Purbanchal University

Faculty of Engineering

Biratnagar

Second Semester's Course Structure

Program: Bachelor in Electrical Engineering

Effective from 2021 (2078) Batch

Year-I **Semester-II**

S.N	Course code	Subject	Credit hours	L	T	Pr.	Total	Internal		Final		Total
								Th.	Pr.	Th.	Pr.	
1		Mathematics-II	3	3	3	-	6	40		60	-	100
2		Chemistry	3	3	2	2	7	40	10	60	15	125
3		Object Oriented Programming with C++	3	3	2	3	8	40	30	60	20	150
4		Digital Electronics	3	3	1	3	7	40	25	60	-	125
5		Basic Electrical Engineering	3	3	1	2	6	40	25	60	-	125
6		Applied Mechanics	3	3	2	-	5	40	-	60	-	100
		Total	18	18	11	10	39					725

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

Purbanchal University

Program: BE Biomedical/Civil/Computer/Electronics/Electrical/Geomatic

Semester: II

Subject: Mathematics II

Mathematics-II

BEG 02SH

Year: I

Semester: II

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 aim of this course is to provide students a sound knowledge of vector calculus and analytic geometry of 3D to make familiar to the method for testing the convergence of infinite series and give idea to solve differential equations through theoretical explanations and problem solving techniques.

Micro-Syllabus:

Analytic Geometry of 3-D **[12 hrs]**

1.1 Coordinates in space: Cartesian, cylindrical and Spherical systems, and equations relating to these coordinates, direction ratios and cosines angle between two lines.

1.2 Plane: Intercept and normal form of plane, angle between two planes, a plane through three points, plane through the intersection of two planes.

1.3 Straight lines: Equations of a line in general and symmetrical forms, angle between two lines, coplanar lines, intersecting lines, shortest distance between two skew lines.

1.4 Sphere: Equation of Sphere in standard and general forms, plane section of sphere cut by a plane, tangent plane.

1.5 Cone and Cylinder (Right Circular Case)

2. Plane Curves and Polar Coordinates **[6 hrs]**

2.1 Polar Equation of Conic Section and their sketching

2.2 Area arc length, surface area and volume of parametric and polar curves

3. Infinite Series **[6 hrs]**

3.1 Tests for convergence: Cauchy principle, P-test, limit comparison test, ratio test, root test and integral test.

3.2 Alternating series: Absolutely convergent and conditionally convergent.

3.3 Power Series: Interval of convergence and radius of convergence

4. Vector Calculus **[7 hrs]**

4.1 Differentiation of vector functions.

4.2 Integration of vector function.

4.3 Gradient, divergence, curl and directional derivatives.

5. Differential Equation **[14 hrs]**

5.1 First order first degree differential equations: Variable separation method, change of variable, homogeneous differential equations, reducible to homogeneous forms, linear differential equations, Bernoulli's equations, exact differential equations

5.2 First order higher degree differential equations: the equation of the form f(x,y,p) = 0 where $p = \frac{dy}{dx}$; solvable for p, x and y, Clairaut's form.

5.3 Second order differential equations: Linear differential equation with constant coefficients and Cauchy's homogeneous linear equations.

5.4 Applications of ordinary differential equations in engineering fields (*SEC. 2.9 Modeling: Electric Circuits and related numerical problem from Erwin Kreyszig Advance Engineering Mathematics 10th edition*)

5.5 Initial value problems.

5.6 Non-homogeneous Equations.

5.7 Solution of differential equations in series form

5.8 Legendre's equation (Statement only), Bessel's equation (without proof), Bessel's function (without proof) and recurrence relations.

Marks Distributions

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	Analytic Geometry of 3-D	2	3	5
2	Plane Curves and Polar Coordinates	1	1	2
3	Infinite Series	2	1	3
4	Vector Calculus	1	2	3
5	Differential Equation	4	3	7
Total		10	10	20

Note:

- One long question and one short question from 1.1 to 1.2; one long and one short question from 1.3; one long with "OR" questions from 1.4 to 1.5
- One long question with "OR" and one short question from 2.1 to 2.2.
- Two short questions from 3.1 to 3.2.; one long question from 3.3
- One long question from 4.1 to 4.2.; one long question with "OR" and one short question from 4.3.
- One long question and one short question from 5.1; one short question from 5.2; two long questions with "OR" and two short questions from 5.3 to 5.8.

PURBANCHAL UNIVERSITY

II SEMESTER (MODEL QUESTION)

Level: Bachelor
Program: BE Biomedical/Civil/Computer/Electronics/Electrical/Geomatic)
Semester: II

FULL MARKS:- 60

TIME:- 03:00 hrs.

PASS MARKS:- 24

Group A

Attempt all questions. **[10 x 2 = 20]**

1. Find the cylindrical co-ordinates of the point having Cartesian co-ordinate $(1, 0, 1)$.
2. Find the point where the line $\frac{x}{2} = \frac{y}{3} = \frac{z}{1}$ meets the plane $x - 2y + z = 0$.
3. Find the area of the polar curve $r^2 = 4cos2\theta$.
4. Test the convergence of the series $\sum \frac{1}{n^2+n}$.
5. Test the convergence of the series $\sum ne^n$ by using integral test.
6. Find the unit vector normal to the surface $z = x^2 + y^2$ at the point $(1, 2, -5)$.
7. Solve: $(1 + x^2)dy = (1 + y^2)dx$.
8. Find the general solution of $y'' + 4y' + 4 = 0$.
9. Find particular integral of $(D^2 - 4)y = e^{-x}$.
10. Solve: $p^2 - 7p + 12 = 0$.

Group: B

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

11. Find the equation of plane through the intersection of planes $x + 2y + z = 3$ and $2x - 3y + 4z = 5$ and perpendicular to the plane $x + y - z = 0$.
12. Show that the lines $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ and $\frac{x-2}{3} = \frac{y-3}{4} = \frac{z-4}{5}$ are co-planar. Also find the equation of plane in which they lie.

13. Find the equation of sphere for which the circle $x^2 + y^2 + z^2 - 2x + 3y + z = 2, x - y + 2z = 0$ is a great circle.

OR

Find the equation of cone whose vertex is (α, β, γ) and the base $y^2 = 4ax, z = 0$.

14. Derive the polar equation of conic, the focus being at the pole.

OR

Find the area of the closed curve: $r = a(1 + cos\theta)$.

15. Find the center, radius and interval of convergence of the power series $\sum \frac{(-1)^n x^n}{n(n+1)}$.

16. Prove that the necessary and sufficient condition for a vector function $\vec{r}$ of scalar variable t to have constant magnitude is that $\vec{r}.\frac{d\vec{r}}{dt} = 0$.

17. Find the value of 'n' so that the vector $r^n\vec{r}$ is solenoidal.

OR

If $\vec{r} = x\vec{i} + y\vec{j} + z\vec{k}$ and $\vec{a}$ is a constant vector, prove that

$$\nabla \times \left(\frac{\vec{a} \times \vec{r}}{r^3}\right) = -\frac{\vec{a}}{r^3} + \frac{3(\vec{a}.\vec{r})}{r^5}\vec{r}$$

18. Solve: $\frac{1}{y}\frac{dy}{dx} + 1 = xy$.

19. Solve; $(D^2 - 2D + 1)y = x^2e^{3x}$.

20. Solve the differential equation by power series method: $y'' - y = x$.

OR

Prove the Bessel's function: $J_0'(x) = -J_1(x)$.

Purbanchal Universitv

Course Title: Chemistry
Course no: BEG
Credit hours: 3
Semester: II
Nature of course: Theory (3 Hrs.) + Lab (2 Hrs.)

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

Program: BE Biomedical/Computer/Electrical/Electronics Communication and Automation

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: **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 is expected from unit 9

PURBANCHAL UNIVERSITY
SEMESTER FINAL EXAMINATION 2022

Program: BE Biomedical/Computer/Electrical/Electronics Comm. & Automation

LEVEL:- **Bachelor** **Semester: II**
SUBJECT:- BE ---- **SH** 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]**

PURBANCHAL UNIVERSITY

Faculty of Engineering

Object Oriented Programming with C++

Full Marks: 60

Program: BE Computer/Electrical/Electronics Communication & Automation

Credit hours: 3

Pass Marks: 24

Year: I

Semester: II

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal		Final		Total
			Theory	Practical	Theory	Practical	
3	2	3	40	30	60	20	150

Duration: 3 hours

Course Objective: This course introduces the fundamental concepts of Object Oriented Programming constructs in C++.

Goals: This course provides a thorough understanding of the fundamentals of object-oriented 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.

Lesson Plan

Chapter	Course content-breakdown	Lecture Hours	Remarks
I	**Introduction to Object Oriented Programming** 1.1 Introduction • *Introduction of OOP and POP* • *Organization of data and function in OOP & POP* • *Characteristics of OOP and POP* 1.2 Procedural Oriented Programming vs. Object Oriented Programming 1.3 Features of OOP 1.3.1 Objects 1.3.2 Classes 1.3.3 Data Abstraction 1.3.4 Data Encapsulation 1.3.5 Inheritance 1.3.6 Polymorphism 1.3.7 Dynamic Binding 1.3.8 Message Passing	3 hrs.	

	1.4 Application and Benefits of using OOP		
2	**Basic Syntax of C++** • *Introduction to C++* • *General structure of C++ program* 2.1 Derived Types • *Data type* o *Built-in* o *Derived* o *User-defined* 2.2 new and delete operator 2.3 const 2.4 Enumeration 2.5 Reference Variables *2.6 Scope resolution operator* *2.7 Manipulators (setw(), setprecision(), setfill(), endl)* 2.8 *Type conversion (automatic and type cast)*	2 hrs.	
3	**Functions in C++** 3.1 Inline function • *Definition* • *Advantages and disadvantages* • *Example* 3.2 Function Overloading • *Definition* • *Advantages and disadvantages* • *Example* 3.3 Default arguments • *Definition* • *Advantages and disadvantages* • *Example*	3 hrs.	
4	**Classes and Objects** 4.1 Introduction 4.2 Visibility Modes (public, private, protected) 4.3 Defining class members • *Data members and member functions* • *Defining and accessing member functions* 4.4 Static class members • *Static data member* • *Static member function* • *Accessing static members* 4.5 Passing and Returning objects 4.6 'this' pointer • *Definition* • *Example*	5 hrs.	

5	**Friend Function** • *Introduction* • *Friend function vs Member function* • *Advantages and disadvantages of friend function* 5.1 Making non member function as a friend of the classes 5.2 Making member function of one class as friend of another classes 5.3 Friend Class	4 hrs.	
6	**Constructor and Destructor** 6.1 Constructor 6.2 Characteristics of Constructor 6.3 Types of Constructor (Default, Parameterized, Copy Constructor) • *Constructor overloading* 6.4 Destructor 6.5 Characteristics of Destructor 6.6 Constructor vs. Destructor	4 hrs.	
7	**Operator Overloading** 7.1 Introduction • *Restrictions of operator overloading* • *Operator function as a member function* 7.2 Rules for Operator Overloading 7.3 Overloading Unary and Binary Operators 7.4 Overloading using Friend function 7.5 Type Conversion 7.5.1 Conversion between objects and basic types • *Object to basic type* • *Basic type to object* 7.5.2 Conversion between objects of different types	5 hrs.	
8	**Inheritance** 8.1 Introduction 8.2 Base classes and Derived classes 8.3 Forms of inheritance (Single, Multiple, Multilevel, Hierarchical, Hybrid) 8.4 Types of Inheritance (private, protected and public type derivation) 8.5 Overriding Function 8.6 Casting Base class Pointer to Derived class pointer 8.7 Virtual Base Class 8.8 Constructor and Destructor in Derived classes 8.9 Benefits of Inheritance	5 hrs.	
9	**Polymorphism** 9.1 Introduction	4 hrs.	

	• *Role of polymorphism* 9.2 Early vs. Late Binding 9.3 Virtual function • *Introduction & characteristics* • *Example* 9.4 Pure Virtual function • *Introduction* • *Example* 9.5 Abstract class • *Introduction* • *Example*		
10	**File handling** • Introduction 10.1 Stream class hierarchy 10.2 Opening and Closing a file • *Opening file using open()* • *Opening file using constructor* 10.3 File input / output 10.4 File modes 10.5 File Pointers 10.6 Error Handling Functions during File operation • *Common problems that lead to error during file operations* • *Error handling functions:* o *good()* o *bad()* o *fail()* o *eof()*	5 hrs.	
11	**Advanced C++ topics** 11.1 Template 11.1.1 Introduction 11.1.2 Class and Function Template • *Introduction* • *Example* 11.1.3 Standard Template Library (STL) • *Introduction (container, algorithm, iterator)* 11.2 Namespace 11.2.1 Introduction • *Introduction to namespace* • *Uses* 11.2.2 Defining Namespace • *Using directives* • *Using declaration* • *Example* 11.3 Exceptions 11.3.1 Introduction 11.3.2 Exception Handling Mechanism	5 hrs.	

	11.3.3 Exception Handling Construct: try, throw, catch • *Introduction* • *Example* 11.4Creating Header files • *Sample program for creating header file*		

Assignments:

Assignment should be given for each chapter.

Laboratory Work:

There shall be lab exercises covering concepts mentioned in syllabus of Object-oriented programming with C++.

Marks Distribution:

Chapters	Tentative marks Distribution
Chapter 1	4+2
Chapter 2	
Chapter 3	4
Chapter 4	4+2
Chapter 5	4
Chapter 6	4+2
Chapter 7	8
Chapter 8	8
Chapter 9	4
Chapter 10	8
Chapter 11	4+2
Total	60

Text Books:

1. Rober Lafore, "Object- Oriented programming in C++", Galgotia Publications India
2. Dietel & Deitel, "C++ How to Program", Prentice Hall
3. Navajyoti Barkakati, "Object- Oriented Programming in C++", Prentice Hall
4. Venugopal, Rajkumar & Ravishankar,"Mastering C++", Tata McGraw Hill Publication
5. E. Balagurusamy, "Object Oriented Programming in C++ ", Tata McGraw Hill, 2nd Edition.
6. Pohl, Ira,"Object Oriented Programming using C++", Pearson education
7. Jain, V.K,"C++ Object Oriented Programming", Cybertech Publications
8. Gaddish, Tony,"Object Oriented Programming in C++", Dreamtech Press

Model Question
PURBANCHAL UNIVERSITY

B.E Computer/Electronics/Electrical
Time: 3:00 hrs. Full Marks: 60/Pass Marks: 24
BE …: Object Oriented Programming with C++
Semester: II

Very short (4*2=8) **Attempt All Questions**

1. Define data abstraction and Encapsulation.
2. What do you mean 'this' pointer?
3. Differentiate between constructor and destructor.
4. Define namespace and describe their usages.

Short (7*4=28) **Attempt any Seven Questions**

1. What is reference variable? Illustrate with suitable program.
2. Define function overloading. Write a program to calculate the area of circle, rectangle and triangle using function overloading
3. How object is passed with member function? Illustrate with suitable example
4. Define friend function. Discuss its advantage and disadvantage
5. Write a program that illustrate the order of execution of constructor and destructor
6. Define pure virtual function and abstract class. Differentiate between early verses late binding
7. Write is generic programming? Write a program to input 5 numbers and print the largest number using template function.
8. Differentiate between static and non static data members with an example.

Long (3*8=24) **Answer any Three Questions**

1. Explain the rule of operator overloading. Write a program to convert feet and inch into meter and centimeter using one class type to another class type
2. Define a class student with data member name, roll, mark with appropriate member function to input the information and display the information. Derive a class examination with member mark1, mark2, mark3 and member function to read the marks of students. Write a program to display the total mark with their information. Use appropriate member function
3. What is file pointer? Write a program to read the name, age and salary of 10 employees and store them in file. Read and display the information of employees whose salary is greater than 50000.
4. **Write a program using function template to sort N numbers in an array of type int and float in ascending order.**

PURBANCHAL UNIVERSITY

Subject: BE--- Digital Electronics
Semester: II

Full Marks: 60

Program: BE Biomedical/Electrical/Electronics Communication & Automation
Credit hours: 3

Pass Marks: 024

Nature of course: Theory (3 Hours), Tutorial (1 Hour) and Practical (3 Hours)
Course Objective: To introduce students about fundamental of digital electronics, digital computer design and digital devices.

Lesson Plan

Chapter	Course content-breakdown	Lecture Hours	Remarks
1	**Binary System** 1.1 Digital System • Definition and examples 1.2 Advantages of digital system over analog system Comparison 1.3 Number System Decimal, binary, octal, hexadecimal 1.4 Number base conversion Converting from one number system to another 1.5 Complements • r's complement (10's and 2's) and (r-1)'s complement (9's and 1's) • Subtraction using r's and (r-1)'s complement • Debugging process • Testing with types (White box and Black box) 1.6 Binary codes and its types • Definition, BCD, Excess- 3, gray and alphanumeric codes	5 hrs.	
	1.7 Integrated Circuits		

	Definition 1.8 Introduction to 7400 ICs		
2	**Boolean Algebra** 2.1 Basic definition 2.2 Functions of boolean algebra 2.3 Logical operators • AND, OR, NOT 2.4 Rules of Boolean algebra 2.5 Theorems of Boolean algebra De- Morgan's law, Duality theorem, commutative law, associative law, distributive law 2.6 Minterms and Maxterm 2.7 Standard, Non- standard and canonical form	3 hrs.	
3	**Logic Gates** 3.1 Basic gates Definition, symbols, truth table, Boolean function 3.2 Universal gates Definition, symbols, truth table, Boolean function	4 hrs.	
	3.3 Derived gates Definition, X- OR, X- NOR		
4	**Karnaugh Map** 4.1 Simplification of Boolean functions using K map 2,3 and 4 variable 4.2 Don't Care Condition	5 hrs.	

5	**Combinational Logic Circuits** 5.1 Definition, design procedure 5.2 Adders Half adder and full adder 5.3 Subtractor Half subtractor and full subtractor 5.4 Code convertor Definition, BCD to Excess- 3, binary to Gray, Gray to binary 5.5 Analysis procedure	5 hrs.	
6	**Combinational Logic With MSI And LSI** 6.1 Binary parallel adder 4- bit binary parallel adder 6.2 Adder/ subtractor 4- bit adder subtractor 6.3 Decimal adder Definition, BCD Adder 6.4 Magnitude Comparator Definition, 4- bit magnitude comparator 6.5 Encoder Definition, Octal to Binary Encoder 6.6 Decoder Definition,3x8 decoder, implementation of larger decoders from small decoders 6.7 Multiplexers Definition, 4x1 MUX, implementation of larger MUX using smaller MUX 6.8 Read Only Memory (ROM) Definition of PROM, EPROM,EEPROM 6.9 Programmable logic device (PLD) (PLA and PAL)	8 hrs.	
7	Sequential Logic Circuits 7.1 Latch and Flip Flop Basic latch, types of flip flop (RS, D,T,JK) , Conversion between flip flops 7.2 Triggering of flip flop Level triggering, edge triggering 7.3 Analysis of clocked sequential circuits 7.4 Design Procedure Design of sequential circuits 7.5 Design with state equation (using D and JK)	8 hrs.	

8	**Registers and Counters** 8.1 Registers, shift registers Serial in Serial Out, Serial in parallel out, Parallel in parallel out and parallel in serial out 8.2 Counters Definition, Ripple counters, Synchronous counter	7 hrs.	

Laboratory:

1. Familiarization with logic gates
2. De Morgan's law
3. Half adder and full adder
4. Half subtractor and full subtractor
5. Decoder2x4, 4x2 Encoder
6. Multiplexer 4x1
7. Latch, D flip flop
8. Registers
9. Ripple Counters
10. Simulation using suitable software.

Assignments:

Assignment should be given for each chapter.

References:

1. M.Morris Mano," Digital logic and computer design ", Pearson Education
2. Thomas L. Floyd, " Digital Fundamentals", 9th edition
3. William I. Fletcher," An Engineering Approach To Digital Design", Prentice Hall of India, New Delhi, 1990.
4. A. P. Malvino, Jerald A. Brown, " Digital Computer Electronics", 1995.

Model Question
PURBANCHAL UNIVERSITY

Program: BE Biomedical/Electrical/Electronics Communication & Automation

Time: 3:00 hrs. Full Marks: 60/Pass Marks: 24

BEG……EC : Digital Electronics

Semester: II

GROUP-A

4x2=8

1. What are the advantages of digital signal over analog signal?
2. Write De Morgan law's.
3. Define minterm and maxterm
4. Why NAND and NOR gates are called universal gates?.

GROUP-B

7X4=28

5. (a) $(101.1101)_2 = (?)_{10}$, $(2A5.D)_{16} = (?)_8$
   (b) Subtract 1101 from 1001 by using 2's complement.
6. Define and design X-OR and NAND gates.
7. Design basic gates using NOR gates.
8. Simplify the function F(A,B,C,D) = **Σ(0,2,5,7,8,10,13,15)**.
9. **D**esign Full Adder by using two half adders and OR gate.
10. Implement 8x1 MUX using 4x1 MUX
11. Explain the working of RS flip flop by using NAND gate.

GROUP-C

3X8=24

12. What is magnitude comparator? Design and explain 4 bit magnitude comparator.
13. Design a sequential circuit with JK flip flops to satisfy the following state equations:
    A (t+1) = A'B'CD + A'B'C + ACD + AC'D'
    C (t + 1) = B
14. Differentiate between ripple and synchronous counter. Design 3 bit synchronous counter.

Best of Luck

Question pattern:

Chapter	Hours	Tentative Marks Distribution
1	5	6
2	3	8
3	4	6
4	5	4
5	5	4
6	8	12
7	8	12
8	7	8

Purbanchal University

Subject: BASIC ELECTRICAL ENGINEERING

Program: BE Computer/Electrical/Electronics Communication & Automation

Year: I **Semester: II**

Teaching Schedule Hours/Works			Examination Scheme				
L	Pr.	T	Final		Internal Assessment		Total
3	2	1	Theory	Practical	Theory	Practical	
			60	-	40	25	125

Duration: 3 Hours

Course Objectives: This course serves as the foundation course on Basic Electrical Engineering. After the completion of this course, students will be able to Analyze A.C.&D.C. Electric Circuits.

1. Dc Circuit Analysis **(11 hrs)**

1.1 Concept of electric charge and current Ohm's law its application and limitation
1.2 Electric circuit elements.
1.3 Resistance inductance and capacitance, their functional behavior, constructional features, Mathematical descriptions
1.4 Introduction to voltage source and current source
1.5 Series and parallel connection of resistors
1.6 Series and parallel connection of sources effect of their internal resistance on the circuit characteristics
1.7 Star/ delta transformation
1.8 Power and energy in D.C. circuit

2. Circuit Analysis **(16 hrs)**

2.1 Kirchoff's laws- current law and voltage law, application, limitations Superposition theorem reciprocity theorem
2.2 Nodal analysis of electric circuit
2.3 Superposition theorem
2.4 Thevenin's theorem
2.5 Norton's theorem
2.6 Reciprocity theorem
2.7 Maximum power transfer theorem

3. AC Circuit **(10 hrs)**

3.1 Faraday's law of Electro Magnetic induction, Generation of sinusoidal alternating emf, terminologies used in A.C. circuit.
3.2 Sinusoidal A.C., emf, phasor representation of A.C., j-operator and its use in A.C. circuit.
3.3 R,L and C excited by A.C. source, R-L, R-C, R-L-C series circuits, parallel A.C. circuit, Resonance in series and parallel R-L-C circuit, construction of phasor diagrams (vector diagrams)
3.4 Power and Power factor factor in A.C. circuit

4. Three Phase A.C. Circuit **(10 hrs)**

4.1 Generation of three phase A.C. emf wave form representation, use of j-operator star and delta connection of source and load, line voltage and line current, phase voltage and phase current, balanced three phase system, calculation of current and voltage, measurement of power, three phase four wire system.

Laboratory:

1. Basic electrical measurements and verification of ohms law.
2. Series and parallel connection of resistors, verification of Kirchoff's laws
3. Measurement of power in DC, Circuit using Wattmeter.
4. Measurement of power in single phase ac circuit using wattmeter.
5. Measurement of rms value, amplitude value, power factor by using oscilloscope.
6. Measurement of power in three phase ac circuit
7. Series, resonance and parallel resonance

References:

1. S.N.Tiwari And A.S.Gin Saarror, "A First Course In Electrical Engineering", A.H.Wheeler & Co. Ltd. Allahabad, India.
2. B.L. Thereja And A.K. Thereja, "A Text Book Of Electrical Technology" S.Chand & Co. Ltd., New Delhi, India
3. V. Del Toro, "Principles of Electrical Engineering" , Prentice Hall Of India, Ltd. New Delhi
4. I.J. Nagrath, "Basic Electrical Engineering" , Tata McGraw Hall, New Delhi
5. P.S. Bhimbra, "Electric Machinery", Khanna Publishers, New Delhi

Purbanchal University

Program: BE Computer/Electrical
Subject: BE---CI Applied Mechanics

Applied Mechanics
BEG___CI

Year: I **Semester: II**

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

Course Objective:

The purpose of the course is to provide basic knowledge of engineering mechanics to the students so that it would be helpful for them to understand structural engineering principles in later courses or to use basics of mechanics in their branch of engineering.

Course Contents:

1. Introduction **(3 hrs)**

- 1.1 Definitions and scope of applied mechanics
- 1.2 Concept of rigid and deformed bodies
- 1.3 Fundamental concepts and principles of mechanics
- 1.4 Concept of particles and free body diagram
- 1.5 Equation of equilibrium in two dimension
- 1.6 Vector concept

2. Forces **(10 hrs)**

- 2.1 Definition and principles of forces
- 2.2 Types of forces (coplanar, collinear, concurrent, parallel, external and internal forces)
- 2.3 Principle of transmissibility and equivalent forces
- 2.4 Resolution and composition of forces
- 2.5 Lami's theorem, Varignon's theorem, triangle, parallelogram and polygon law of forces
- 2.6 Moment of forces about a point and axis (in scalar and vector form)
- 2.7 Definition of couple and proof of it as a free vector
- 2.8 Resolution of force into force and a couple and vice versa
- 2.9 Resultant of a system of forces. (parallel, coplanar, concurrent and general)

3. Distributed Forces **(6 hrs)**

- 3.1 Definition and derivation of center of gravity and centroid (composite figure and direct Integration method)
- 3.2 Definition of second moment of area (moment of Inertia) and radius of gyration
- 3.3 Parallel and perpendicular axis theorem
- 3.4 Calculation of MOI (built up section and by direct integration method)

4. Friction **(4 hrs)**

- 4.1 Introduction (definition, types, cause and effect)
- 4.2 Laws of dry friction
- 4.3 Static friction, co-efficient of friction and angle friction
- 4.4 Condition of sliding or tipping
- 4.5 Application to static problems

5. Kinematics of Particles **(8 hrs)**

- 5.1 Position, velocity and acceleration
- 5.2 Rectilinear and curvilinear motion
- 5.3 Uniformly accelerated rectilinear motion
- 5.4 Rectangular components of velocity and acceleration
- 5.5 Tangential and normal components of velocity and acceleration
- 5.6 Radial and transverse components of velocity and acceleration

6. Kinetics of Particles: Force and Acceleration **(6 hrs)**

- 6.1 Newton's second law of motion
- 6.2 Linear momentum and rate of change
- 6.3 Equation of motion and dynamic equilibrium
- 6.4 Angular momentum and rate of change
- 6.5 Equation of motion-rectilinear and curvilinear
- 6.6 Projectile motion

7. Kinetics of Particles: Energy and Momentum **(8 hrs)**

- 7.1 Work done by a force
- 7.2 Potential and kinetic energy of a particle
- 7.3 Principle of work and energy
- 7.4 Power and efficiency
- 7.5 Conservation of energy
- 7.6 Principle of impulse and momentum
- 7.7 Impulsive motion and impact

Final Examination Scheme:

Chapters	Marks	Remarks
1	4	Th
2	14	Th+Nu
3	8	Th+Nu
4	6	Th/Nu
5	10	Th+Nu
6	8	Th+Nu
7	10	Th+Nu
Total	**60**	

References:

1. Beer F.P., and Johnston, E.R. (1987). *Mechanics for Engineers-Statics and Dynamics.* 4th edition, Mcgraw-Hill
2. Hibbeler, R.C, and 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.

Applied Mechanics
BEG___CI

Year: I **Semester: II**

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

Course Objective:

This course has been developed to provide the basic knowledge of engineering mechanics where in laws of physics are applied to solve engineering problems.

Detailed Course Contents:

Ch. No.	Topic		Subtopic	Depth							Hour	Remarks
				D	De	Dr	I	A	Ex	Nu		
1	Introduction	1.1	Definitions & scope of applied mechanics	✓					✓		3	
		1.2	Concept of rigid & deformed bodies	✓					✓			
		1.3	Fundamental concepts & principles of mechanics	✓				✓				
		1.4	Concept of particles & free body diagram	✓			✓		✓			
		1.5	Equation of equilibrium in two dimension		✓							
		1.6	Vector concept	✓				✓				
2	Forces	2.1	Definition & principles of forces	✓							10	
		2.2	Types of forces (coplanar, collinear, concurrent, parallel, external & internal forces)	✓			✓		✓			
		2.3	Principle of transmissibility & equivalent forces	✓	✓		✓		✓			
		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 (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 & volumes	✓		✓	✓			✓		
		3.3	Definition of second moment of area (moment of Inertia) & radius of gyration	✓	✓		✓			✓		
		3.4	Parallel & perpendicular axis theorem	✓		✓	✓					
		3.5	Calculation of MOI (built up section & 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	Kinematics of Particles	5.1	Position, velocity & acceleration		✓					✓	8	
		5.2	Rectilinear & curvilinear motion			✓				✓		
		5.3	Uniformly accelerated rectilinear motion			✓				✓		
		5.4	Rectangular components of velocity & acceleration			✓						
		5.5	Tangential & normal components of velocity & acceleration			✓				✓		
		5.6	Radial & transverse components of velocity & acceleration			✓				✓		
		5.6	Projectile motion	✓		✓				✓		

6	Kinetics of Particles: Force & Acceleration	6.1	Newton's second law of motion	✓	✓						6	
		6.2	Linear momentum & rate of change	✓		✓						
		6.3	Equation of motion & dynamic equilibrium	✓	✓		✓					
		6.4	Angular momentum & rate of change	✓		✓				✓		
		6.5	Equation of motion-rectilinear & curvilinear	✓		✓				✓		
7	Kinetics of Particles: Energy & Momentum	7.1	Work done by a force	✓		✓					8	
		7.2	Potential & kinetic energy of a particle	✓		✓						
		7.3	Principle of work & energy	✓		✓		✓		✓		
		7.4	Power & efficiency	✓								
		7.5	Conservation of energy	✓		✓				✓		
		7.6	Principle of impulse & momentum	✓		✓				✓		
		7.7	Impulsive motion & impact	✓		✓				✓		
Note: Define (D), Description (De), Derive (Dr), Illustration (I), Application (A), Explanation (Ex), Numerical (N)												

Final Examination Scheme:

Chapters	Marks	Remarks
1	4	Th
2	14	Th+Nu
3	8	Th+Nu
4	6	Th/Nu
5	10	Th+Nu
6	8	Th+Nu
7	10	Th+Nu
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 & Dynamics.* 4th edition, Mcgraw-Hill.
2. Hibbeler, R.C., & Gupta, A. (2009). *Engineering Mechanics-Statics & Dynamics.* 11th edition. Pearson Education.
3. Shames, I.H. (1990). *Engineering Mechanics-Statics & Dynamics*. 3rd edition. Prentice Hall of India.

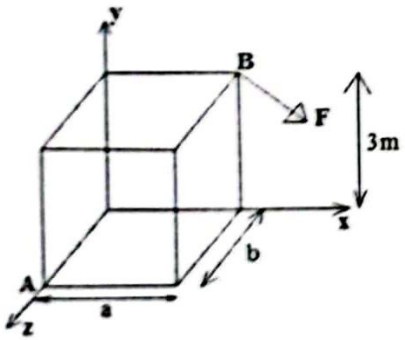
PURBANCHAL UNIVERSITY
I SEMESTER FINAL EXAMINATION – 2022 (MODEL QUESTION)

LEVEL: Bachelor Program: BE Comuter/Electrical
SUBJECT: Applied Mechanics
YEAR/ SEMESTER: I/II FULL MARKS: 60
TIME: 03:00 hrs. PASS MARKS: 24

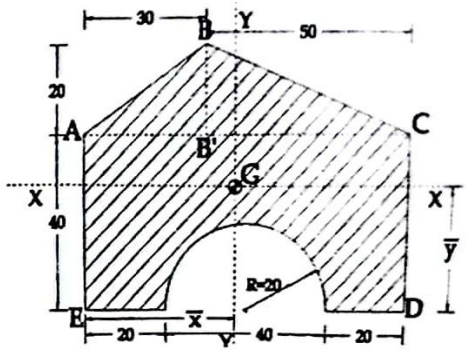
Attempt all questions

1. Explain statically determinant & indeterminate structure with example. [4]

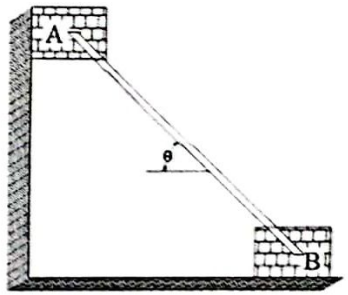
2.
   a. Show that couple is a free vector. [4]
   b. The moment of the force $\vec{F}$=(3i-4j-5k) acting at B about point A is given by $\vec{M}$= (-3i+19j-17k). Determine the dimension 'a' & 'b' of the rectangular box. [10]



3.
   a. Proof parallel axis theorem. [2]
   b. Find the centroid & determine the moment of inertia about its centroidal axes for the given shaded portion of the figure given below. [2+4]



4. Two identical blocks, A along the vertical wall & B on the floor are kept stationary with the help of connected struts, as in figure If sliding impends when θ = 45°, determine the coefficient of friction, assuming it to be same at both the floor & the wall. [6]

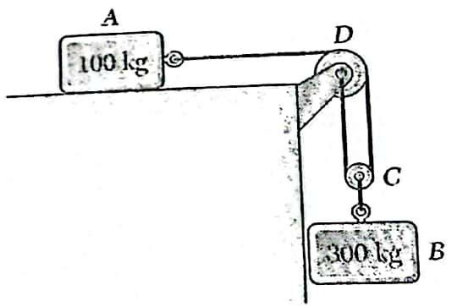


5.
   a. Ball 'A' is released from rest at a height of 20m. After 1 second, a second ball 'B' is thrown upward from the ground. If the two balls pass one another at a height of 6m, Determine
      i. Speed at which the ball B was thrown upward.
      ii. Speed of each ball when they pass. [6]
   b. Derive the expression for velocity and acceleration of a particle in tangential and normal component system when the particle is moving along a curvilinear path. [4]

6.

a. Describe conservation of angular momentum gets conserved when particle moves under central force. [2]

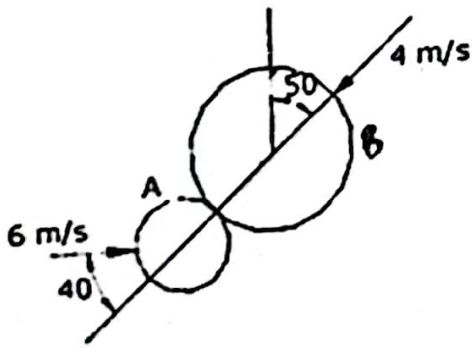
b. The two blocks shown in fig. start from rest. The horizontal plane and pulleys is assumed to be of negligible mass. Determine the acceleration of each block and the tension in each cord. [6]



7.

a. Illustrate principle of conservation of energy of a particle with an appropriate example. [4]

b. The initial velocities and their directions of the balls are as shown in figure. Determine the final velocities and the direction after impact. Take e= 0.8. Mass of ball A = 600g, mass of Ball B= 1 Kg. [6]



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