given drawing (by construction)

3.3 Methods for drawing standard curves such as ellipses, parabolas, hyperbolas, involutes, cycloids, spirals and helices.

4. Basic Descriptive Geometry **(8 hrs)**

4.1 Introduction to Orthographic projection, Principal Planes, Four Quadrant or Angles

4.2 Projection of points on first, second, third and fourth quadrants

4.3 Projection of Lines: Parallel to one of the principal planes, Inclined to one of the principal plane and parallel to other, Inclined to both principal planes
4.4 Projection Planes: Perpendicular to both principal planes, Parallel to one of the principal planes and Inclined to one of the principal planes, perpendicular to other and Inclined to both principal planes
4.5 True length of lines: horizontal, inclined and oblique lines
4.6 Rules for parallel and perpendicular lines
4.7 Point view or end view of a line
4.8 Shortest distance from a point to a line
4.9 Edge View and True shape of an oblique plane
4.10 Angle between two intersecting lines
4.11 Intersection of a line and a plane
4.12 Angle between a line and a plane
4.13 Dihedral angle between two planes
4.14 Shortest distance between two skew lines
4.15 Angle between two non- intersecting (skew) lines

5. Theory of Projection **(2 hrs)**

5.1 Common types of projections- Pictorial (Perspective, Isometric, Oblique) and Orthographic Projection
5.2 System of orthographic projection: 1st angle projection and 3rd angle projection

6. Multi view (Orthographic projection Drawings) **(12 hrs)**

6.1 Principal Views: Methods for obtaining orthographic views, projection of lines, angles and plane surfaces, analysis in three views projection of curved lines and surfaces. Object orientation and selection of views for best representation, Full and hidden lines
6.2 Orthographic Drawings: Making an orthographic drawing, visualizing objects from the given views, Interpretation of adjacent areas, True- length lines, Representation of holes, Conventional practices.

7. Sectional Views **(5 hrs)**

7.1 Full Section, half section, broken section, revolved section, removed (detail) section, phantom or hidden section, auxiliary section views, specifying cutting planes for section, conventions for hidden lines, holes, ribs, spokes

8. Auxiliary Views **(5 hrs)**

8.1 Basic Concept and Use of Auxiliary Views
8.2 Drawing Methods and Types of Auxiliary Views
8.3 Symmetrical and Unilateral Auxiliary Views
8.4 Projection of Curved Lines and Boundaries
8.5 Line of Intersection Between two Planes
8.6 True size and shape of plane surfaces

9. Developments and Intersections **(14 hrs)**

9.1 Introduction and Projection of Solids

9.2 Developments: general concepts and practical considerations, development of a right or oblique prism, cylinder, pyramid, and cone, development of truncated pyramid and cone, Triangulation method for approximately developed surfaces, transition pieces for connecting different shapes, constructing a development using auxiliary views

9.3 Intersections: Intersection of – two cylinders, two prisms, prism and cylinder, a cylinder/prism & a cone, pyramid and prism/cylinder

Practical:

1. Freehand Technical Lettering and Use of Drawing Instruments
2. Dimensioning
3. Geometrical and Projection Drawing
4. Descriptive Geometry
5. Projection and Multi view Drawing
6. Sectional Views
7. Auxiliary views
8. Developments and Intersections

Final Examination Scheme:

Chapters	Marks	Remarks
1, 3	8 to10	
4	4 to 6	
2,5,6,7,8	14 to 16	
9	14	
Total	**40**	

References:

1. French, T., Vierck, C., & Foster, R. (1981). *Engineering Drawing and Graphic Technology.* McGraw Hill.
2. Giesecke, F., Mtichell, A., H.C, S., & Dygdone, J. (1986). *Technical Drawing.* 8th Edition. Macmillan.
3. Luzadder, W. J. (1981). *Fundamentals of Engineering Drawing, Eighth Edition.* Prentice Hall.

Engineering Drawing-I

BEG__ME

Year: I **Semester: I**

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

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4.13 Dihedral angle between two planes
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7.1 Full Section, half section, broken section, revolved section, removed (detail) section, phantom or hidden section, auxiliary section views, specifying cutting planes for section, conventions for hidden lines, holes, ribs, spokes

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8.5 Line of Intersection Between two Planes
8.6 True size and shape of plane surfaces

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9.1 Introduction and Projection of Solids

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9.3 Intersections: Intersection of – two cylinders, two prisms, prism and cylinder, a cylinder/prism & a cone, pyramid and prism/cylinder

Practical:

1. Freehand Technical Lettering and Use of Drawing Instruments
2. Dimensioning
3. Geometrical and Projection Drawing
4. Descriptive Geometry
5. Projection and Multi view Drawing
6. Sectional Views
7. Auxiliary views
8. Developments and Intersections

Final Examination Scheme:

Chapters	Marks	Remarks
1, 3	8 to10	
4	4 to 6	
2,5,6,7,8	14 to 16	
9	14	
Total	**40**	

References:

1. French, T., Vierck, C., & Foster, R. (1981). *Engineering Drawing and Graphic Technology.* McGraw Hill.
2. Giesecke, F., Mtichell, A., H.C, S., & Dygdone, J. (1986). *Technical Drawing.* 8th Edition. Macmillan.
3. Luzadder, W. J. (1981). *Fundamentals of Engineering Drawing, Eighth Edition.* Prentice Hall.