Purbanchal University

Faculty of Engineering

Biratnagar, Nepal

Third Semester's Course Structure

Program: Bachelor in Computer Engineering

Effective from 2021 (2078) Batch

Year-II **Semester-III**

S.N.	Course code	Subject	Credit Hours	L	T	P	Total	Internal		Final		Total
								Th.	P	Th.	P	
1		Mathematics-III	3	3	3	-	6	40		60	-	100
2		Data Structure and Algorithm	3	3	1	3	7	40	30	60	20	150
3		Object Oriented Analysis and Design	3	3	1	-	4	40	--	60	-	100
4		Computer Graphics	3	3	1	3	7	40	30	60	20	150
5		Electronic Devices and Circuits	3	3	1	2	6	40	25	60	-	125
6		Applied Sociology	2	2	1	-	3	20	-	30	-	50
7		Project I	3	1	-	3	4	-	60	-	40	100
		Total	20	18	8	11	37					775

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

Purbanchal University

Faculty of Engineering, Biratnagar, Nepal

Syllabus

Level: Bachelor

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

Subject: BSH---- MATHEMATICS III

Year: II **Semester: III**

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

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

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

1. Determinants and Matrices **11 Hrs**

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

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

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

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

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

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

2. Laplace Transform **10 Hrs**

2.1 Introduction

2.2 Laplace Transforms of elementary functions

2.3 Properties of Laplace Transform

2.4 Inverse Laplace transforms

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

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

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

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

3.2 Surface Integrals: Introduction, evaluation, application as flux

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

3.4 Integral Theorems

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

4. Fourier Series **6 Hrs**

4.1 Introduction, Periodic Functions, odd and even functions

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

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

4.4 Parseval's Formula

5. Linear Programming Problem **5 Hrs**

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

5.2 Big-M Method and Two Phase Method

Text Book

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

Evaluation Scheme

Internal Assessment: 40

Final Examination: 60

Chapter-wise Marks Division for Final Exam

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

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

Sample Question Paper

PURWANCHAL UNIVERSITY
3rd SEMESTER (NEW)

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

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

Full marks- 60
Pass marks- 24

GROUP -A

Answer all the questions: [10X2 = 20]

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

GROUP – B

Answer all questions (4 X 10 = 40)

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

    Or

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

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

    Or

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

    Or

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

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

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Purbanchal University

Faculty of Engineering, Biratnagar, Nepal

Syllabus

Level: Bachelor

Program: Bachelor in Computer Engineering

Subject: BCE---- DATA STRUCTURE AND ALGORITHM

Year: II **Semester: III**

Teaching Schedule Hours/Week					Examination Schedule						Total Marks
					Final				Internal Assessment		
					Theory		Practical		Theory Marks	Practical Marks	
Credit Hours	L	T	P	Total	Duration	Marks	Duration	Marks	40	30	150
3	3	1	3	7	3 Hrs.	60	-	20			

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

Course Description: This course introduces the fundamental concepts of data structure and algorithm. It covers the concepts as well as implementation of various data structures, sorting and searching algorithms.

1.0 Introduction to Data Structure and Algorithm **(2 hours)**

1.1 Data types
1.2 Data structure , Types of Data structure.
1.3 Abstract data type
1.4 Introduction to Algorithms
1.5 Asymptotic notations.

2.0 Stack **(4 hours)**

2.1 Basic concept of stack
2.2 Stack as ADT
2.3 Stack operations
2.4 Conversion from infix to postfix
2.5 Evaluation of postfix and prefix expression

3.0 Queue **(5 hours)**

3.1 Basic concept of Queue
3.2 Queue as ADT
3.3 Queue Operations
3.4 Linear Queue, Circular Queue, Priority Queue
3.5 Queue Applications

4.0 Recursion **(3 hours)**

4.1 Recursion, Types of Recursion
4.2 Recursion Vs. Iteration
4.3 Fibonacci sequence , TOH
4.4 Application of Recursion

5.0 List **(8 hours)**

5.1 Basic concept of List, array implementation of List
5.2 Linked List ,Linked list as ADT
5.3 Types of Linked List :
    5.3.1 Linear Linked List (singly, doubly)
    5.3.2 Circular Linked List (singly, doubly)
5.4 Operations in Linked List : Node creation, Node insertion and deletion from Beginning , End and Specified Position
5.5 Application of Linked List

6.0 Tree and Graph **(10 hours)**

6.1 Basic concept of Tree
6.2 Tree Terminologies (Root, Node, Degree of node and tree, Terminal and Non-terminal node, Siblings, Level, Edge, Path, Tree Depth/Height, Forest)
6.3 Binary Tree, Operations in Binary Tree
6.4 Types of Binary Tree (Strictly , Full, Complete)
6.5 Binary Search Tree
6.6 Tree traversals (inorder, preorder, postorder)
6.7 AVL Tree and Balancing Algorithm
6.8 Huffman Tree and its application
6.9 Graph definition and representation
6.10 Graph Traversal: DFS and BFS
6.11 Spanning Tree, Minimum Spanning Tree
6.12 Kruskal's and Prim's Algorithm for creating minimum spanning tree
6.13 Shortest Path Algorithm (Dijkstra's algorithm)

7.0 Sorting **(7 hours)**

7.1 Introduction and types of Sorting (Internal and External sort)
7.2 Sorting algorithms (Bubble, Selection, Insertion, Shell, Quick, Merge, Radix, Binary, Heap)
7.3 Efficiency of sorting algorithms

8.0 Searching **(6 hours)**

8.1 Introduction to searching
8.2 Searching algorithms (Sequential Search and Binary Search)
8.3 Efficiency of Searching algorithms
8.4 Hashing: Hash function and Hash table
8.5 Collision Resolution techniques

Laboratories:

The laboratory work consists of implementing the algorithms and data structures studied in the course using C/C++ programming language.

Marks Distribution

Chapter	Tentative Marks distribution
1	2
2+3	10 (2+ 4+4)
4	4
5	2+8 or 4+8
6	2+4
7	4+8
8	4
9	4+8 or 2+8
Total	60

References:

1. Y. Langsam ,M.J. Augenstein and A.M. tanenbaum, "Data Structures using C and C++", PHI
2. G.W. Rowe, "Introduction to Data Structure and Algorithms with C and C++", PHI
3. R.L. Kruse, B.P Leung, C.L. Tondo," data Structure and Program Design in C", PHI
4. Udit Agarwal, "Data Structures using C"

PURBANCHAL UNIVERSITY
Final Exam Model Question 2023

Level: Bachelor
Program: Bachelor in Computer Engineering
Subject: BCE---- Data Structure and Algorithm

Full Marks: 60
Pass Marks: 24
Time: 3 Hrs

Group A: Answer all questions (4*2=8)

1. Differentiate between Stack and Queue.
2. Define degree and depth of tree..
3. Define data structure and list the types of data structure.
4. What do you mean by linked list?

Group B: Answer any 7 Questions (7*4=28)

1. Write the algorithm to evaluate postfix expression.
2. Write the algorithm of Enqueue and Dequeue operation performed in Circular Queue
3. Write the algorithm to solve the TOH game.
4. Create Binary Tree using following traversals;
   Inorder: B I D A C G E H F
   Postorder: I D B G C H F E A
5. Write the algorithm to sort the given numbers using Quick sort.
6. Write the algorithm to search the given number using Binary Search.
7. Explain different Graph traversals with example.
8. Write a pseudocode to perform push and pop operations in stack.

Group C: Answer any three questions (3*8=24)

1. How Singly Linear linked list is different from Doubly Linear linked list? Write the algorithm to insert the node from the beginning and delete the node from the end in Singly Linear linked list. [3+5]
2. List the techniques to solve the collision and explain any one of the collision resolution techniques with an example.
3. Explain Kruskal's algorithm to create minimum spanning tree with example.
4. Describe AVL tree with an example.

Detailed Course Contents of Data Structure and Algorithm

Note: Define (D), Description (Des), Derive (DR), Design (DSG), Illustration (I), Algorithm(Alg), Application (A), Experiment[Program (P)/Hardware(H)], Numerical (N)

Ch No.	Topic		Subtopic	Depth								Hour
				D	Des	DR/DSG	I	Alg	H/P	A	N	
1	**Introduction to Data Structure and Algorithm**	1.1	Data types	**D**								**2 hrs**
		1.2	Data structure , Types of Data structure.		**Des**							
		1.3	Abstract data type	D								
		1.4	Introduction to Algorithms	D								
		1.5	Asymptotic notations.		**Des**							
2	**Stack**	2.1	Basic concept of stack	**D**								**4 hrs**
		2.2	Stack as ADT		**Des**							
		2.3	Stack operations (Push and Pop)					**Alg**	**P**			
		2.4	Conversion from infix to postfix				**I**	**Alg**	**P**		**N**	
		2.5	Evaluation of postfix and prefix expression				**I**	**Alg**	**P**		**N**	
3	**Queue**	3.1	Basic concept of Queue (linear and circular)	**D**	**Des**							**4 hrs**
		3.2	Queue as ADT		**Des**							
		3.3	Queue Operations (Enqueue, Dequeue) of Linear and Circular queue					**Alg**	**P**			
		3.4	Priority Queue	**D**								
		3.5	Queue Applications		**Des**							
4	**Recursion**	4.1	Recursion, Types of Recursion (Direct,Indirect,Tail, Linear, Tree)	**D**	**Des**							**3 hrs**

		4.2	Recursion Vs. Iteration	**D**	**Des**							
		4.3	Fibonacci sequence , TOH		**Des**			**Alg**	**P**			
		4.4	Application of Recursion	**D**								
5	**List**	5.1	Basic concept of List, array implementation of List	**D**								**8 hrs**
		5.2	Linked List ,Linked list as ADT	**D**	**Des**							
		5.3	Types of Linked List :									
		5.3.1	Linear Linked List (singly, doubly)	**D**	**Des**							
		5.3.2	Circular Linked List (singly, doubly)	**D**	**Des**							
		5.4	Operations in Linked List : Node creation, Node insertion and deletion from Beginning , End and Specified Position					**Alg**	**P**			
		5.5	Application of Linked List	**D**								
6	**Tree and Graph**	6.1	Basic concept of Tree	**D**								**10 hrs**
		6.2	Tree Terminologies (Root, Node, Degree of node and tree, Terminal and Non-terminal node, Siblings, Level, Edge, Path, Tree Depth/Height, Forest)	**D**								
		6.3	Binary Tree, Operations in Binary Tree	**D**	**Des**			**Alg**	**P**			
		6.4	Types of Binary Tree (Strictly , Full, Complete)	**D**								
		6.5	Binary Search Tree		**Des**			**Alg**	**P**			
		6.6	Tree traversals (inorder, preorder, postorder)		**Des**		**I**	**Alg**	**P**			
		6.7	AVL Tree and Balancing Algorithm				**I**	**Alg**			**N**	
		6.8	Huffman Tree and its application		**Des**		**I**	**Alg**				
		6.9	Graph definition and representation	**D**								
		6.10	Graph Traversals(DFS, BFS)	**D**	**Des**							
		6.11	Spanning Tree, Minimum Spanning Tree	**D**								

		6.12	Kruskal's and Prim's Algorithm for creating minimum spanning tree		**Des**		**I**	**Alg**			**N**	
		6.13	Shortest Path Algorithm (Dijkstra's Shortest path algorithm)		**Des**		**I**	**Alg**			**N**	
7	Sorting	7.1	Introduction and types of Sorting (Internal and External sort)	**D**	**Des**							**5 hrs**
		7.2	Sorting algorithms (Bubble, Selection, Insertion, Shell, Quick, Merge, Radix, Binary, Heap)		**Des**		**I**	**Alg**	**P**		**N**	
		7.3	Efficiency of sorting algorithms		**Des**							
8	Searching	8.1	Introduction to searching	**D**								**6 hrs**
		8.2	Searching algorithms (Sequential Search and Binary Search)	**D**	**Des**		**I**	**Alg**	**P**			
		8.3	Efficiency of Searching algorithms		**Des**							
		8.4	Hashing: Hash function and Hash table	**D**	**Des**		**I**					
		8.5	Collision Resolution techniques		**Des**		**I**					

Purbanchal University

Faculty of Engineering, Biratnagar, Nepal

Syllabus

Level: Bachelor
Program: Bachelor in Computer Engineering
Subject: BCE----OBJECT ORIENTED ANALYSIS AND DESIGN
Year: II **Semester:** III

Teaching Schedule Hours/Week					Examination Schedule						Total Marks
					Final				Internal Assessment		
					Theory		Practical		Theory Marks	Practical Marks	
Credit Hours	L	T	P	Total	Duration	Marks	Duration	Marks	40	-	100
3	3	1	-	4	3 Hrs.	60	-	-			

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

Course Objective:

- To introduce basic concepts of object-oriented analysis and design and to study the main features of the software development process in an object-oriented framework.
- Performance analysis with real time system.
- Familiarization with Object oriented data and system
- To provide exposure to Visual Object Oriented Modeling languages, specifically Unified Modeling Language (UML),Object Constraint Language(OCL).Performance analysis with real time system.

Course Outline:

- Chapter 1: Fundamentals of OOAD
- Chapter 2: Object-Oriented Analysis
- Chapter 3: Object-Oriented Design
- Chapter 4: Object-Oriented Method
- Chapter 5: Implementation

Chapter 1: Fundamentals of OOAD

Topic	Duration
1 **Introduction** • Introduction to OOAD • Development and Object Orientated Modeling • Evolution of Object Orientated Modeling • Software development system (SDLC) • Differentiate between Object oriented development life cycle and traditional SDLC • Analysis vs Design • Steps/analysis for OOA • OOD(Goal, Steps, Guidelines, Strategy) • OOA vs OOD	6 hrs

Chapter 2: Object-Oriented Analysis

Topic	Duration
2.1 Building Conceptual Model a)Domain Analysis b)Domain Model(Conceptual Model) c)Domain Model as a Visual Dictionary d)Conceptual Class e)Creating a Domain Model i)Reuse or modifying existing models ii)Category List iii)Noun Phrase Analysis o POS(Point of Sale) o Simplified Banking System, o Math Trainer o Simplified Library System 2.2 Adding Association and Attributes a)Guideline to Name Association b)Applying UML • Roles • Multiciplity • Multiple Association Between two classes c) Guideline: Finding Association with Common Associations List d)Example: Associations in Domain Models	8 hrs

e) Guideline to add Attributes f) Attributes Notation(Syntax for Attribute) g) Guideline to record Attribute Requirement h) Derived Attributes i) Data type attribute on Domain Model 2.3 Representation of System Behavior a)System Sequence Diagram(SSD) i) Introduction ii) Use case to SSD b)Naming System Events and Operations c) Operation Contract d) Object Constraint Language (OCL)	

Chapter 3: Object-Oriented Design

Topic	Duration
3.1 Analysis to Design a) From Requirements/Analysis to Design b) Input(Sources)For OOD c) Output(Deliverables) of OOD d) OOD Process e) Designing Object (Static and Dynamic Modeling) 3.2 Describing and Elaborating Use Cases a) Object design Technique i) Class Responsibility Cards(CRC Cards) ii) Realization of Use Case iii) Class Diagram Owned by Use Case Realization iv)Communication and Sequence Diagram owned by Use Case Realization 3.3 UML Interaction Diagrams a) Sequence Diagram • Notation of Sequence Diagram • Sequence Diagram Example b) State Chart Diagrams • State Chart components and Notation (States, Events, Complex State) • State Chart Example c) Collaboration Diagram(Communication Diagram) • Notation of Collaboration Diagram • Collaboration Diagram Example d) Activity Diagram • Notation of Activity Diagram	15

• Activity Diagram Example e) Class Diagram • Design Class Diagram(DCD) • Creating DCD i. Adding Classes ii. Adding Attributes iii. Adding Operations iv. Adding Visibility v. Adding Associations vi. Adding Dependency • Relationships in Class Diagram • Relationship Between Class Diagram and Interaction Diagram 3.4 Determining Visibility a) Attribute Visibility b) Parameter Visibility c) Local Visibility d) Global Visibility e) Constraints f) Qualified Association	

Chapter 4: Object-Oriented Methods

Topic	Duration
4.1 Introduction to Object-Oriented Method 4.2 Object-Oriented Analysis (Coad-Yourdon) 4.3 Object-Oriented Design (Booch) 4.4 Hierarchical object-oriented design (HOOD) 4.5 Object-Oriented Techniques (OMT) 4.6 Responsibility Driven Design (RDD)	**8 hrs.**

Chapter 5: Implementation

Topic	Duration
5.1 Programming and Development Process • Problem Definition • Program Design • Coding • Debugging • Testing • Documentation • Maintenance 5.2 Mapping Design to Code a) Characteristics of Object Design Activities b) State of the Art: Model-based Software Engineering c) Four Different types of transformations • Model transformation • Forward engineering • Reverse engineering • Refactoring. 5.3 Creating Class Definitions from Design Class Diagrams a)Defining a class with method signatures and attributes b)Adding reference attributes c)Reference Attributes and Roles names d) Updating Class Definitions e) Collection Classes in code 5.4 Exception and Error Handling a)Categories of Exception b)Common Examples of Exception c)Exception Handling Process d)Exception class Hierarchy	**8 hrs.**

Assignments:

Assignment should be given for each Chapter.

References:

1. Larman,C.,"Applying UML and Patterns", Pearson Education Asia
2. Object-Oriented Analysis and Design with Applications,Second Edition by Grady Booch.

3. Object Oriented Modelling and Design with UML,Second Edition , by James R. Rumbaugh , Michael R. Blaha , William Lorensen , Frederick Eddy , William Premerlani
4. Ivar Jacobson-Object-Oriented software engineering
5. Ian Sommerville-Software Engineering
6. Grady Booch-Object-oriented analysis and design

Mark Distribution

Chapter	Marks Distribution
Chapter 1	**8**
Chapter 2	**12**
Chapter 3	**16**
Chapter 4	**12**
Chapter 5	**12**

Remarks: There may be minor marks deviation in marks distribution.

Purbanchal University
Model Question 2023

Full Marks: 60
Pass Marks: 24
Time: 3hrs

Program: Bachelor in Computer Engineering/Final
Subject: BCE---- Object Oriented Analysis and Design

Group A: Answer All Questions **4*2=8**

1. Compare Between Function Oriented and Object Oriented System
2. Describe Domain Model with its necessary component.
3. What are the key benefits of using design pattern.
4. What is attribute and parameter visibility.

Group B: Answer any Seven Questions **7*4=28**

5. Explain and illustrate the fundamental Concepts of Object orientation?
6. What are the building blocks of UML? Explain.
7. How is system behaviour represented in Object oriented analysis? Explain.
8. A patient calls the clinic to make an appointment for a yearly checkup. The receptionist finds the nearest empty time slot in the appointment book and schedules the appointment for that time slot. Find all the use cases , actor and draw use case diagram for taking Appointment in Dental Hospital
9. What are the differences between sequence diagram and collaboration diagram?
10. Explain the concept of interface and implementation in any object oriented programming languages.
11. What are the major functions of exception handling and error handling in object-oriented implementation.
12. Describe responsibility driven design with suitable example.

Group C: Answer any Three Questions **3*8=24**

13. Identify the candidate objects, relationships and draw domain model for following scenario.

    ATM System :The software to be designed will control a simulated automated teller machine (ATM) having a magnetic stripe reader for reading an ATM card, a customer console (keyboard and display) for interaction with the customer, a slot for depositing envelopes, a dispenser for cash (in multiples of Rs 500), a printer for printing customer receipts, and a keyoperated switch to allow an operator to start or stop the machine. The

ATM will communicate with the bank's computer over an appropriate communication link. The ATM will service one customer at a time. A customer will be required to insert an ATM card and enter a personal identification number (PIN) - both of which will be sent to the bank for validation as part of each transaction. The customer will then be able to perform one or more transactions. The card will be retained in the machine until the customer indicates that he/she desires no further transactions, at which point it will be returned - except as noted below. A customer must be able to make a cash withdrawal from any suitable account linked to the card. Approval must be obtained from the bank before cash is dispensed. A customer must be able to make a deposit to any account linked to the card, consisting of cash and/or checks in an envelope. The customer will enter the amount of the deposit into the ATM, subject to manual verification when the envelope is removed from the machine by an operator. Approval must be obtained from the bank before physically accepting the envelope. A customer must be able to make a transfer of money between any two accounts linked to the card. A customer must be able to make a balance inquiry of any account linked to the card. A customer must be able to abort a transaction in progress by pressing the Cancel key instead of responding to a request from the machine.

14. Read the Case study carefully and draw sequence diagram.
    Ministry of Health and Population is willing to computerize the system. This new system be able to tell the word of specific place. The system will update its data in monthly basis so that the birth rate and death rate can be easily seen. The home page is displayed when a person enters to the system. Administrators can enter to the admin panel by logging in with an ID and Password. He/She has privileges to enter and modify the data into database. On the other hand, normal users can view the data but not modify them. they can also visualize the data in graphical form with animated charts, maps as well as in tabular form based on their selection of data. Besides, they can also view the forcasted data.(make assumptions if necessary)

15. Explain hierarchical object-oriented design in detail.
16. Write Short notes on: [2*4=8]
    a. Forward Engineering and Reverse Engineering
    b. Model View Controller(MVC) Pattern

Detailed Course Contents of Object Oriented Analysis and Design

Note: Define(D), Description(Des), Derive (DR), Design(DSG), Illustration (I), Algorithm(Alg), Application (A), Experiment[Program (P)/Hardware(H)], Numerical (N)

Chapter No.	Topic		Subtopic	Depth								Hour
				D	Des	DR/ DSG	I	Alg	H/P	A	N	
1	**Fundamentals of OOAD**	1.1	Introduction to OOAD	**D**						**A**		**6 hrs.**
		1.2	Development and Object Orientated Modeling		**Des**		**I**					
		1.3	Evolution of Object Orientated Modeling		**Des**		**I**					
		1.4	Software development system (SDLC)		**Des**		**I**					
		1.5	Differentiate between Object oriented development life cycle and traditional SDLC		**Des**					**A**		
		1.6	Analysis vs Design	**D**	**Des**		**A**					
		1.7	Steps/analysis for OOA		**Des**		**I**					
		1.8	OOD(Goal, Steps, Guidelines, Strategy)		**Des**		**I**					
		1.9	OOA vs OOD		**Des**		**I**			**A**		
2	**Object-Oriented Analysis**	2.1	Building Conceptual Model	**D**			I					**8 hrs.**

			a)Domain Analysis		**Des**		I					
			b)Domain Model(Conceptual Model)		Des	**DSG**	**I**					
			c)Domain Model as a Visual Dictionary		Des		**I**					
			d)Conceptual Class		**Des**	DSG	**I**					
			e)Creating a Domain Model	**D**		**DSG**	**I**					
			i)Reuse or modifying existing models		Des	**DSG**	I					
			ii)Category List		Des	**DSG**	I					
			iii)Noun Phrase Analysis o POS(Point of Sale) o Simplified Banking System, o Math Trainer o Simplified Library System		Des	**DSG**	I					
		2.2	Adding Association and Attributes		Des					A		
			a)Guideline to Name Association		Des		I					

			b)Applying UML • Roles • Multiciplity • Multiple Association Between two classes	D		**DSG**	I					
			c) Guideline: Finding Association with Common Associations List		Des					A		
			d)Example: Associations in Domain Models		Des	**DSG**	I					
			e) Guideline to add Attributes		Des	**DSG**	I					
			f) Attributes Notation(Syntax for Attribute)		Des	**DSG**	I					
			g) Guideline to record Attribute Requirement		Des	**DSG**	I					
			h) Derived Attributes		Des	**DSG**	I					
			i) Data type attribute on Domain Model		Des	**DSG**	I					

		2.3	Representation of System Behavior		Des	**DSG**	I				
			a)System Sequence Diagram(SSD) i) Introduction ii) Use case to SSD		Des	**DSG**	I				
			b)Naming System Events and Operations		Des	**DSG**	I				
			c) Operation Contract		Des	**DSG**	I				
			d) Object Constraint Language (OCL)	D		**DSG**	I				
3	**Object-Oriented Design**	**3.1**	Analysis to Design	**D**						A		**15 hrs.**
			a) From Requirements/Analysis to Design		**Des**		I			A	
			b) Input(Sources)For OOD		**Des**	**DSG**	I				
			c) Output(Deliverables) of OOD		**Des**	**DSG**	I				
			d) OOD Process		**Des**	**DSG**	I				
			e) Designing Object (Static and Dynamic Modeling)		**Des**	**DSG**	I				

		3.2	Describing and Elaborating Use Cases		**Des**		I				
			a) Object design Technique		**Des**		**I**			A	
			i) Class Responsibility Cards(CRC Cards)	**D**		**DSG**				A	
			ii) Realization of Use Case		**Des**	**DSG**	I				
			iii) Class Diagram Owned by Use Case Realization	**D**		DSG	**I**				
			iv)Communication and Sequence Diagram owned by Use Case Realization		**Des**	**DSG**	I				
		3.3	UML Interaction Diagrams		**Des**						
			a) Sequence Diagram • Notation of Sequence Diagram • Sequence Diagram Example		**Des**	DSG	**I**			A	
			b) State Chart Diagrams • State Chart components and Notation (States, Events, Complex State) • State Chart Example		**Des**	DSG	**I**			A	
			c) Collaboration Diagram(Communication Diagram) • Notation of Collaboration Diagram		**Des**	DSG	**I**			A	

			• Collaboration Diagram Example									
			d) Activity Diagram • Notation of Activity Diagram • Activity Diagram Example		**Des**	DSG	**I**			A		
			• State Chart components and Notation (States, Events, Complex State)									
			e) Class Diagram • Design Class Diagram(DCD) • Creating DCD i. Adding Classes ii. Adding Attributes iii. Adding Operations iv. Adding Visibility v. Adding Associations vi. Adding Dependency • Relationships in Class Diagram • Relationship Between Class Diagram and Interaction Diagram		**Des**	DSG	**I**			A		
		3.4	Determining Visibility	**D**						A		
			a) Attribute Visibility		**Des**	DSG	**I**					
			b) Parameter Visibility		**Des**	DSG	**I**					

			c) Local Visibility		**Des**	DSG	**I**					
			d) Global Visibility		**Des**	DSG	**I**					
			e) Constraints		**Des**	DSG	**I**					
			f) Qualified Association		**Des**	DSG	**I**					
4	**Object-Oriented Methods**	4.1	Introduction to Object-Oriented Method	**D**						A		**8hrs.**
		4.2	Object-Oriented Analysis (Coad-Yourdon)		Des		**I**			A		
		4.3	Object-Oriented Design (Booch)		Des		**I**			A		
		4.4	Hierarchical object-oriented design (HOOD)		Des		**I**			A		
		4.5	Object-Oriented Techniques (OMT)		Des		**I**			A		
		4.6	Responsibility Driven Design (RDD)		Des		**I**			A		
5	**Implementation**	5.1	Programming and Development Process • Problem Definition • Program Design • Coding • Debugging • Testing • Documentation		Des		**I**			A		**8 hrs.**

			• Maintenance									
		5.2	Mapping Design to Code	**D**								
			a) Characteristics of Object Design Activities		Des		**I**					
			b) State of the Art: Model-based Software Engineering		Des		**I**					
			c) Four Different types of transformations • Model transformation • Forward engineering • Reverse engineering • Refactoring.		Des		**I**					
		5.3	Creating Class Definitions from Design Class Diagrams	**D**	Des							
			a)Defining a class with method signatures and attributes		Des	DSG	**I**		P			
			b)Adding reference attributes		Des	DSG	**I**		P			
			c)Reference Attributes and Roles names		Des	DSG	**I**		P			
			d) Updating Class Definitions		Des	DSG	**I**		P			
			e) Collection Classes in code		Des	DSG	**I**		P			
		5.4	Exception and Error Handling		Des		**I**					
			a)Categories of Exception		Des		**I**					
			b)Common Examples of Exception		Des							
			c)Exception Handling Process		Des		**I**					
			d)Exception class Hierarchy		Des		**I**					
											Total:	**45 hrs.**

Purbanchal University

Faculty of Engineering, Biratnagar, Nepal

Syllabus

Level: Bachelor

Program: Bachelor in Computer Engineering

Subject: BCE---- Computer Graphics

Year: II **Semester:** III

Teaching Schedule Hours/Week					Examination Schedule						Total Marks
					Final				Internal Assessment		
					Theory		Practical		Theory Marks	Practical Marks	
Credit Hours	L	T	P	Total	Duration	Marks	Duration	Marks	40	30	150
3	3	1	3	7	3 Hrs.	60	-	20			

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

Course Objectives:

After completion of this course students will be:

- Familiarize with hardware involved in graphics.
- Familiarize with the basic techniques used in Computer Graphics System.

Course Contents:

Theory

Unit 1: Introduction **[2 Hrs.]**

1.1. History of Computer Graphics,
1.2. Application of Computer Graphics

Unit 2: Graphics Hardware **[8 Hrs.]**

2.1. Input Hardware
  2.1.1. Keyboard, Mouse (mechanical & optical), Light pen, Touch panel (Optical, Sonic, and Electrical), Digitizers (Electrical, Sonic, Resistive), Scanner, Joystick
2.2. Output Hardware
  2.2.1. Monitors
    2.2.1.1. Monochromatic CRT Monitors
    2.2.1.2. Color CRT Monitors
    2.2.1.3. Flat Panel Display Monitors
  2.2.2. Hardcopy Devices
    2.2.2.1. Plotters

2.2.2.2. Printers

2.3. Raster and Vector Display Architectures, Principles and Characteristics
2.4. Architecture of simple non-graphical display terminals
2.5. Architecture of graphical display terminals including frame buffer and color manipulation techniques
2.6. Advanced raster graphic architecture

Unit 3: Two Dimensional Algorithms and Transformations [10 Hrs.]

3.1. Mathematical Line Drawing Concept
3.2. Line Drawing Algorithms
  3.2.1. Digital Differential Analyzer (DDA)
  3.2.2. Bresenham's Line Drawing Algorithm for m>1 and m<1
3.3. Mid-point Circle Drawing
3.4. Mid-point Ellipse Drawing Algorithm
3.5. Review of Matrix Operations – Addition and Multiplication
3.6. Two-dimensional Transformations
  3.6.1. Translation
  3.6.2. Scaling
  3.6.3. Rotation
  3.6.4. Reflection
  3.6.5. Shearing
3.7. Two-dimensional object to screen viewing transforms
3.8. Recent Transform Concept and advantages

Unit 4: Windows, Viewport and Clipping [6 Hrs.]

4.1. Introduction
4.2. Windows to Viewport Transformation
4.3. Viewing Transformation implementation
4.4. Clipping
  4.4.1. Point Clipping
  4.4.2. Line Clipping
    4.4.2.1. Cohen Sutherland Line Clipping Algorithm
  4.4.3. Polygon Clipping
    4.4.3.1. The Sutherland-Hodgman Polygon Clipping Algorithm

Unit 5: Three Dimensional Graphics [14 Hrs.]

5.1. Three-dimensions transformations
  5.1.1 Translation
  5.1.2 Scaling
  5.1.3 Rotation
  5.1.4 Reflection
5.2 Three-dimensions Projections
  5.2.1 Concept of Projection
  5.2.2 Projection of 3D Objects onto 2D Display Devices
  5.2.3 Three-dimensional Projection Methods
    5.2.3.1 Parallel Projection Method

5.2.3.2 Perspective Projection Method

5.3 Specialized and future three-dimensional display

5.4 Three-dimensional Object Representations

5.4.1 Polygon Surfaces

5.4.2 Polygon Tables

5.5 Introduction to Hidden Line and Hidden Surface Removal Techniques

5.5.1 Object Space Method

5.5.2 Image Space Method

5.6 Introduction to Illumination/ Lighting Models

5.7 Need for Shading in Engineering Data Visualization

5.8 Introduction to Shading/ Surface Rendering Models

5.8.1 Constant Shading Model

5.8.2 Gouraud Shading Model

5.8.3 Phong Shading Model

Unit 6: Graphics Language and Graphics DesignPackages [4 Hrs.]

6.1 Introduction to graphics file formats

6.2 Discussion of available graphical file formats

6.3 Type, purposes and features of graphics packages

6.4 Examples of graphics packages and libraries

6.5 Discussion of available graphical languages (PHIGS, GKS, PHIGS+)

6.6 Need for machine independent graphical languages

Unit 7: Fundamentals of Animation Techniques [1 Hrs.]

7.1 Introduction of Animation

7.1.1Computer Animation Language

7.1.1.1 Open GL Introduction

7.1.1.2 Some examples of Open GL

Practical

As a part of the laboratory exercise, the students are required to create a small project implementing graphics.

Some algorithm implementation to include:

1. Introduction to graphics primitives and graphics drivers.
2. Implementation of Digital Differential Analyzer (DDA), a line Drawing Algorithm.
3. Implementation of Bresenham's Line Drawing Algorithm.
4. Implementation of mid-point Circle Drawing Algorithm.
5. Implementation of mid -point Ellipse Drawing Algorithm.
6. Implementation of basic 2D transformation.
7. Implementation of basic 3D transformation.
8. Implementation of basic projections.
9. Implementation of line clipping Algorithm
10. Implementation of Polygon Clipping Algorithm

References:

1. D. Hearn and M. P. Baker, “Computer Graphics”, PHI Edition
2. T. I. James, D. Foley, A. Van Dam, S. K. Feiner, and J. F. Hughes, “Computer Graphics, Principles, and Practice”, PHI Edition

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction	2	3
2	Graphics Hardware	8	10
3	Two Dimensional Algorithms and Transformations	10	12
4	Windows, Viewport and Clipping	6	10
5	Three Dimensional Graphics	14	15
6,7	Graphics Language and Graphics DesignPackages, Fundamentals of Animation	4,1	5
	Total	**45**	**60**

* There may be minor deviation in marks distribution.

PURBANCHAL UNIVERSITY

SEMESTER FINAL EXAM – 2023 (MODEL QUESTION)

LEVEL: BACHELOR PROGRAM: Bachelor in Computer Engineering

SUBJECT: BCE---- Computer Graphics

Semester: III FULL MARKS: 60 PASS MARKS: 24

TIME: 03:00 hrs.

Computer Graphics

Group: A Answer All Questions [4x2=8]

1. Define Computer Graphics. Explain any one application of Computer Graphics in various real world with examples.
2. Differentiate between Bresenham and DDA algorithms.
3. How is the limitation of Random Scan Architecture overcome by Raster Scan Architecture?
4. What do you mean by hidden surface removal methods?

Group: B Answer any Seven [7x4=28]

5. Explain different types of touch panels in brief.
6. Write detail on 2-D rotation and reflection methods.
7. Explain window to viewport transformation.
8. Explain detail on Polygon Tables.
9. Write down Sutherland-Hodgeman (Polygon Clipping) algorithm.
10. Explain Specular Reflection Method in detail.
11. Why do we need machine independent graphical languages? Explain.
12. Draw a line between points A(-2,3) and B(3,5) using Bresenham's algorithm.

Group: C Answer any three questions (3x8=24)

13. Explain on Raster Scan and Vector Scan Architectures with neat diagrams.

14. Derive the mid-point circle generating algorithm. [8]
15. Explain Gouraud and Phong Shading methods in detail.[4+4]
16. Describe reflection about the X-axis/plane YZ and reflect the point, P(4,7,5) about that axis using homogeneous coordinate form. [8]

Detailed Course Contents of Computer Graphics:

Note: Define (D), Description (Des), Derive (DR), Design (DSG), Illustration (I), Algorithm (Alg), Application (A), Experiment [Program (P)/ Hardware (H)], Numerical (N)

Detailed Course Contents:

Ch No.	Topics		Subtopics	Depth								Hour	Remarks
				D	Des	DR/DSG	I	Alg	H/P	A	N		
1	**Introduction**	1.1	History of Computer Graphics	**D**	**Des**							**2 Hrs.**	
		1.2	Application of Computer Graphics							**A**			
2	**Graphics Hardware**	2.1	Input Hardware		**Des**							**8 Hrs.**	
		2.1.1	Keyboard, Mouse (mechanical & optical), Light pen, Touch panel (Optical, Sonic, and Electrical), Digitizers (Electrical, Sonic, Resistive), Scanner, Joystick		**Des**								
		2.2	Output Hardware		**Des**								
		2.2.1	Monitors		**Des**								
		2.2.1.1	Monochromatic CRT Monitors		**Des**								
		2.2.1.2	Color CRT Monitors		**Des**								

		2.2.1.3	Flat Panel Display Monitors		**Des**								
		2.2.2	Hardcopy Devices		**Des**								
		2.2.2.1	Plotters		**Des**								
		2.2.2.2	Printers		**Des**								
		2.3	Raster and Vector Display Architectures, Principles and Characteristics	**D**	**Des**		**I**						
		2.4	Architecture of simple non-graphical display terminals		**Des**								
		2.5	Architecture of graphical display terminals including frame buffer and color manipulation techniques	**D**	**Des**		**I**				**N**		
		2.6	Advanced raster graphic architecture		**Des**		**I**						
3	**Two Dimensional Algorithms and Transformations**	3.1	Mathematical Line Drawing Concept		**Des**		**I**					**10 Hrs.**	
		3.2	Line Drawing Algorithms		**Des**		**I**						
		3.2.1	Digital Differential Analyzer (DDA)		**Des**	**DR**	**I**	**Alg**	**P**		**N**		
		3.2.2	Bresenham's Line Drawing Algorithm for m>1 and m<1		**Des**	**DR**	**I**	**Alg**	**P**		**N**		
		3.3	Mid-point Circle Drawing		**Des**	**DR**	**I**	**Alg**	**P**		**N**		
		3.4	Mid-point Ellipse Drawing Algorithm		**Des**	**DR**	**I**	**Alg**	**P**		**N**		

		3.5	Review of Matrix Operations – Addition and Multiplication		**Des**		**I**						
		3.6	Two-dimensional Transformations		**Des**		**I**						
		3.6.1	Translation	**D**	**Des**	**DR**	**I**		**P**		**N**		
		3.6.2	Scaling	**D**	**Des**	**DR**	**I**		**P**		**N**		
		3.6.3	Rotation	**D**	**Des**	**DR**	**I**		**P**		**N**		
		3.6.4	Reflection	**D**	**Des**	**DR**	**I**		**P**		**N**		
		3.6.5	Shearing		**Des**	**DR**	**I**		**P**		**N**		
		3.7	Two-dimensional object to screen viewing transforms	**D**	**Des**		**I**	**Alg.**		**A**			
		3.8	Recent Transform Concept and advantages		**Des**		**I**						
4	**Windows, Viewport and Clipping**	4.1	Introduction									**6 Hrs.**	
		4.2	Windows to Viewport Transformation	**D**	**Des**	**DR**	**I**	**Alg.**	**P**				
		4.3	Viewing Transformation implementation	**D**	**Des**		**I**			**A**			
		4.4	Clipping	**D**	**Des**		**I**		**P**	**A**			
		4.4.1	Point Clipping	**D**	**Des**	**DR**	**I**	**Alg.**	**P**				
		4.4.2	Line Clipping	**D**	**Des**		**I**		**P**				
		4.4.2.1	Cohen Sutherland Line Clipping Algorithm	**D**	**Des**	**DR**	**I**	**Alg.**	**P**				
		4.4.3	Polygon Clipping	**D**	**Des**		**I**			**A**			

		4.4.3.1	The Sutherland-Hodgman Polygon Clipping Algorithm	**D**	**Des**	**DR**	**I**	**Alg.**					
5	**Three Dimensional Graphics**	5.1	Three-dimensions transformations	**D**	**Des**		**I**					**14 Hrs.**	
		5.1.1	Translation	**D**	**Des**	**DR**	**I**				**N**		
		5.1.2	Scaling	**D**	**Des**	**DR**	**I**				**N**		
		5.1.3	Rotation	**D**	**Des**	**DR**	**I**				**N**		
		5.1.4	Reflection	**D**	**Des**	**DR**	**I**				**N**		
		5.2	Three-dimensions Projections	**D**	**Des**	**DR**	**I**			**A**			
		5.2.1	Concept of Projection	**D**	**Des**	**DR**	**I**						
		5.2.2	Projection of 3D Objects onto 2D Display Devices	**D**	**Des**	**DR**	**I**			**A**			
		5.2.3	Three-dimensional Projection Methods	**D**	**Des**	**DR**	**I**						
		5.2.3.1	Parallel Projection Method	**D**	**Des**	**DR**	**I**			**A**			
		5.2.3.2	Perspective Projection Method	**D**	**Des**	**DR**	**I**			**A**			
		5.3	Specialized and future three-dimensional display	**D**	**Des**		**I**						
		5.4	Three-dimensional Object Representations	**D**	**Des**		**I**						
		5.4.1	Polygon Surfaces	**D**	**Des**	**DR**	**I**						
		5.4.2	Polygon Tables	**D**	**Des**	**DR**	**I**						
		5.5	Introduction to Hidden Line and Hidden Surface Removal Techniques	**D**	**Des**		**I**						
		5.5.1	Object Space Method	**D**	**Des**	**DR**	**I**	**Alg.**					

		5.5.2	Image Space Method	**D**	**Des**	**DR**	**I**	**Alg.**					
		5.6	Introduction to Illumination/ Lighting Models	**D**	**Des**		**I**			**A**			
		5.7	Need for Shading in Engineering Data Visualization	**D**	**Des**		**I**			**A**			
		5.8	Introduction to Shading/ Surface Rendering Models	**D**	**Des**		**I**			**A**			
		5.8.1	Constant Shading Model	**D**	**Des**	**DR**	**I**	**Alg.**		**A**			
		5.8.2	Gouraud Shading Model	**D**	**Des**	**DR**	**I**	**Alg.**		**A**			
		5.8.3	Phong Shading Model	**D**	**Des**	**DR**	**I**	**Alg.**		**A**			
6	**Graphics Language and Graphics DesignPackages**	6.1	Introduction to graphics file formats	**D**	**Des**		**I**					**4 Hrs.**	
		6.2	Discussion of available graphical file formats	**D**	**Des**		**I**			**A**			
		6.3	Type, purposes and features of graphics packages	**D**	**Des**		**I**						
		6.4	Examples of graphics packages and libraries	**D**	**Des**		**I**			**A**			
		6.5	Discussion of available graphical languages (PHIGS, GKS, PHIGS+)	**D**	**Des**		**I**						
		6.6	Need for machine independent graphical languages	**D**	**Des**		**I**			**A**			
7	**Fundamentals of Animation Techniques**	7.1	Introduction of Animation	**D**	**Des**		**I**					**1 Hr.**	

		7.1.1	Computer Animation Language	**D**	**Des**		**I**			**A**			
		7.1.1.1	Open GL Introduction	**D**	**Des**		**I**			**A**			
		7.1.1.2	Some examples of Open GL				**I**			**A**			

Laboratory:

As a part of the laboratory exercise, the students are required to create a small project implementing graphics.
Some algorithm implementation to include:

1. Introduction to graphics primitives and graphics drivers.
2. Implementation of Digital Differential Analyzer (DDA), a line Drawing Algorithm.
3. Implementation of Bresenham's Line Drawing Algorithm.
4. Implementation of mid-point Circle Drawing Algorithm.
5. Implementation of mid -point Ellipse Drawing Algorithm.
6. Implementation of basic 2D transformation.
7. Implementation of basic 3D transformation.
8. Implementation of basic projections.
9. Implementation of line clipping Algorithm

References:

1. D. Hearn and M. P. Baker, "Computer Graphics", PHI Edition
2. T. I. James, D. Foley, A. Van Dam, S. K. Feiner, and J. F. Hughes, "Computer Graphics, Principles, and Practice", PHI Edition

Marks Distribution

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction	2	2
2	Graphics Hardware	8	10 (2+4+4)
3	Two Dimensional Algorithms and Transformations	10	12 (4+8) or (4+4+4)

4	Windows, Viewport and Clipping	6	10 (2+4+4) or (2+8)
5	Three Dimensional Graphics	14	16 (8+8) or (4+4+8) or (2+2+4+4+4)
6,7	Graphics Language and Graphics DesignPackages, Fundamentals of Animation	4,1	6 (2+4)
	Total	**45**	**60**

* There may be minor deviation in marks distribution.

Purbanchal University

Faculty of Engineering, Biratnagar, Nepal

Syllabus

Level: Bachelor
Program: Bachelor in **Computer/Electrical** Engineering
Subject: BEC---- ELECTRONICS DEVICES AND CIRCUITS
Year: II **Semester:** III

Teaching Schedule Hours/Week					Examination Schedule						Total Marks
					Final				Internal Assessment		
					Theory		Practical		Theory Marks	Practical Marks	
Credit Hours	L	T	P	Total	Duration	Marks	Duration	Marks	40	25	125
3	3	1	3/2	5.5	3 Hrs.	60	-	-			

Note: L: Lecture T: Tutorial P: Practical

Course Objectives: To introduce students about working principles and applications of basic semiconductor devices like diodes, BJTs and FETs.

1.0 Semiconductor: **[15 hours]**
- 1.1 Semiconductor and its types
- 1.2 PN junction
- 1.3 PN junction as a diode:
  - 1.3.1. VI characteristics of PN junction diode
  - 1.3.2. Effect of temperature on VI characteristics of PN junction diode
- 1.4 Zener diode and its VI characteristics:
  - 1.4.1. Zener diode as a voltage regulator
- 1.5 Schottky diode
- 1.6 Applications of PN junction diode:
  - 1.6.1. Rectifier and its types
  - 1.6.2. Clippers and clamper

2.0 Bipolar junction Transistor: **[14 hours]**
- 2.1 Construction and its types
- 2.2 Different Configuration of BJT
  - 2.2.1. Input and output characteristics of CB, CE and CC
- 2.3 BJT as an amplifier
- 2.4 BJT as a switch
- 2.5 Types of biasing

3.0 Field Effect Transistors: **[8 hours]**
- 3.1 Junction Field Effect Transistors:
  - 3.1.1 Construction and characteristics
  - 3.1.2 Biasing of JFET
- 3.2 Metal Oxide Semiconductor Field Effect Transistor
  - 3.2.1 Construction, characteristics and types
  - 3.2.2 NMOS(Depletion and Enhancement types)

4.0 Operational Amplifier: **[8 hours]**
- 4.1 Ideal and non-ideal characteristics
- 4.2 Inverting and non-inverting configuration
- 4.3 Op-amp as adder , subtractor, differentiator, integrator

Practicals:
1. Measurement of characteristics of PN junction diode, zener diode
2. Half wave and full wave rectifier with and without filter capacitor
3. Measurement of input and output characteristics of CE configuration
4. Observe the output of op-amp in inverting and non-inverting configuration

References:

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

Question pattern:

Chapter	Hours	Marks
1.	15	20
2	14	20
3	8	10
4	8	10

Model Questions

Attempt All Questions

Group A

[4*2=8]

1. What is semiconductor? Describe its types
2. Describe clipper circuits briefly.
3. Differentiate between BJT & FET.
4. Differentiate between ideal and non ideal op-amp.

Group B

[7*4=28]

1. When the voltage across a forward biased diode at T=10°c is 0.621V, the current is 4.3 mA. If the current is held constant, what is the voltage when T=40°c .
2. Explain how BJT acts as a switch.
3. What is rectifier? Describe its types
4. State the different transistor configurations used in a BJT. Explain input characteristics of Common emitter configuration.
5. Define bias stabilization. What are the factors which may affect it?
6. Design a summing inverting amplifier with 3 inputs V1=2V,V2=3V & V3=4V and R1=R2=R3=RF= 1KΩ and calculate output voltage.
7. What is op-amp? Describe its inverting mode.

[3*8=24]

Group C

1. Explain VI characteristic curve of zener diode and explain the significance of reverse bias mode of zener diode to realize it as a voltage regulator circuit.

2. A Si transistor with β=100 is to be used in the self biasing circuit such that Q point corresponds to V_{CE}=12V & I_C=2mA. Construct the circuit and find R_B if V_{CC}=24V & R_C=5KΩ.
3. What is a MOSFET? What are its types? Explain the construction and working of N channel E-MOSFET .

Detailed Course Contents of ELECTRONIC DEVICES AND CIRCUITS (for BE Computer/ Electrical Third Semester)

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

Detailed Course Contents:

Ch No.	Topic		Subtopic	Depth								Hours	Remarks
				SD	D	DR	I	E	A	EX	N		
1	Semiconductor	1.1	Semiconductor and its types	✓	✓		✓	✓				15	
		1.2	PN junction	✓									
		1.3	VI characteristics of PN junction diode, Effect of temperature on VI characteristics of PN junction diode		✓		✓	✓			✓		
		1.4	Zener diode and Zener diode as a voltage regulator		✓		✓	✓			✓		
		1.5	Schottky diode	✓	✓								
		1.6	Rectifier types, Clippers and clampers	✓	✓	✓	✓	✓			✓		
2	Bipolar junction Transistor	2.1	Introduction and its types	✓	✓		✓	✓				14	
		2.2	BJT Configuration, Input and output characteristics of CB, CE and CC	✓	✓		✓	✓			✓		
		2.3	BJT as an amplifier	✓	✓		✓	✓					
		2.4	BJT as a switch	✓	✓		✓	✓					

		2.5	Types of biasing	✓	✓		✓	✓			✓		
3	Field Effect Transistors	3.1	Junction Field Effect Transistors: Construction, characteristics and Biasing	✓	✓		✓	✓			✓	**8**	
		3.2	Metal Oxide Semiconductor Field Effect Transistor : Construction, characteristics and NMOS(Depletion and Enhancement types)	✓	✓		✓	✓					
4	Operational Amplifier	4.1	Ideal and non-ideal characteristics	✓	✓		✓	✓				**8**	
		4.2	Inverting and non-inverting configuration	✓	✓		✓	✓	✓		✓		
		4.3	Op-amp as adder, subtractor, differentiator, integrator	✓	✓		✓	✓	✓		✓		
Note: Define(SD), Description (D), Derive (Dr), Illustration (I), Explanation (E), Application (A), Experimentation (Ex), Numerical (N)													

Final Examination Scheme:

Chapters	Marks	Remarks
1	**20**	
2	**20**	
3	**10**	
4	**10**	
Total	**60**	

Note: There might be minor deviation in mark distribution.
Mandatory: Marks should be evaluated based on solving steps.

Evaluation Scheme;
Marks Division

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

Purbanchal University

Faculty of Engineering, Biratnagar, Nepal

Syllabus

Level: Bachelor

Program: Bachelor in Computer Engineering

Subject: BSH---- APPLIED SOCIOLOGY

Year: II **Semester: III**

Teaching Schedule Hours/Week					Examination Schedule						Total Marks
					Final				Internal Assessment		
					Theory		Practical		Theory Marks	Practical Marks	
Credit Hours	L	T	P	Total	Duration	Marks	Duration	Marks	20	-	50
2	2	1	-	3	1.5 Hrs.	30	-	-			

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

Course Objectives: The course is designed:

1) To impart fundamental sociological and societal information's to the bachelor level students in the engineering discipline.
2) To identify the core values that shapes the social behavior of an engineer.
3) To enable students understand the issues of social, cultural, economic and political aspects of society.

Course contents:

Unit 1. Introduction (3hrs)

1.1 Meaning, definition and evolution of sociology
1.2 Role of sociology in software engineering
1.3 Social and technical issues of society

Unit 2. Social and Cultural Change (4hrs)

2.1 Definition and process of change
2.2 Theories of social change (evolutional, functional, conflict)
2.3 Factors of Social & Cultural change(Economy, Technology, Education, Demography)
2.4 Resistance factors of Socio-Cultural change
2.5 Technological changes and its consequences

Unit 3. Development (6hrs)

3.1 Definition and Importance of development
3.2 Approaches of development
3.3 Indicators of development
3.4 Development Planning
3.5 Features of developing countries
3.6 Role of indigenous and appropriate technology

Unit 4. Process of Transformation (5hrs)

4.1 Modernization
4.2 Globalization
4.3 Migration
4.4 E-governance
4.5 E-commerce

Unit 5. Patterns of Political-Economic System (5hrs)

5.1 Concept of state, Division of labor
5.2 Flow of capital, labor, goods and culture
5.3 Economy (Types of production, Shift in economy)
5.4 Emergence of Political power
5.5 Political System (Nation building process and use of power , Political regime)

Unit 6.Characteristics of Nepalese Society & Culture (4hrs)

6.1 Historical Development of Nepalese Society
6.2 Demographic composition
6.3 Issue of gender, caste and ethnic group
6.4 National integration and differentiation

Unit 7. Introduction to Emotional Intelligence (3hrs)

7.1 Definition and benefits of Emotional Intelligence (EI)
7.1Components of EI
7.2 Domains and Competencies of EI
7.3 Optimism, Pessimism and the balance between optimism & pessimism

Reference Books:

1. Alex Inkles, "What is Sociology? Introduction in the Discipline & Profession", Prentice Hall of India
2. Foster G.M .,"Traditional Culture & Impact of Technological Change"
3. Regmi Rishikeshav Raj, "Dimension of Nepali Society & Culture"
4. Rao,C.N.S., "Principle of Sociology with an Introduction of Social Thought",S.Chand & Company Ltd.
5. Daniel Goleman, "Emotional Intelligence: Why it can matter more than IQ"
6.

Question Type	Number of Question	Total Marks
Short Questions	4 Questions out of 5	4X4= 16
Long Questions	2 Questions out of 3	2X7= 14

PURBANCHAL UNIVERSITY

2023 Model Question

Full Marks:30
Pass Marks:12
Time: 01:30hrs

Program: Bachelor in Computer Engineering
Semester: IV

Subject: BSH---- Applied Sociology

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

Group A: Answer any four Questions [4X4=16]

1. Briefly explain any two factors of social and cultural changes.
2. What are the main approaches of development?
3. State the role of modernization in the society.
4. Why national integration is required for national development?
5. Highlight the emergence of political power in the context of Nepal.

Group A: Answer any two Questions [2X7=14]

6. Define Sociology and how is it applied in the field of engineering? Discuss. [2+5]
7. Introduce Emotional Intelligence. How do you manage emotions like optimism and pessimism? [2+5]
8. Write a brief account of the socio- historical development of Nepal.

Purbanchal University

Faculty of Engineering, Biratnagar, Nepal

Syllabus

Level: Bachelor

Program: Bachelor in Computer Engineering

Subject: BCE---- Project I

Year: II **Semester:** III

Teaching Schedule Hours/Week					Examination Schedule						Total Marks
					Final				Internal Assessment		
					Theory		Practical		Theory Marks	Practical Marks	
Credit Hours	L	T	P	Total	Duration	Marks	Duration	Marks	-	60	100
3	1	-	3	4	-	-	-	40			

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

Course Objective: To design and complete a software project in a high level language (C or C++). On the completion of the project, students will be able to develop a small scale software based on C or C++ programming language.

Course Contents:

This course covers implementation of important features of a high-level language (C or C++). A Software development project will be assigned to students in a group (A group will have maximum of four students). A relevant topic shall be identified and instructed to each group. Students must develop the assigned project, submit written report, and deliver oral presentation.

Project Guidelines:

1. Group Size and Roles:

1.1 A group can have maximum of four members(students).

1.2 Every member in a group **must** contribute towards following:

- Topic Selection
- Information Gathering
- System Requirements Specifications
- Coding & Testing
- Implementation
- Documentation

2. A Supervisor will be assigned to every group who will internally assess the project work.

3. Project Report Format

-Title Page

-Certificate of project Completion (Internal + External)

- Acknowledgement

- Abstract

-Table of Contents

-List of Abbreviations

-List of Figures

-List of Tables

- Introduction to accomplished project

- Statement of the problem

- Objective

- System Implementation

- System Testing

- Limitations/Future Work

- Conclusion

- References and Bibliography